

Stansted Airport Limited

CLIMATE CHANGE ADAPTATION PROGRESS REPORT For London Stansted Airport

August 2016





Report submitted to the Department for Environment, Food and Rural Affairs (Defra) at:

Climate Change Adaptation
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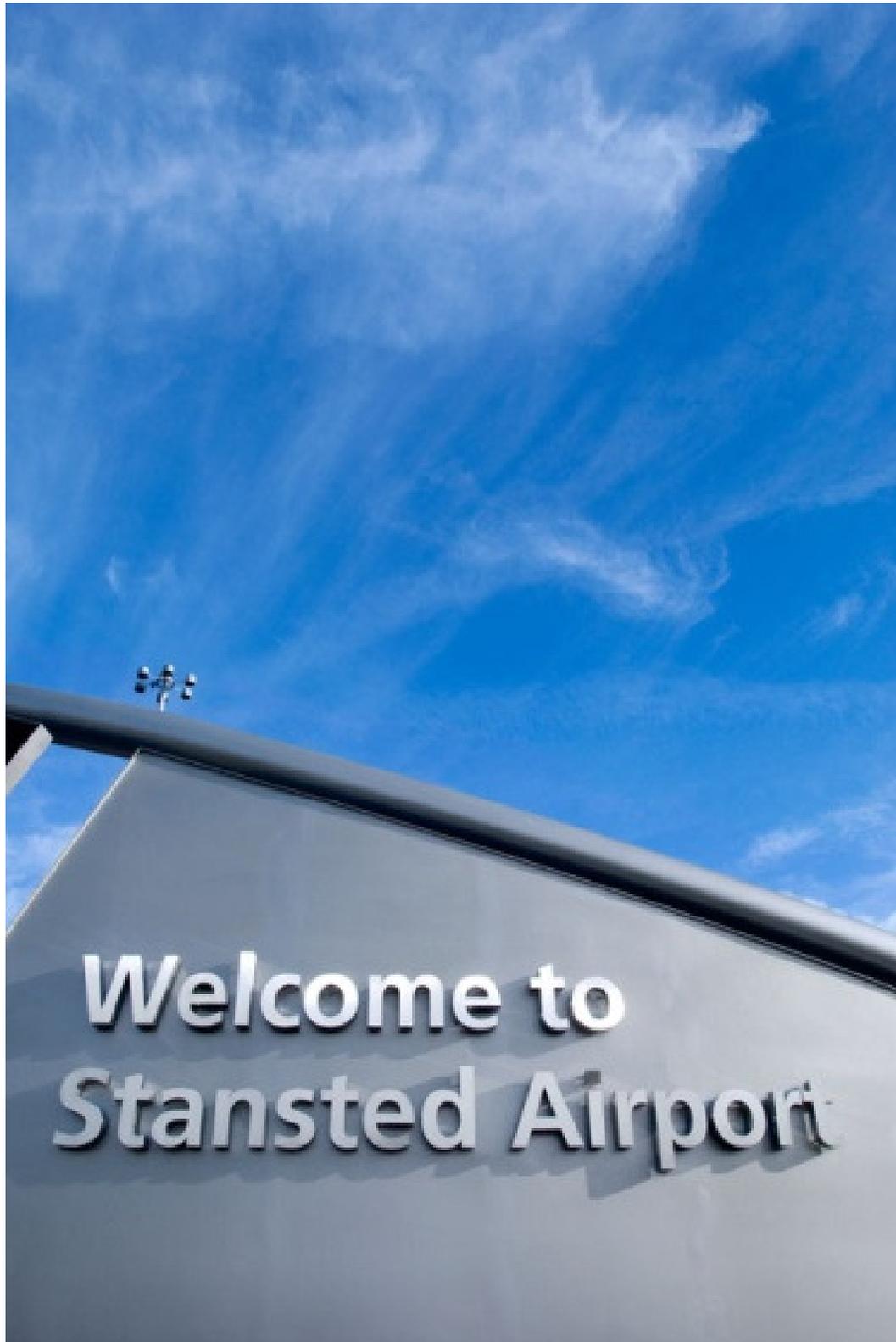
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August 2016

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INTRODUCTION

Purpose and scope

In 2011, London Stansted Airport Ltd (STAL) produced our first Climate Change Adaptation Report.

The report fulfilled STAL's regulatory requirement to respond to the request from the Department for Environment, Food and Rural Affairs' (Defra), to identify the risks posed to the airport by a changing climate. In addition to supporting our business build resilience to climate change, our submission contributed to the Government's first round of national adaptation reporting. STAL was included in this process due to our importance to the national economy, and to the transportation of people and cargo.

As part of Defra's second round of reporting, organisations, including STAL, have been invited to voluntarily submit progress updates. This report forms that submission and outlines the progress made at STAL since 2011. It should be read in conjunction with the original report.

Whilst the focus of this report is our climate change adaptation programme, we are also engaged in climate change mitigation and emission reduction activities. Since acquisition by Manchester Airport's Group, Stansted has significantly reduced its contribution to climate change through a 17% reduction in energy consumption despite a 32% increase in passenger numbers and the M.A.G policy to procure 100% renewable electricity. Further information regarding our climate change mitigation programme can be found in the London Stansted Airport 2014/15 Corporate Responsibility Report¹ and in the London Stansted Sustainable Development Plan²

Manchester Airports Group

MAG is the UK's leading airport group and owns and operates Manchester, London Stansted, East Midlands and Bournemouth Airports, together with a significant property business. MAG employs over 4,500 people and annually serves over 50 million passengers.

