Heathrow Airport Limited

Heathrow climate change risk, adaptation and resilience advisory services

Review of climate change science, data and information published since 2011

Draft 2 | 25 July 2016

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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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Contents

1 Introduction

This document has been written to support Heathrow Airport Limited (HAL) in updating its existing Climate Change Adaptation Report (CCAR) and Risk Assessment. This was published in May 2011 in response to the UK Government's Adaptation Reporting Power requirements under the Climate Change Act 2008. HAL is submitting a Progress Report to Defra in July 2016 and the incorporation of additional data and information about climate change projections made publically available since 2011 is required, to ensure that the updated 2016 CCAR and Risk Assessment is as well informed, comprehensive and robust as possible.

The aim of this report is, therefore, to provide an overview of the latest climate change science, projections, data and information relevant to London and the Heathrow Airport area specifically to support the CCAR update. New and/or improved global and regional climate models are regularly developed based on improvements in physical understanding of climate systems, as a result of greater supercomputing power, and revised greenhouse gases (GHGs) emission scenarios and pathways. In addition, further analysis of existing weather and climate change data is continually being undertaken. It is important to regularly review climate models, data and analyses to ensure the data and information used for the assessment of climate change risks and the development of adaptation and resilience strategies remains appropriate.

Section 2 presents a summary of the climate change science and data included in the 2011 HAL CCAR. It also includes a review of the draft updated 2016 CCAR, to outline any potential current gaps in data and information exist.

Section 3 includes a literature review highlighting the main sources of data and information reviewed and their relevance to Heathrow Airport and London. These sources of information and data have been used to identify where changes or improvement in data or information exist for each climate variable compared with existing data within the 2011 CCAR and Risk Assessment.

Section 4 provide a summary of new climate change science, data and information

Section 5 provides a comparison of climate change science, data and information used in existing Heathrow reports (the HAL 2011 CCAR and working draft HAL 2016 CCAR) and suggestions for new science, data and information to be included in the updated HAL 2016 CCAR.

Section 6 provides a summary of the outcome of this report and recommendations for HAL as a result of these outcomes.

Section 7 contains a list of references used in this report.

2 Climate science, data and information included in existing Heathrow reports

In HAL's 2011 CCAR and Risk Assessment, climate model outputs were analysed for two periods, the short term (up to 2020) and the medium to long term (2020s – 2050s). It was considered not feasible to conduct a detailed assessment of climate projections beyond the 2050s. This was based on the fact that high uncertainties exist in the science, emissions scenarios and future airport development plans for time periods beyond the 2050s.

Baseline climate conditions were based on meteorological data from the weather observation station at Heathrow Airport. This station has been collecting weather and climate data since 1948, and provides a good source of data for understanding the current climate at Heathrow. The main evidence sources used for the analysis of climate change projections were: UKCP09 data and reports; peer reviewed science published after UKCP09 until 2011; and additional guidance provided by the Environment Agency (EA) and the Department for Environment, Food and Rural Affairs (DEFRA). Climate change projections for the high, medium and low GHG emissions scenarios were considered.

The current working draft HAL 2016 CCAR progress report suggests that the UKCP09 should continue to be used for climate change risk assessments and adaptation strategy development. When considering summer rainfall, it is recommended that the CMIP5 projections are used alongside UKCP09. There is reference to the development of new climate projections to be published in 2018, UKCP18, and a recommendation that HAL should undertake a comprehensive review of UKP18 once UKCP18 it has been published.

3 Literature review

Table 1 presents a summary of the main sources of publically available historic climate data, climate change data, analysis and information that have been developed or published since the HAL 2011 CCAR which are of relevance for Heathrow Airport.

The list of publications in Table 1 includes several academic reports published since 2011 which are specifically relevant to aviation impacts. However, it should be noted that a large body of academic literature has been published since 2011 and contributes to the general understanding of climate change impacts which are not included in this table. This is in an attempt to keep the list focused on the most relevant publications and official sources of data.

Table 1. Summary of the main sources of publically available climate change data, analysis and information that have been developed or published since the HAL 2011 CCAR.

