

Aviation Reimagined

2024 webinar series

Supporting
European
Aviation

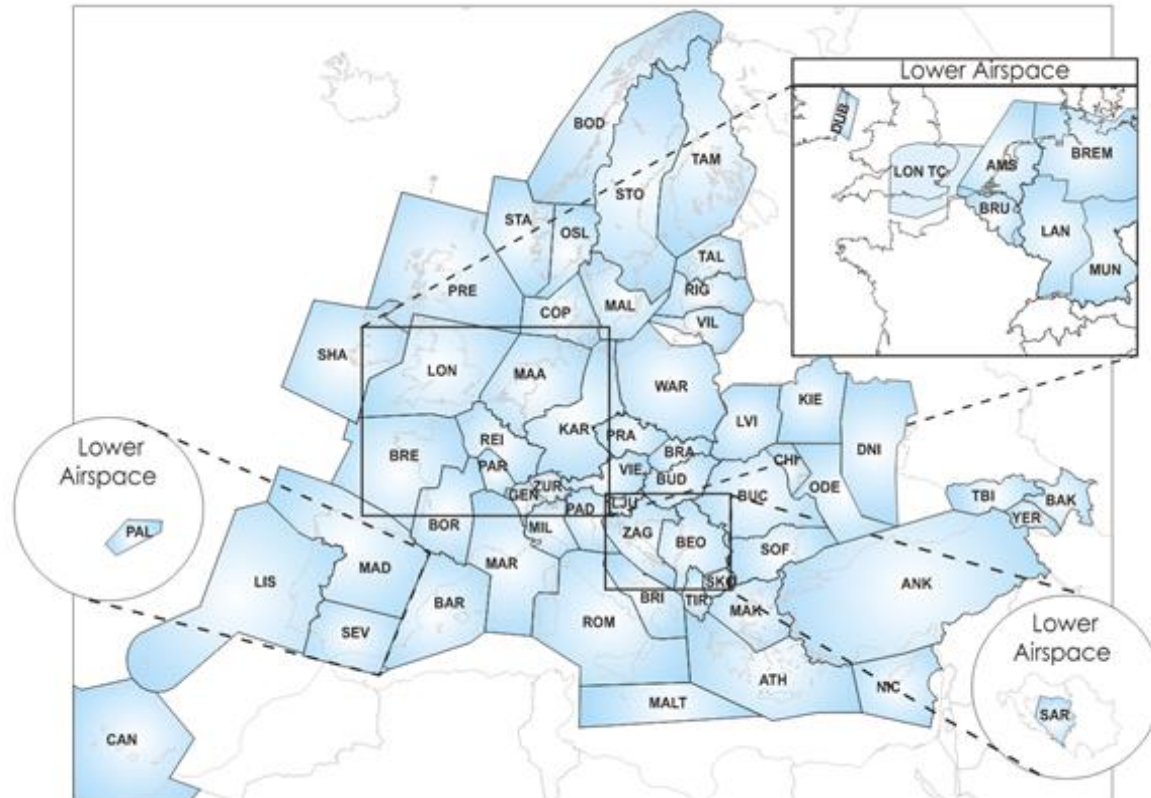


Climate Proofing Aviation Now and for the Future

Rachel Burbidge, EUROCONTROL
17th October 2024



EUROCONTROL – who are we?



- 41 Member States, typically each with its own ANSP
- Approximately 64 Area Control Centres (ACC)
- Over 700 sectors when at full capacity
- Approx. 17,000 Air Traffic Controllers
- 14.2 million flight hours controlled

We know that decarbonisation is urgent...



But...