MAG's strategy is to increase long-term shareholder value by generating profitable growth through the further development of its assets and by offering a high quality user experience for customers using its airports. By achieving this goal, MAG aims to become a global leader in airport management, products and services.

MAG also includes the commercial property division, MAG Property, which has over £640m of investment property assets across its four airports and has a 50% investment in the £800m major Enterprise Zone development, Airport City, at Manchester. In North America, the new MAG USA is looking to work with airports to develop and operate terminal and retail solutions, passenger lounges and car parking facilities.

MAG is managed on behalf of its shareholders who comprise Manchester City Council (35.5%), IFM Investors (35.5%) and the nine other Greater Manchester local authorities (29%).

¹ Our Corporate Social Responsibility report is published annually, and available online at: <http://mag-umbraco-media-live.s3.amazonaws.com/1008/final-stansted-csr-report-2014-15.pdf>

² Our Sustainable Development Plan was published in 2015 and is available online at <http://www.stanstedairport.com/about-us/developmentplan/>

London Stansted Airport

London Stansted Airport is the 3rd largest in London (4th in UK) serving nearly 24 million passengers a year.

Firmly positioned as a market leader for short-haul travel across Europe, with over 170 destinations across 30 countries, Stansted serves more scheduled connections to Europe than any other airport in the world. With approval to serve 35mppa, it's the only London airport with space and permission to grow, within its existing infrastructure.

Stansted also boasts an impressive and growing range of transport links that benefit from close proximity to the M11 and A120, as well direct trains to London and Cambridge and is proud to be the UK's leading major airport (and one of the best-performing in Europe), with nearly half of passengers travelling to and from by public transport.

London Stansted Airport was named London Airport of the Year at the London Transport Awards in March 2016.

The airport also holds ISO14001 for environmental management, OHSAS18001 for Health & Safety systems and Carbon Trust Standard for reductions to emissions

PROGRESS IN ADAPTING FOR CLIMATE CHANGE

Overview

Since our first adaptation report was prepared in 2011, we have taken steps to progress the resilience of our business to climate change.

When considering our approach to climate change, we recognise that potential impacts cut across many of our Business Units, and often need a combined response. There may also be interdependencies with external organisations and stakeholders. As such, we have consulted with key representatives across our business to develop our adaptation plan and this update report.

The concept of climate change is now firmly embedded within all areas of our business. Building on the first round of risk workshops held in 2011, our business leaders have evolved their awareness of climate change risks and impacts. They are now considering the day-to-day implications on their area of the business and how to adapt to them.

Our 2011 adaptation report identified a number of actions required in order to prepare our business for a changing climate, or for us to better understand the likely impact of climate change. Progress against these actions is discussed later in this report.

Having joined M.A.G in 2013, it has also been necessary to transpose the 2011 climate change risk assessment into the M.A.G corporate risk register. The realignment of risks also provided the opportunity to review our assessment of climate change risk at STAL. This was completed through a risk workshop which engaged colleagues from across our business.

Our revised climate change risk register now reflects changes to our business processes and responsibilities for risk and assurance. It also reflects progress against previously identified actions, changes at our airport and the development in our understanding of climate change.

Reviewing our assessment of climate change risk

In summer 2016, a workshop was held with business unit leaders at London Stansted Airport to review the 2011 risk register. Participants represented key areas of the business and were asked to review risks previously identified, and to consider any new climate change risks.

The UK Climate Impacts Programme (UKCP09) climate change projections, as used during our first round of reporting, formed the basis of the review. The 90th percentile of the medium emissions scenario has been selected as this represents, for each climate variable, a threshold that most climate models suggest is unlikely to be exceeded. The 90th percentile of a given UKCP09 projection illustrates that 90% of the model runs fall at or below that level, and 10% of the model runs returned values higher than that level, and is an indication of a level that is unlikely to be exceeded. A 90% probability level does not indicate that there is a 90% chance of a given projection occurring in the future.

Furthermore, a level of uncertainty in climate projections will always be inevitable as the degree of future climate change will be determined by factors which are yet to be realised, including future emissions and population levels. Thus no climate change projection should be seen as a prediction, and the projections referred to in this report should be considered to be the best available evidence at this time.

The UKCP09 projections and the later UKCP09 weather projections are summarised in Tables 1 and 2 respectively.

Of note is that, in addition to the UKCP09 projections, Met Office data shows that many of the UK maximum temperature records are held by stations in Eastern England, whilst much of eastern England also receives less than 700 mm per year and includes some of the driest areas in the country. Both these features mean that the East of England is expected to see an increase in likelihood of drought conditions, resulting in water scarcity in the region.

Table 1 UKCP09 projections³ at London Stansted Airport

| Climate variable | Baseline conditions | 2020s | 2050s |
|----------------------|---------------------|---------------------------|---------------------------|
| Temperature (°C) | | | |
| Winter average | 6.6 °C | 8.9 °C | 9.8 °C |
| Summer average | 20.5 °C | 23.9 °C | 25.5 °C |
| Summer recorded max. | 37.3 °C | 41.8 °C | 43.6 °C |
| Precipitation (mm) | | | |
| Winter average | 144mm | 169.3mm (17% increase) | 184.0mm (27% increase) |
| Summer average | 154.8mm | 176.2mm (14% increase) | 172.8mm (12% increase) |

³ Values denote reasonable worst case (RWC) forecast absolute value using central case result.