Title of source of data or information	Raw data or report	Description	Relevance to climate hazards and impacts to Heathrow	Spatial scale (i.e. Heathrow, London, National, International)
Chartered Institution of Building Services Engineers (CIBSE) TM49 Design Summer Years for London 2014 [1]	• Technical Memorandum • Report	This guidance was commissioned by the Greater London Authority (GLA) to provide a risk-based approach to addressing the challenges of London's Urban Heat Island effect and the uncertainties in future climate change projections with respect to building environmental design and building heating, cooling and air-conditioning services. It discusses whether the CIBSE Design Summer Year (DSY), which is based on weather data from London Heathrow Airport during summer 1989, is the most appropriate year of weather data for assessing summertime cooling requirements of developments in London. This report highlights that there are significant variations in the characteristics of warm summers in London, both due to year-to-year variability and due to microclimatic variations across the city. The report also provides evidence for a significant warming trend in London over the last few decades and an increase in the likelihood of heatwaves. The	Data from the weather station at Heathrow Airport should be used as far as possible as it is more representative than other London weather and climate data. The selection of a suitable DSY should be based on the appropriate degree of risk. Whilst it is still acceptable to use the 1989 DSY, this is the TM49 DSY with the lowest return period so it is only appropriate for projects with low heat risk profile.	• Heathrow • London

		relative intensity of the urban heat island at Heathrow is also discussed. Accompanying the report, CISBE have provided a number of DSYs with different likelihoods of occurrence and also climate change adjusted counterparts. The report recommends that a combination of these DSYs be used according to the design life of the building and the attitude to risk.		
CIBSE weather data [2]	• Data	CIBSE provides historic data from the UK Met Office for 16 locations across the UK. Two types of weather files are produced, DSYs and Test Reference Years (TRY). CIBSE released updated weather files in 2016. The TRY files have been updated to use a new 30 year baseline period (1984-2013). This has been updated to ensure that already observed effects of climate change are included in the selection of months. The update of the DSY is also based on the updated baseline. In addition, the procedure for selecting the warm year has changed. 3 DSYs are now available per location: • DSY1 – Moderately warm summer • DSY2 – Short, intense warm spell • DSY3 – Long, less intense warm spell	The London data in this data set is the same as that in the CIBSE TM49 data set.	• London • UK

		TRYs and DSYs are also available for future time periods based on UKCP09 climate projections. Note, the methodology used for CIBSE weather data follows the one described in CIBSE TM49.		
UKCP18 [3]	• Data	New climate change projections for the UK will be made available as part of UKCP18 in 2018. These updates will be based on technical advances in climate science, climate modelling and additional observations since the UKCP09 work was carried out. UKCP18 will include an update to the future climate scenarios over land and updated projections for sea-level rise. The new data will aim to overcome problems with spatial coherence, in addition to considering a method to include factors in seasonal variability (Sexton and Harris, 2015) [4].	Updated climate projections will be published in 2018 (UCP18). These should be reviewed by HAL to confirm whether any updates to the 2016 CCAR and Risk Assessment are necessary.	• UK
IPCC AR5 reports [5] and the CMIP5 data	• Report	The Intergovernmental Panel on Climate Change (IPCC) is an international body that synthesises and disseminates the science related to climate change. The Fifth Assessment Report (AR5) was published in 2013 – 2014 and presents the latest progress. The climate change projections in AR5 are based on the outputs from the global climate models used in the Coupled Model Intercomparison Project Phase 5 (CMIP5). AR5 and CMIP5 data are based on a new set of pathways for greenhouse gas concentrations and other anthropogenic	The new set of greenhouse gas concentrations scenarios, used for CMIP5, should be used in future climate change risk assessment and adaptation reporting.	• UK • International