Table 2 UKCIP climate change projections for storms, wind-speed, fog, lightning and snow

| Variable | Baseline conditions | Change ⁴ |
|------------|---|---|
| Storms | n/a | An increase in frequency and severity has been assumed for this assessment. |
| Wind-speed | n/a | A general calming of surface wind speeds (<10%) is projected for all seasons. |
| Fog | n/a | Spring: >35% decrease in fog events Summer: >65% decrease in fog events Autumn: 10 - 30% decrease in fog events Winter: 20% increase in fog events |
| Lightning | Winter: <1 day Spring: 4 – 5 days Summer: 8 – 9 days Autumn: 2 – 3 days | Winter: Similar Spring: increase to 6 – 10 days Summer: increase to 8 – 13 Autumn: increase to 5 – 9 days |
| Snow | Days of snowfall: Spring 5 – 6 Autumn 1.2 – 1.4 Winter 12 – 14 Heavy snow events: Spring: n/a Winter: n/a | Days of snowfall: Autumn/spring: 80% less Winter: 70% less Heavy snow events: Spring: 80% reduction Winter: 60% reduction |

Since the first round adaptation report was prepared, our corporate risk and assurance processes have changed significantly to align with M.A.G processes. These changes are reflected in our updated risk register.

Specifically, our assessment now considers impact and likelihood of potential risk consequences on a scale of 1 (minimal) to 5 (critical), rather than (1) minor to (5) grave. Furthermore, our risk registers also now consider risk on both a gross and net basis and introduce the concept of risk appetite. This dual assessment is particularly helpful to this progress report as the net risk reflects our assessment of the benefit our actions are expected to have. MAG's approach is to take a cautious approach to environmental risk and hence any net (residual) risk of Amber or Red is considered "out of appetite" and requires action to be taken.

Our 2016 climate change adaptation risk register for London Stansted Airport is included as Appendix 1.

Reviewing our assessment of climate change risk

During the workshop, participants identified little change to the risks of most significance to the business. These continue to be the impacts of increased rainfall on both the capacity of our drainage systems and to ground water levels potentially causing subsidence, localised flooding events and exacerbating pollution risks.

⁴ Note that baseline conditions data for some variables were not available from UKCP09 in probabilistic or numerical format.

The risk posed to increased ground movement, airside and landside surface and sub-surface damage from increases in summer temperatures and summer and winter rainfall has increased since 2011, and has the highest risk associated with them. Control measures have been put in place to reduce the risk, and an ongoing watching brief applied.

The risks that were changed during the review are outlined below.

Three risks were identified as having either an increased impact or likelihood of occurring:

- The likelihood of aircraft overheating on stands, in both the short and long term, was increased compared to the 2011 risk assessment. However, with control measures in place the risk is manageable and a watching brief applied.
- The change in summer and winter temperatures will place a greater demand on energy supplies and HVAC systems to heat and cool buildings. The risks associated with these demands were increased compared to the 2011 risk assessment. Control measures and on-going actions are in place to reduce the risk.
- The increase in summer temperatures present a risk to ground movement, airside and landside surface damage and sub-surface structural damage. The likelihood of impacts occurring was increased compared to the 2011 risk assessment. Control measures have been put in place to reduce the risk, and an on-going watching brief applied.

One risk was identified as decreasing:

- The likelihood that variability in snowfall will challenge contingency plans has been reduced compared to the 2011 risk assessment.

Three new risks were added, relating to:

- Extremities of wet and dry climate events affecting ground reflection navigation aids due to extreme raising and lowering of water table, leading to incorrect instrument landing system (ILS) beam formation and possible shut down of ILS equipment
- Increased build-up of rubber on runway due to increased temperatures.
- More resident's windows open, particularly at night in hot weather, increasing impact of noise.

When reviewing the 2011 risk assessment, participants at the workshop took the opportunity to rationalise a number of risks. It was agreed that similar risks would be combined and recorded as a single entry in the 2016 risk register. For example, it was considered that the impact of increased summer temperatures on landside and airside surface and sub-surface structural damage be viewed as one rather than two risks.

Five risks were rationalised and combined, including risks relating to:

- Increased ground movement both airside and landside
- Decrease in passenger and staff comfort from summer and winter temperatures
- Electrical storms impacting control systems and electricity supply
- Fracture risk to above ground and underground infrastructure
- Increase in local air quality pollutants

Following extensive discussion at the workshop one risk, related to ‘reduced lift’, was removed from the risk register. This is not thought to be a genuine risk as aircraft operate in significantly hotter climates than the UK.

Required actions

The approach for required actions has slightly changed since the first round adaptation report. In 2011, actions were assigned wither watching brief, action or investigate. The new approach for 2016, in line with M.A.G processes is to assign one of the following three categories:

- Watching brief – To be maintained in the short term using the latest information on climate projections and the situation at the airport;
- Action – Identify what actions are needed to adapt to a climate change risk; and
- Investigate – A risk to more fully understand it, associated impacts, likelihood and it to be taken as a risk.

Details of our new adaptation actions are included in our risk register.

Progress against previously identified actions

The progress we have made towards fulfilling the actions detailed in our first round climate change adaptation report is discussed below.

As a result of the long term nature of the timeframes considered by our risk assessment, and because of the uncertainties highlighted in our first round climate change adaptation report, it was not appropriate to set specific completion dates for the actions identified.