		climate forcing factors, the Representative Concentration Pathways (RCPs). RCPs are pathways that include time series of emissions and concentrations of the full suite of GHGs, aerosols and chemically active gases, as well as land use/land cover. Four RCPs were defined and used in AR5 and CMIP5, RCP2.6, RCP4.5, RCP6 and RCP8.5. These are defined by their total radiative forcing pathway (a measure of the severity of anthropogenic influence on the climate system) and level by 2100. For example, RCP8.5 refers to one high emissions pathway for which radiative forcing reaches greater than 8.5 Wm^{-2} by 2100. The Synthesis Report [6] of AR5 provides an overview of the assessment and highlights the new results from the publication of AR4 in 2007. Since AR4, there have been significant improvements in understanding and climate projections for sea level rise. Under all RCP scenarios, the rate of sea level rise will be very likely to exceed the observed rate in 1971-2010.		
Is the UKCP09 still an appropriate tool for adaptation planning? [7]	• Technical note	This technical note provides an assessment of the appropriateness of using UKCP09 as a tool for adaptation planning, given the recent improvements in climate science, mainly IPCC AR5. It concludes that UKCP09 still provides a valid basis for the assessment of future UK climate over land and demonstrates that the results are consistent with CMIP5 for the future changes to summer and winter temperature as well as winter rainfall in the UK. Some differences are highlighted in the projections for summer rainfall.	Given summer rainfall projections will affect the operations of HAL, CMIP5 results should be used to complement the interpretation of UKCP09 results for summer rainfall projections.	• UK

		The report describes that the global climate models used in AR5 have generally improved since AR4. Particular aspects where modelling improvements have been made are for storm tracks, blocking and the Atlantic meridional overturning circulation.		
UKCP09 Weather Generator 2.0 [8]	• Data	In February 2011, a revised version of the Weather Generator was released. Four main updates were made relating to: rainfall extremes; temperature extremes; vapour pressure; and improvement in the representation of sunshine hours and projected changes.	It is unclear whether this updated Weather Generator was used in the 2011 HAL CCAR and Risk Assessment. To be confirmed whether this is the case and if not, updated WG data should be used.	• Heathrow • UK
H++ scenarios [9]	• Report • Data	H++ scenarios describe extreme climate change scenarios typically those beyond the 10th to 90th percentile range of the UKCP09 and CMIP5 projections. Scenarios have been developed for heat waves, cold snaps (referred to as L- - scenarios), low/high rainfall, low/high river flows and wind storms. H++ scenarios present plausible extreme risks but with low associated likelihoods. A report was published in 2015 by the Adaptation Sub-Committee (ASC) of the Committee of Climate Change (CCC) which presents the results of the development of the H++ scenarios. The results are discussed within the UK Climate Change Risk Assessment (CCRA) evidence report, released this month [17].	Including information on extreme risks can contribute to a more robust climate change adaptation and resilience strategy.	• UK

		Whilst H++ scenarios typically are in the tail of the uncertainty distribution, it is generally not possible to specify specific probabilities for a scenario.		
CEDA platform [10]	• Data platform	The Centre for Environmental Data Analysis (CEDA) provides a source of climate change data for both the UK and the rest of the world. A large number of climate data sets are available from the CEDA, including the Met Office Integrated Data Archive System (MIDAS) land and marine surface stations data.	Current and future climate data and analysis	• UK
State of the UK Climate [11], UK Met Office annual report	• Report	The State of the UK Climate report is an annual publication which provides an accessible, authoritative and up-to-date assessment of UK climate trends, variations and extremes based on the latest available climate quality observational datasets. This report includes information on current trends for temperature, precipitation, sunshine, wind speed, sea level pressure and humidity. The first State of the UK Climate report 'State of the UK Climate 2014' was published in 2015 and will be updated each year.	Up-to-date current climate information.	• UK
The Extra Project, University of Reading [12]	• Data	This is a project being carried out at the University of Reading, funded by the Natural Environment Research Council, researching upper-tropospheric climate change in mid-latitudes, and its impacts on aviation.	This study is still in progress with funding until August 2017. However, given that the jet stream already has a significant effect on aviation and that future changes in the jet stream may have potentially significant	• UK