Progress against actions identified at London Stansted Airport

| | |
|---------------------|--|
| Action (2011) CCA15 | Monitor and stress test the Balancing Pond System performance and liaise with the Environment Agency (EA) and Thames Water (TWUL) to determine any improvement work required, ensuring that the risks identified by this study are considered appropriately. |
| Progress | STAL has initiated on-going dialogue with Environment Agency and Thames Water. Monitoring started two years ago and is on-going. A new surface water modelling and assessment will be carried out in 2016. Along with Flood Risk Assessments (FRAs) as required. This will inform future development and any upgrades to our infrastructure. . |
| Current status | Action updated to reflect the surface water modelling now needs to be carried out, and to identify if and where improvement works are required. Continue to monitor and stress test the Balancing Pond performance (CCA15) |
| Action (2011) CCA17 | Sensitivity test airport drainage infrastructure to ensure as robust as practicable to future climate extremes. Investigate and address risks of flooding to existing critical airport assets. |
| Progress | As above |
| Current status | Action open to reflect the surface water modelling and assessment now needs to be carried out (CCA16) |

| | |
|-------------------------|---|
| Investigate (2011) CCA3 | Ensure that the fire water demand assessment and related changes to the Fresh Water Pumping Station consider and address the potential for increased fire risk resulting from climate change, and review fire water management procedures. |
| Progress | We have completed a project to upgrade our Fresh Water Pumping Station increasing our resilience. We have also provided a contingency fire water supply in the event that of failure or interruption of the pumping station operation. We have increased our interaction with water companies and will continue to review capacity and contingencies. |
| Current status | Investigation open (CCA21) |

| | |
|-------------------------|--|
| Investigate (2011) CCA6 | Monitor surface water drainage system performance and assess predicted climate change impacts to identify the surface water flood risk within the airport site, especially upstream of balancing ponds. Develop flood risk assessment and review attenuation policy. |
| Progress | Work has been completed regarding source control for pollutant migration. A new surface water modelling and assessment will be carried out in 2016. |
| Current status | Changed to action – to implement the surface water modelling and assessment (CCA17) |

| | |
|--------------------------|---|
| Investigate (2011) CCA13 | Investigate: Review and ensure robustness of hard standing (road/apron/runway) assets design standards to future climate change. Consider more heat resistant or harder wearing top surface when carrying out next runway resurfacing exercise. |
| Progress | Investigate: Review records of pavement repair frequency and periods of dry weather. Review existing inspection regimes and design standards in light of findings. A new asset maintenance position has been created with responsibility for managing this risk and maintenance is now driven by performance modelling using the Pavement Condition Index (PCI). A sinkhole review was also completed over the last two years which determined the risk associated with sinkholes on this site is low given the underlying ground conditions.. Runway resurfacing has been deferred until 2021. The potential risk of damage to surfaces will be considered during that project and taken into consideration in design. Until then we will continue to monitor the hard standing areas and develop our PCI capability. |
| Current status | Watching brief (CCA25) |

| | |
|--------------------------|---|
| Investigate (2011) CCA18 | Monitor surface water drainage system performance and stress test predicted climate change performance. Liaise with EA to identify risk of flooding of receiving watercourses and EA role in downstream flood management. |
| Progress | A new surface water modelling and assessment will be carried out in 2016 and we will continue to work liaise with the EA and other stakeholders. |
| Current status | Investigation open to reflect the surface water modelling and assessment now needs to be implemented (CCA17) |

| | |
|--------------------------|---|
| Investigate (2011) CCA22 | Review, consult and update STAL water strategy in line with future predicted water supply constraints and predicted airport growth. Review and ensure continued robustness of building design standards to future water resource constraints. Ensure adoption of demand management arrangement and water efficient technologies such as rain water recycling to critical water use asset refurbishment and replacement. |
| Progress | Decision made to develop a contingency and prioritisation plan with water supply company and to continue to roll out water efficiency measures particularly in new build. |
| Current status | Investigation closed and replaced with an action to develop a contingency and prioritisation plan with water supply company (CCA18) |

INTERDEPENDENCIES

Our first round adaptation report identified a number of interdependencies with external organisations and stakeholders. These were considered as part of our 2016 climate change risk register review. Attendees of the risk workshops did not identify any further interdependencies and felt those detailed in our first round climate change adaptation report remain relevant.

Our understanding of the collaborative approach required to enable our airport to fully prepare for climate change has advanced. We have developed a better understanding of how our climate change adaptation actions will impact upon other stakeholders, and the roles other stakeholders have in enabling us to prepare for a changing climate. Our collaborative approach to environmental management has greatly assisted this learning.

At a Group level, M.A.G contributes to climate change adaptation discussions within the wider industry. Our membership of Sustainable Aviation and Airports Council International enable us to share our learning and reflect on actions taken by others. We also have strong links with National Air Traffic Services (NATS) and Eurocontrol who are responsible for the movement of aircraft within the UK and Europe respectively.

MONITORING AND CONTROL

The risk registers for Stansted Airport contribute to our corporate assessment of risk. An overall assessment of the risk climate change poses to M.A.G is included within our corporate risk register, ensuring that climate change risk is discussed at the highest level within the organisation.

We plan to undertake a full review of our climate change adaptation risk registers in five years. This will take account of the upcoming UKCP18 climate projections, which we will consider and integrate with our next review. If new information becomes available sooner or if newer climate change projections are published by Government we will undertake our review at an earlier time.

In the interim period, progress against the actions identified in our climate change adaptation risk registers will be regularly reviewed.

CLIMATE CHANGE ADAPTATION RISK REGISTERS

Appendix 1 –Stansted Airport climate change adaptation risk register

Stansted Airport - Climate Change Adaptation Risk Register
Version 1 | August 2016

| Risk ID | Airport | Business Unit | Risk Owner | Climate Variable | Risk Narrative | Consequences | Gross Risk Short term - 2020s | | | Gross Risk Medium/Long term 2050s | | | Existing Controls | Net Risk Short term - 2020s | | | Within Risk Appetite? | Net Risk Medium/long term - 2050s | | | Within Risk Appetite? | Further Actions (if required) (including owner & timescale) |
|---------|----------|-------------------------------|---------------------|------------------------------------|---|--|-------------------------------|------------|----------|-----------------------------------|------------|----------|---|---|--------|------------|-----------------------|-----------------------------------|-----|--------|-----------------------|---|
| | | | | | | | Impact | Likelihood | Exposure | Impact | Likelihood | Exposure | | Mitigating Actions / Controls (Auditable) | Impact | Likelihood | | Exposure | Y/N | Impact | | |
| CCA01 | Stansted | Airside Security & Operations | Operations Director | Summer temperatures | Changes in distribution of pests and wildlife species Changes to airfield habitats and wildlife. May be changes to bird species and bird attractants. | Changes to bird populations requiring additional management of wildlife. - Increased bird strike risk - Health and safety incident - Reputational damage | 3 | 1 | 3 | 3 | 2 | 6 | PPE First aid for outdoor workers. Veterinary service Bird management controls and Long Grass Policy (LGP) | 1 | 1 | 1 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA02 | Stansted | Airside Security & Operations | Operations Director | Summer rainfall Winter rainfall | Increased rainfall and heavy rain events Causes additional exposure to airfield related safety events due to: - Reduced visibility - Icy or wet conditions - Local flooding - Pollutant load from washing operational areas - Accidental release of pollution from storage facilities or separators | Operational disruption due to drainage capacity and local flooding - business disruption/flight delays Increased risk of airside collisions Health and safety incident Pollution incident | 3 | 3 | 9 | 3 | 3 | 9 | Grooved runway, drainage system, Air Traffic Control procedures i.e. increased separation distances, runway safety zones, operational guidance for pilots/airside staff. Increased monitoring including weather warnings. Pond operational contingencies for pollution incidents Pollution source controls and spillage clean up arrangements. | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Action: Complete surface water modelling and implement Flood Risk Assessment measures .Update attenuation policy. |
| CCA03 | Stansted | Airside Security & Operations | Operations Director | Fog | Seasonal changes to fog related disruption <i>Fog frequency likely to increase in winter</i> Low Visibility Procedures (LVPs) limit movements, increase separation distances. Potential for backlog, delays, compromised night flying quotas and cancellations. Impacts on maintenance teams airside restrictions on free-ranging and requirement for ranger vehicle 'lookouts'. Impacts on surface access routes. | Operational disruption Diverted flights Passenger inconvenience and requiring transfers Additional resource requirements Delays to maintenance activities | 2 | 2 | 4 | 2 | 2 | 4 | Low Visibility Procedures, operational guidance for pilots and airside vehicles. Terminal contingencies for delays and/or overcrowding | 1 | 2 | 2 | Y | 1 | 2 | 2 | Y | Watching brief |

| | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|-------------------------------|---------------------|----------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|-----------------------|---|---|---|---|
| CCA04 | Stansted | Airside Security & Operations | Operations Director | Storms | Increased risk of schedule interruption Loss of overhead power lines, electrical supply interruption. Delays to construction projects. ULDS, signage and lighting columns most vulnerable. H&S impacts. Delays. | Operational disruption Power cut/impacts on passenger and staff welfare Impact of power outage on key systems and time to restart. Costs of project delays | 3 | 3 | 9 | 3 | 3 | 9 | Air Traffic Control procedures i.e. separation distances, contingency plans for disruption. Electrical resilience strategy under development, dual supplies to the airport with 1 underground supplies. Power outage contingencies. | 2 | 2 | 4 | Y | 2 | 3 | 6 | N | Action: Complete and implement electrical site resilience strategy |
| CCA05 | Stansted | Airside Security & Operations | Operations Director | Wind | Increased longevity of wing tip vortex effect due to general becalming of surface wind speeds Increased damage to local properties and associated costs for repairs. Increases to separation distances possible | Financial costs for damage caused Reputational damage | 3 | 1 | 3 | 3 | 1 | 3 | Reparation programme to repair affected roofs, Air Traffic Control procedures i.e. increased separation distances. | 2 | 1 | 2 | Y | 2 | 1 | 2 | Y | Watching brief |
| CCA06 | Stansted | Airside Security & Operations | Operations Director | Wind speed/direction | Change to prevailing wind direction affects runway utilisation and schedules Impacts on take off and landing rates, movements, noise impacts. Delays. | Operational disruption | Not able to be processed due to lack of projection data | | | | | All commercial aircraft are tested to a "demonstrated" maximum crosswind as part of their certification. Large aircraft are better able to handle cross winds than light aircraft. Technology is improving all of the time. | Not able to be processed due to lack of projection data | | | | | Watching brief | | | | |
| CCA07 | Stansted | Airside Security & Operations | Operations Director | Lightning | Increase in lightning events Asset damage due to strike/fire Decrease in ground handling agents operational performance Decrease in airfield/space availability Power cuts and voltage spikes to those parts of airport not on UPS Increased use of UPS, surge protection and battery back ups. | Operational disruption caused by decrease in aircraft movements Increased insurance claims Reputational damage H&S incident Increased repair costs | 3 | 2 | 6 | 3 | 2 | 4 | Suspension of refuelling, changes to arriving aircraft holding locations and departure routes, increased diversions to or from other airports. UPS for safety critical systems, dual fed electricity supply. Monitoring and weather warnings Electrical resilience | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Watching brief |

| | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|-------------------------------|---------------------------|---------------------------------------|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----------------|
| CCA08 | Stansted | Airside Security & Operations | Asset Management Director | Temp | Overheating of aircraft on stands Sustained temperatures above 25-30 °C require use of aircraft Auxiliary Power Units (APU) or provision of pre-conditioned air (PCA) for cooling aircraft. Increased cooling demand and energy costs. Reduced productivity. Plant failure. Increased use of APUs and fixed ground power for A/C on-board aircraft. | Increase in health and safety incidents/accidents Reputational damage Operational delays Financial costs of increased energy demand Capacity stretched Negative impact on air quality/noise/health due to increased noise and emissions from running engines for cooling. | 2 | 2 | 4 | 3 | 3 | 9 | 2 | 1 | 2 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA09 | Stansted | Airside Security & Operations | Operations Director | Winter temperatures Snow | Increasing variability of snowfall challenges winter contingency plans Years of no snow followed by heavy snow mean staff / systems out of practice, supplies inadequate. Airside ops', surface access disrupted. Cancellations, delays, stand closure, reputational damage. De-icing supplies disrupted by competing demand, road congestion. | Increased health and safety incidents/accidents Reputational damage. Delays to operations. Staff shortages Increased de-icer costs Increased de-icer leads to increased pollution risk and discharges | 3 | 3 | 9 | 3 | 2 | 6 | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA10 | Stansted | Asset Management | Operations Director | Summer rainfall Winter rainfall | Extremities of wet and dry affecting ground reflection navigation aids Extreme raising and lowering of water table, leading to incorrect instrument landing system (ILS) beam formation and possible shut down of ILS equipment | Financial costs to repair/replace equipment Operational disruption Reduced aircraft movements | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | Y | 1 | 1 | 1 | Y | Watching brief |
| CCA11 | Stansted | Asset Management | Asset Management Director | Summer temperature Winter rainfall | Increased build up of rubber on runway Requirement to maintain appropriate friction level | Operational disruption due to runway closure Runway excursion Health and safety incident/accident | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | Y | 1 | 1 | 1 | Y | Watching brief |

| | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|-------------|---|--|--|---|---|---|----|---|---|----|---|---|---|---|---|---|---|---|---|--|
| CCA12 | Stansted | Corporate | Customer Services and Security Director | Summer rainfall Winter rainfall Snow | Remote impacts could restrict the flow of essential supplies to the airport. Transport routes for key supplies i.e. glycol disrupted. Pressure on cargo storage. Impacts on retailers, catering | Reputational damage Operational delays Staff shortages | 3 | 2 | 6 | 3 | 2 | 6 | Contingency plans for disruption, (limited) storage of critical supplies, investigation of preferential partnership status / alternate supplies of key resources i.e. de-icer. | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA13 | Stansted | Engineering | Asset Management Director | Winter temperatures Snow | Freeze - thaw damage of surfaces and fracture risk to underground infrastructure Fracturing of fire mains (cast iron), fuel supply pipe work could lead to closure. Surface heave / pot hole damage requiring temporary closure of areas for repairs | Increase in health and safety incidents/accidents Reputational damage. Airport closure Financial cost of repairs Pollution incident | 4 | 2 | 8 | 4 | 2 | 8 | Regular inspections, rapid maintenance response, regular surface relaying, surfaces defined by detailed design standards based on current best practice. Spillage clean up, fuel leak detection system. | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA14 | Stansted | Engineering | Operations Director | Wind | Wind damage Damage to assets, standing aircraft, vehicles Injuries to staff/property Loss of overhead power lines, supply interruption. Delays to construction projects. ULDs, signage and lighting columns most vulnerable. H&S impacts. Delays. | Increase in health and safety incidents/accidents Reputational damage. Operational delays Financial cost of repairs Delays to construction projects | 3 | 2 | 6 | 3 | 2 | 6 | Design standards, regular inspections, maintenance as needed, operational guidance for airside staff in high winds, warning signs on nearby motorway network alerting drivers to hazardous conditions. | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA15 | Stansted | Engineering | Asset Management Director | Increased winter rainfall | Surface Water Balancing Pond System challenged during episodes of extreme weather. Winter water storage capacity and increased severity of first flush effect. Balancing pond integrity compromised by subsidence of earth walls, deterioration or failure of embankment structures. and / or extreme rainfall events. Inability to contain de-icer contaminated water Compromise of | Health and safety incident/accident Financial costs of repair/maintenance Overflow/flooding, reservoir breach Pollution incident/breach of discharge consent | 4 | 4 | 16 | 4 | 4 | 16 | Balancing Pond control system, Reservoir Inspections as required by Reservoir Act, contingency arrangements, infrastructure monitoring work commencing, water quality monitoring, debris removal from surfaces. Statutory inspections of reservoir structural integrity. 3rd party maintenance of critical infrastructure (e.g. Thames Water trade effluent pumps and discharge pipeline). De-icer contingency plans | 3 | 2 | 6 | N | 3 | 3 | 9 | N | Action: Complete surface water modelling and implement FRA, and identify if and where improvement works are required. Continue to monitor and stress test the Balancing Pond performance. Ensure site developments are assessed for additional impact on the pond system. |

| | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------|---------------|---------------------------|------------------------------------|---|---|---|---|----|---|---|----|--|---|---|---|---|---|---|---|---|---|
| | | | | | balancing pond (Pond C main site) could lead to pollution of local receiving water course. | | | | | | | | | | | | | | | | | |
| CCA16 | Stansted | Engineering | Operations Director | Winter rainfall | Inadequate site drainage system capacity. Increased risk of older drainage being overwhelmed by heavy rainfall events. Older drainage overwhelmed by heavy rainfall events leading to localised flooding. Inundation under ground infrastructure / services. Water ingress to buildings. Mobilisation of pollution. H&S impacts. Airside, surface access disruption. | Operational disruption due to excess surface water Restriction of future development Increased pollution risk | 2 | 3 | 6 | 2 | 4 | 8 | Design standards and construction practices, emergency contingencies for areas affected by flooding / water ingress. On-going monitoring and modelling dialogue with Environment Agency and Thames Water | 2 | 2 | 4 | Y | 2 | 3 | 6 | N | Action: Sensitivity test airport drainage infrastructure to ensure as robust as practicable to future climate extremes. Investigate and address risks of flooding to existing critical airport assets. Confirm airport's attenuation policy. |
| CCA17 | Stansted | Environmental | Asset Management Director | Summer rainfall Winter rainfall | Release of contaminated surface water as a result of storm event exceeding balancing capacity. Requirement to hold water due to de-icer contaminants may be breached. Water courses contaminated due to debris accumulated in pipework during longer dry spells being washed out. | Capacity of balancing pond storage breached. Water courses downstream of airport are polluted. Consent permit breached. Regulatory notification / fine. Reputational damage Restriction of future development. | 4 | 4 | 16 | 4 | 4 | 16 | Balancing Pond System water storage capacity, delayed discharge of peak flows where possible to minimise downstream impacts. Established contingency plans / Aeration equipment to deal with pollution Water quality monitoring and review programme. Maintenance of key parts and equipment | 3 | 3 | 9 | N | 3 | 3 | 9 | N | Investigate: Monitor surface water drainage system performance and stress test predicted climate change performance. Liaise with EA to identify risk of flooding of receiving watercourses and EA role in downstream flood management. Complete surface water modelling and take appropriate action. |
| CCA18 | Stansted | Environmental | Asset Management Director | Summer rainfall | Drought conditions affect water availability Extended periods of drought leading mandatory water reductions and limitations. Restrictions may be posed to water | Health and safety incident/accident Business continuity for water shortage and potential welfare issues Limitations on auxiliary water consuming activities such as vehicle, equipment or aircraft washing Fire fighting with water shortage | 2 | 2 | 4 | 2 | 2 | 4 | On-going leakage detection and repair program, upgrade of the freshwater pumping station, maintenance of water distribution system isolating valves. Commitment to BREEAM very good - excellent ratings for new | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Action: Identified action to develop a contingency and prioritisation plan with water supply company. Plan to include actions to ensure continued robustness of building design standards to future water resource constraints (BREEAM). |

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| CCA21 | Stansted | Fire Safety | Operations Director | Summer temperatures | <p>Increased fire risk due to hotter temperatures combined with increased lightning and drought potential.</p> <p>Grass and vegetation fires could cause poor visibility due to fire smoke and possible fire to outlying structures. Terminal evacuation and subsequent disruption. Firewater supply limited by droughts. Risk of fires off airport site impacting on aircraft operations to/from airport.</p> | Potential fire hazard. Operational disruption. Financial costs for damaged caused. Health and safety incident. | 4 | 2 | 8 | 4 | 3 | 12 | <p>Onsite fire service with modern fleet carrying 56,000 litres of water and response time of ~3 minutes. Rapid replenishment facility holding 108,000 litres of water. Hydrant ring main with multiple fire pumps and recently upgraded control panel. Regular testing and maintenance of hydrants throughout the airport campus. Regular training and drills, smoke and fire detection systems, vegetation management plans, PAT testing of electrical equipment. Volume of water stored on site and available for fire fighting purposes is approx. 6 million litres.</p> | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | <p>We have developed a better understanding of interaction with water companies. We still need to:</p> <p>Investigate: Ensure that the fire water demand assessment and related changes to the Fresh Water Pumping Station consider and address the potential for increased fire risk resulting from climate change, and review fire water management procedures.</p> |
| CCA22 | Stansted | Health, Safety & Wellbeing | Operations Director | Winter temperatures. Winter rainfall Snow | <p>Wintry conditions pose health and safety risks for pax and staff. Reduced thermal comfort, risk of trips and falls. Hazardous driving conditions. School closures raise absenteeism. Some staff operation critical i.e. fire brigade. Construction project delays</p> | <p>Increased financial costs of de-icing Increased health and safety incidents/accidents Staff shortages Operational delays Construction project delays</p> | 2 | 2 | 4 | 3 | 2 | 6 | <p>De-icing, gritting, PPE, additional heating, onsite medical facilities, warning signs on nearby motorway network alerting drivers to hazardous conditions.</p> | 2 | 2 | 4 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA23 | Stansted | Health, Safety & Wellbeing | Operations Director | Summer temp Winter rainfall | <p>Health and wellbeing of outside workers Summer temps may increase local air quality pollutants (e.g. ozone) and cause environmental damage. Failure to exercise appropriate duty of care for outside workers caused by changes in climate. E.g. increased protection such as breaks, sun cream, de-icing. Reduced productivity Construction project delays.</p> | <p>Increase in health and safety incidents/accidents Reputational damage. Financial costs of delayed projects.</p> | 3 | 1 | 3 | 3 | 2 | 6 | <p>Building air conditioning systems, Aircraft mechanical baggage belt loaders, introduction of new technologies to reduce manual handling activities (e.g. Automatic Tray return system in terminal security), Onsite medical and occupational health facilities, PPE, temporary spot cooling (i.e. fans etc.) if needed. Covered in risk assessments for operations and with control measures of effective rotation & hydration, provision of PPE and suitable uniform clothing as well as UV protection creams for external</p> | 2 | 1 | 2 | Y | 2 | 2 | 4 | Y | Watching brief |