			effect on aviation, this research would be worth considering.	
Transatlantic flight times and climate change, P Williams, Environmental Research Letters [13]	• Paper	This paper discusses the two way interaction between climate change and aviation. Impacts discussed in the introduction to this paper include: increased strength of wintertime jet-stream winds due to greenhouse gases forcing; and warmer air reducing the lift force of wings of departing aircraft, potentially introducing the need for take-off weight restrictions or increasing the length of runways.	Take-off weight restrictions, lengthening of runways, increase in journey times.	• Heathrow
Intensification of winter transatlantic aviation turbulence in response to climate change [14]	• Paper	This paper discusses the effect that climate change has on atmospheric turbulence and the knock-on effects to aviation. Using climate change model simulations, the effects of increases in concentration of CO_2 in the atmosphere on clear-air turbulences are shown. The results suggest that climate change will lead to bumpier transatlantic flights.	Higher levels of clear-air atmospheric turbulence could lead to longer journey times and higher fuel consumption and emissions. Given the knock on effects that could occur due to increased turbulence, this climate change effect should be noted by HAL.	• Heathrow

Climate Change and the Impact of Extreme Temperatures on Aviation [15]	• Paper	This paper discusses the influence of likely increases in mean global temperature due to climate change on aviation. Temperature has a significant influence on the maximum allowable take-off weight of an aircraft. For a given runway length, airport elevation and aircraft type, a temperature threshold exists above which the airplane cannot take-off at its maximum weight. The paper investigates how the number of days per summer in which a Boeing 737-800 must be weight restricted may change during the 21st Century due to climate change. It was found that the number of weight-restriction days between May and September will increase by 50-200% at four major US airports by 2050-2070 under the RCP8.5 emissions scenarios.	Take-off weight restrictions, lengthening of runways, increase in journey times	• USA • Heathrow
Evaluating wind extremes in CMIP5 climate models [16]	• Report	This paper evaluates the performance of CMIP5 in simulating extreme winds. It is found that the multi-model ensemble mean captures the spatial variability of annual maximum wind speed well. However, the historical temporal trends in the annual maximum wind speeds are not well represented. It is concluded that the projected annual maxima wind speeds will most likely not change significantly compared to that of the historical period.	Wind is an important factor to consider in aviation and runways are often aligned with the prevailing wind. This report suggests that there will likely be no significant changes to annual maxima wind speed.	• UK • International

UK Climate Change Risk Assessment 2017 Evidence Report [17]	• Report	Every five years the UK Government has to carry out a UK Climate Change Risk Assessment which assesses current and future climate change risks to the UK. The next assessment is due in January 2017. This evidence report published by the ASC will inform the UK Climate Change Risk Assessment 2017. The report summarises the risks and opportunities arising for the UK from climate change. It presents advice on the most urgent priorities to be addressed in the next round of adaptation programmes by the government.	Summarises the key risks to the UK from climate change. Summary of main climate change risks for air transport in the UK.	• UK

4 Summary of new climate change science, data and information

A number of the sources of data and information in Section 3 highlight new science and data of relevance to the assessment of climate change risks relating to eight climate hazards of interest to Heathrow. The main new data and information from the publications described in Section 3 are briefly summarised below.

4.1 Low temperatures

- The H++ scenarios reports describe cold snap scenarios as L-- to highlight that they are at the opposite end of the scale to the extreme heat wave H++ temperatures. In developing the L-- scenario for cold snaps a wide range of observed and modelled data sources were used including: National Climate Information Centre mean temperature data; Central England Temperature record; gridded surface temperatures; and CMIP5 Multi-Model Ensemble. For the L-- cold scenario for the 2020s, the UK mean winter temperature is expected to be 0.3°C, with a coldest day scenario average below freezing across the UK of approximately -7°C. For the 2080s scenario, average winter temperatures are approximately - 4°C, with temperatures on the coldest day of approximately -11°C. Note, consideration of the Urban Heat Island effect was excluded from the analysis. [9]

4.2 High temperatures

- In developing the H++ scenario for heat waves similar data sets were used to those used for cold snaps. In this scenario, all measures of extreme heat considered are projected to increase. Annual average summer maximum temperatures will exceed 34°C over much of central and southern England. It is also found that absolute temperatures in excess of 40°C on the hottest days in summer are entirely possible (the maximum temperature in London is estimated to be 48°C). Note, short-term cooling due to volcanic activity was excluded from the analysis. [9]
- The 2011 report references the effect that the Urban Heat Island (UHI) effect has on increased temperatures in London, and the latest data suggests that climate change effects are likely to be exacerbated by UHI. Appendix A provides a summary of London's UHI effect on Heathrow Airport.

4.3 Low precipitation

- The H++ scenario for low rainfall shows a significant increase in 6 month duration summer drought with deficits up to 60% below the long term average from 1900 – 1999. There is no suggestion of significant changes in winter droughts. However, there is the possibility of longer dry periods across the UK throughout the year, with rainfall deficits of up to 20% below the long term annual average lasting several years, similar to the most severe long droughts on record. Note, these scenarios cannot be compared directly to deviations from a 1961 – 1990 baseline or data for smaller areas or maps with gridded data. [9]

- Both CMIP5 and UKCP09 results indicate that a reduction in long-term average summer rainfall is more probable than an increase. However, CMIP5 suggests a larger chance of an increase and a smaller risk of substantial future reductions in summer rainfall.

4.4 High precipitation

- Two H++ scenarios exist for high rainfall, the first is for increases in average winter rainfall, and the second is for heavy daily and sub-daily rainfall in winter or summer. For average winter rainfall, the H++ scenario points to an increase of 70 – 100% on the 1961 –1990 baseline by the 2080s. This overlaps with the UKCP09 2080s high emissions scenario but is slightly higher. The H++ scenario for heavy daily and sub-daily rainfall for the same period is 60 – 80% increase in rainfall depth for summer or winter events. This was based on consideration of new high resolution modelling and physical processes. This increases fits within the UKCP09 distribution tails for the 2080s high emissions for the wettest day of winter variably but is higher than uplifts considered for summer. [9] This H++ scenario is based only on precipitation, and does not provide trends for storms or other extreme weather events.

4.5 Jet stream

- The AR5 Physical Science Basis report confirms that in the northern hemisphere, it is likely that circulation features have moved poleward since the 1970s. This has involved a poleward shift of storm tracks and jet streams and a contraction of the northern polar vortex. However, the AR5 report states that trends in the jet stream are uncertain.

- The Extra Project [12] issued a presentation in June 2016 summarising that: climate models project that by 2100 there will be small changes to the jet stream (i.e. a northward shift and an increase in wind speeds); eastbound flight routes will experience a northward shift and be faster; and westbound flight routes will be more dispersed and slower.

4.6 Winds

- The H++ scenario for windstorms, based on analysis of CMIP5 projections, suggests a 50 – 80% increase in the number of days of strong winds in the UK by 2070 – 2100 compared to the period 1975 – 2005. Note, the caveat in this study is that model simulations contain biases in the position of North Atlantic storm track and systematically under represent the number of intense cyclones [9].

- As discussed in the HAL 2011 CCAR, there is considerable uncertainty in projections for changes in wind speed and direction. A number of studies show statistically insignificant variations in wind speed.

4.7 Fog

- No new data has been found for projected variations in frequency or intensity of fog events due to climate change.

4.8 Storms

- Considerable uncertainty exists in the projections of future storm frequency and intensity. AR5 [5] states that the frequency and intensity of storms in the North Atlantic have increased since the 1970s but the reasons for this are uncertain. There is low confidence on large-scale trends in storminess in the last century and there is still not enough evidence to understand whether robust trends exist in small-scale severe weather events. There is also low confidence in the near-term projections for the position and strength of the Northern hemisphere storm tracks.

4.9 Global climate change impacts

In addition to local effects of climate change on the UK and Heathrow Airport, climate change effects across the globe which may affect other airports could have a severe knock-on effect for Heathrow. Two sources of information are discussed below which discuss potential global aviation issues.

The US Global Change Research Program conducts a National Climate Assessment [18] (NCA) every four years, the most recent of which was released in May 2014. It discusses how 13 airports out of the 47 largest airports have at least one runway with an elevation within 12 feet (3.56 m) of current sea levels and therefore, within the reach of moderate to high storm surge. This is depicted in Figure 1 below.