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| CCA26 | Stansted | Operations | Operations Director | <p>Summer temperatures Winter temperatures</p> | <p>Heating and cooling of operational buildings Problems rarely experienced today i.e. only in some areas after temperatures exceed 30-35°C for 2 weeks+. Temperature envelopes of some safety critical equipment not clear. - High temperatures reduce performance of some plant (failure) in summer. - Potential breaching of temperature standards and regulated environments - Increased energy demand for HVAC (cooling and heating) stretches supply and increases energy costs. - Health impacts - Decreased pax and staff comfort - Reduced productivity</p> | <p>Increased maintenance Operational disruption Financial costs of repair Decline in revenue and passenger numbers Reputational damage Increased staff absence Increase in health and safety incidents/accidents Impact on passenger experience</p> | 3 | 2 | 6 | 3 | 3 | 9 | <p>HVAC systems and controls, Building management system, temporary spot cooling (fans) if needed, onsite medical staff, monitoring of temperatures in buildings.</p> | 2 | 2 | 4 | Y | 2 | 3 | 6 | N | <p>Investigate: Review and ensure robustness of building design standards to future temperature change.</p> <p>Investigate: Ensure design and development of London Stansted's long term master plan manages risks from future climate change.</p> |
| CCA27 | Stansted | Operations | Customer Services and Security Director | <p>Summer rainfall Winter rainfall Snow</p> | <p>Offsite impacts could impede the flow of people (pax, crew and staff) if destination airports or the UK surface transport network is affected.</p> <p>Climate events may affect destination airports or the UK surface transport network. 'People' may need to be accommodated within STAL terminal buildings.</p> <p>There are limits to the number of people who can be safely accommodated within STAL terminal buildings and min requirement for fire service cover.</p> <p>Destination choice and</p> | <p>Reputational damage Increased health and safety incidents/accidents Operational delays Staff shortages Changes to commercial models and destination profiles</p> | 2 | 2 | 4 | 3 | 3 | 9 | <p>Disruption contingency plans (marquees, refreshment vouchers, comfort facilities, flexible working patterns, communications plans), diversification of surface access toward public transport, motorway warning signs.</p> | 2 | 2 | 4 | | 2 | 2 | 4 | | <p>Watching brief</p> |

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| | | | | | demand affected. Potential for backlog, delays, cancellations. Impacts on passenger and cargo flow could overcrowd onsite facilities, negative publicity. Climate change affected destinations may be more/less popular. | | | | | | | | | | | | | | | | | |
| CCA28 | Stansted | Operations | Operations Director | Sea Level Rise | Sea Level Rise / storm surge risks loss of low lying destination airports e.g. Schiphol, (without adaptation). Disruption to international schedules. Loss of competitor airports. Changes to flight patterns and demand. Potential competitive advantages. | Changes to operations Operational delays | 2 | 1 | 2 | 2 | 3 | 6 | Contingency plans for changes to international schedules and airport closures. | 2 | 1 | 2 | Y | 2 | 2 | 4 | Y | Watching brief |
| CCA29 | Stansted | Operations | Operations Director | Sea Level Rise | SLR / storm surge risks inundation of London transport infrastructure, utility supply systems Floodwaters from the Thames due to SLR could not reach STN directly due to topography. Surface access, essential services disrupted. Staff and pax delayed. | Operational delays Staff shortages | 2 | 1 | 2 | 1 | 4 | 4 | Contingency plans for loss of supplies, disruption to surface transport routes and utility supply problems. | 2 | 1 | 2 | Y | 1 | 3 | 3 | Y | Watching brief |
| CCA30 | Stansted | Social Responsibility | Operations Director | Summer temperature | More resident's windows open, particularly at night Greater disturbance from aircraft operations to neighbouring receptors | Requirement for additional noise mitigation Operational restrictions imposed Reputational damage | 1 | 2 | 2 | 2 | 2 | 4 | Aircraft in general are getting quieter. Our major airlines EJ and RA are due fleet replacements (next generation are even quieter) 2017-19. - Noise action plan - Current sound insulation grants scheme - STAL has designated noise preferential departing routes which is adhered to by 99% of our | 1 | 1 | 1 | Y | 2 | 1 | 2 | Y | Investigate: STAL has committed to carrying out a comprehensive review of our noise insulation scheme in our sustainable development plan. |