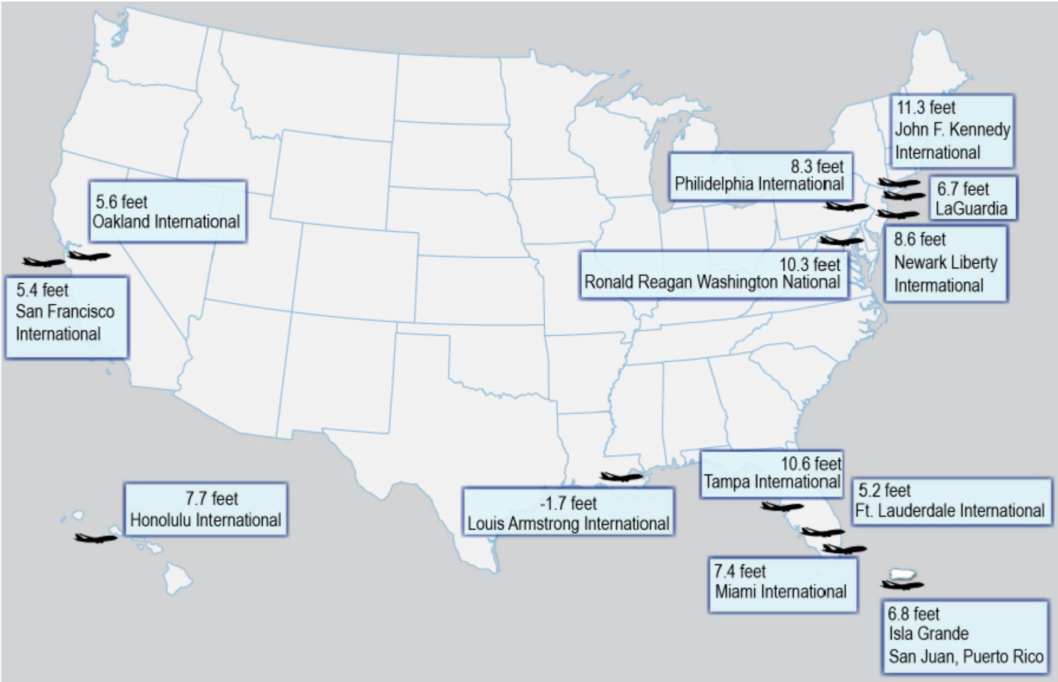

Figure 1. Airports vulnerable to storm surge (Image taken from the NCA)

During Hurricane Sandy, in October 2012, the three major airports in New York (John F. Kennedy (JFK), Newark and La Guardia) all flooded, with La Guardia having to shut for 3 days.

The Government Office for Science published in 2011 a foresight report on the international dimensions of climate change. This report identifies how international climate change is likely to affect the UK due to its global interdependencies. The section on air transportation in the report discussed that 11% out of a total of 9,915 airports worldwide are located within the coastal zone. These airports will most likely be at risk from sea level rise and flooding.

5 Comparison of climate change science, data and information between existing Heathrow reports

Table 2 provides a summary of new sources of data and information to potentially include in the updated 2016 HAL CCAR and Risk Assessment, compared to those included in the existing HAL reports. Note that most of the information used in report in 2011 remains valid. Most of the new sources of data complement the information provided in the 2011 report.

Table 2. Summary comparison of sources of data and information in existing 2011 HAL CCAR reports, working draft 2016 HAL CCAR and updated 2016 HAL CCAR

	Data and information in existing HAL CCARs (2011 and working draft 2016).	**New sources of data and information to be considered for updated 2016 CCAR**
Low temperatures	UKCP09, UKCP09 Technical note	UKCP09 Weather Generator 2.0 [8] H++ scenario [9]
High temperatures	UKCP09	UKCP09 Weather Generator 2.0 [8] H++ scenario [9]
Low precipitation	UKCP09	UKCP09 Weather Generator 2.0 [8] H++ scenario [9] CMIP5 [6] Use of CMIP5 for summer precipitation For example, for 2080s UKCP09 projects a decrease of 23% while the data based on CMIP5 points to a decrease 2.5% decrease.
High precipitation	UKCP09	UKCP09 Weather Generator 2.0 [8] H++ scenario [9]
Jet stream	N/A	AR5 [6] The Extra Project [13]
Winds	UKCP09 Technical documentation	H++ scenario [9]

Fog	UKCP09 Additional product	N/A
Storms	UKCP09 Technical note	AR5 reports [5]

6 Summary and recommendations

This sections provides a brief summary of the main outcomes from the review of climate change science, data and information published since 2011. It also includes a list of suggested recommendations regarding the incorporation of additional data and information in the updated 2016 CCAR and Risk Assessment.

The main outcomes of this review are:

- New and improved climate models have been developed within the last 5 years which have provided updated projections for a number of climate variables and hazards.
- The trends and climate change projections for the UK obtained from previous model outputs (e.g. UKCP09 and AR4 models) are considered to be still valid and appropriate to use in climate change adaptation studies. However, new projections for precipitation have been developed, and these should be addressed in future reporting, especially when assessing changes in summer precipitation. This implies that the trends and projections used in the HAL CCAR in 2011 are overall still valid at exception of summer precipitation estimates.
- H++ scenarios for the UK have been developed (L- - scenarios for low temperatures) and whilst these represent very extreme and low probability scenarios, they are plausible. Consideration of H++ in climate change impact studies could contribute to more robust climate change resilience strategies.
- A new set of climate change projections for the UK will be published in 2018 (UKCP18).

The initial recommendations based on these outcomes are:

- The updated 2016 CCAR and Risk Assessment should include references to the new sources of information referenced in this report.
- Climate change projections for summer precipitation should be updated in the Risk Assessment following the advice from the Met Office.
- H++ (and L- -) scenarios should be considered to assess the robustness of HAL's climate change adaptation and resilience strategies
- The 2016 HAL CCAR and Risk Assessment should be reviewed and updated once the UKCP18 climate change projections become available in 2018. The H7 Business Plan process should factor this review and update into budgets.

7 References

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Appendix A - Urban Heat Island and its effects on Heathrow Airport area

Urban Heat Island (UHI) refers to the tendency for temperatures in urban areas to be higher than those recorded in rural surroundings. London's UHI can result in London's temperature being up to 10 °C warmer than in rural surroundings[1]. London's UHI is mainly a night effect when temperatures are in average 3 to 4 °C higher than in rural areas and it is largest under warm summer weather[2].

Jones and Lister (2009) compared temperature records from two central London sites and two rural sites[3]. They found that the UHI for central London developed before the start of the twentieth century and that since then there has not been any significant urban-related warming.

Jones and Lister (2009) also considered two suburban locations, London Heathrow (LHR) being one of them. In contrast to the central London sites, LHR has experienced enhanced warming (mean temperature increase by 0.4 °C) compared to the rural sites during the period 1951 – 1980. It was found that there has not been further increase in the UHI effect for LHR since 1981. The findings from this study illustrate how London's UHI increased to include suburban locations like LHR.

A study by Hacker et al.[4] compared hourly temperature observations from LHR (considered urban site) and Beaufort Park (rural site) for the period 1993-1998. The UHI for LHR was defined to be the difference in temperature between that measured at LHR and at Beaufort Park. Data collected showed that a significant UHI effect is experienced at LHR, especially in summer. On average, in August, it was found that there are 21 says with a maximum heat island effect of more than 3 °C and 8 days of more than 5 °C.

TM 49[5] discusses the UHI in depth and defines locations as within the Central Activity Zone (CAZ), urban areas outside of the CAZ (peri-urban, such as LHR) and rural areas around London. Whilst reference is made to mircoclimatic conditions and factors to local UHI effects, it is noted that current data suggest that these effects are of secondary importance to macroclimatic factors associated to the London UHI.

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Summary

The studies summarised above indicate that Heathrow Airport is part of London’s UHI and it experiences higher temperatures than rural surroundings. During summer time, the difference in temperature between Heathrow and rural areas is often more than 3 °C.