Climate Change impacts for aviation are wide-ranging



Hurricane Milton 10th October 2024

Total delays today: 9,187

Total delays within, into, or out of the United States today: 480

Total cancellations today: 2,687

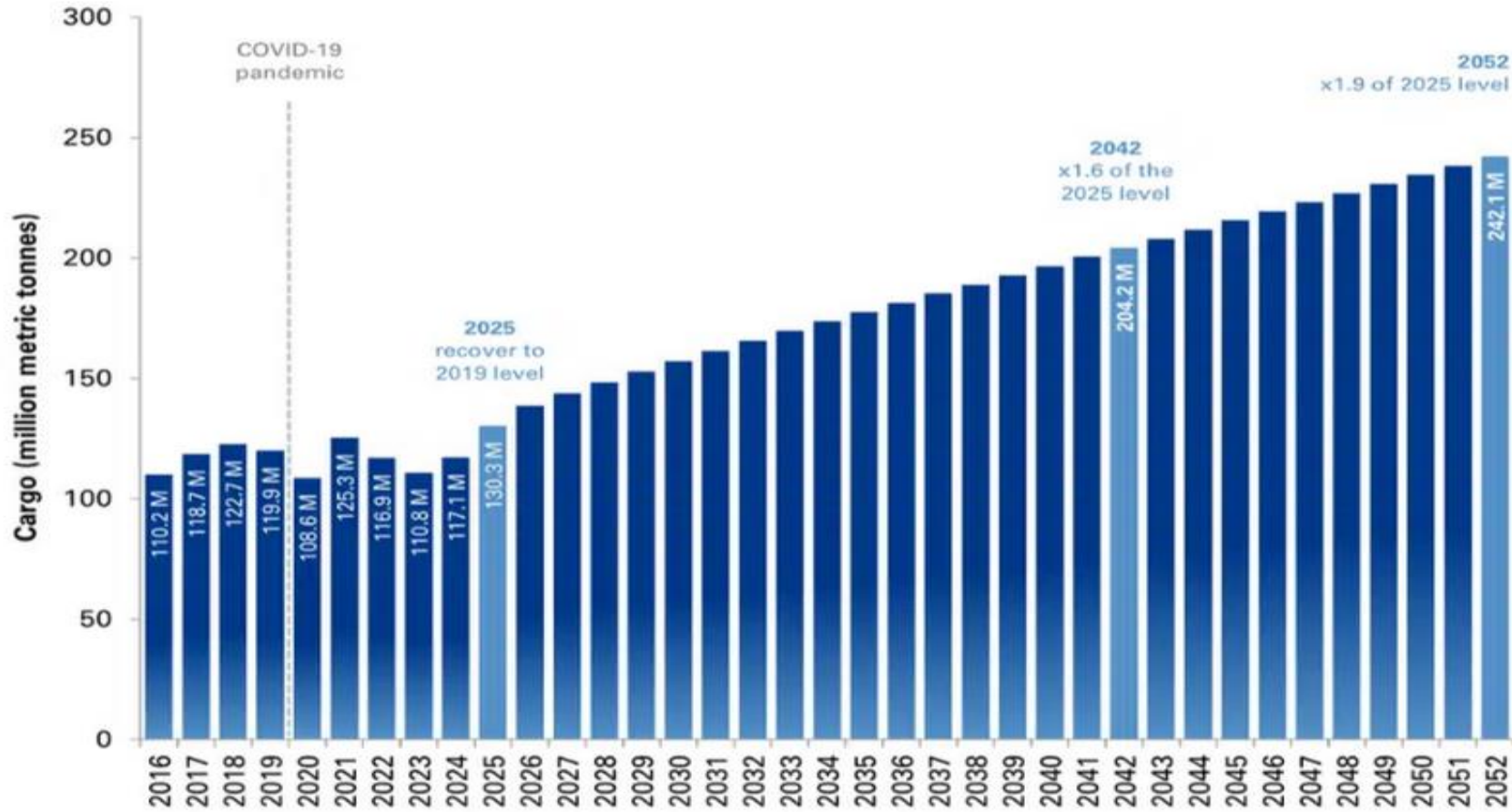
Total cancellations within, into, or out of the United States today: 2,224

How is Hurricane Milton impacting flights?
 More than 1,900 U.S. flights have been canceled for Wednesday and more than 2,100 have been canceled for Thursday, according to flight-tracking website [FlightAware](https://www.flightaware.com).

BY ORIGIN AIRPORT					BY DESTINATION AIRPORT				
Cancelled		Delayed		AIRPORT	Cancelled		Delayed		AIRPORT
#	%	#	%		#	%	#	%	
485	92%	6	1%	Orlando Intl (MCO)	447	83%	7	1%	Orlando Intl (MCO)
232	90%	5	1%	Tampa Intl (TPA)	218	82%	11	4%	Tampa Intl (TPA)
96	96%	0	0%	Southwest Florida Intl (RSW)	92	92%	0	0%	Southwest Florida Intl (RSW)
67	5%	7	0%	Hartsfield-Jackson Intl (ATL)	91	15%	19	3%	Miami Intl (MIA)
61	80%	7	9%	Palm Beach Intl (PBI)	83	6%	12	1%	Hartsfield-Jackson Intl (ATL)
55	9%	26	4%	Miami Intl (MIA)	57	6%	15	1%	Charlotte/Douglas Intl (CLT)
50	5%	13	1%	Charlotte/Douglas Intl (CLT)	50	56%	9	10%	Palm Beach Intl (PBI)
48	94%	0	0%	Sarasota/Bradenton Intl (SRQ)	48	94%	0	0%	Sarasota/Bradenton Intl (SRQ)

And traffic is growing...

Long-term global passenger traffic (2016–2052)



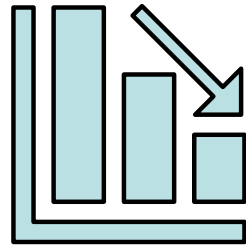
Source: ACI World Airport Traffic Forecasts (WATF) 2023–2052

Impacts of Storms

- Disruption to operations:
 - delays, re-routings, route extensions, trajectory management, HFE, increased fuel burn and emissions
 - potential en-route capacity loss and congestion
- Larger / more intense convective systems could affect multiple hub airports
- Damage to infrastructure
- Increase in lightning strikes: airport closures

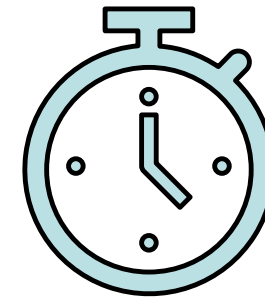


EUROPE: Frequency of major storms forecast to drop by 2050, *but* intensity of storms that do affect flights will lead to more significant delay



-8% to -12%

Forecast drop in share of all flights likely to be delayed by a major storm (*if there was no change in the aviation system in 2050*)



20 to 22 minutes

Forecast average en-route ATFM delay due to weather per flight delayed by a major storm in 2050

Higher average and extreme temperatures



- Changes to aircraft performance: take-off, payload, runway length, landing speed
 - Phoenix 2017: too hot for some regional jets to take-off (certification)
- Heat damage to airport surface (e.g. runway, taxiway)
- Heat damage to equipment e.g. ATM equipment, electronic equipment

Conditions for passengers, personnel, ground handlers, ATC

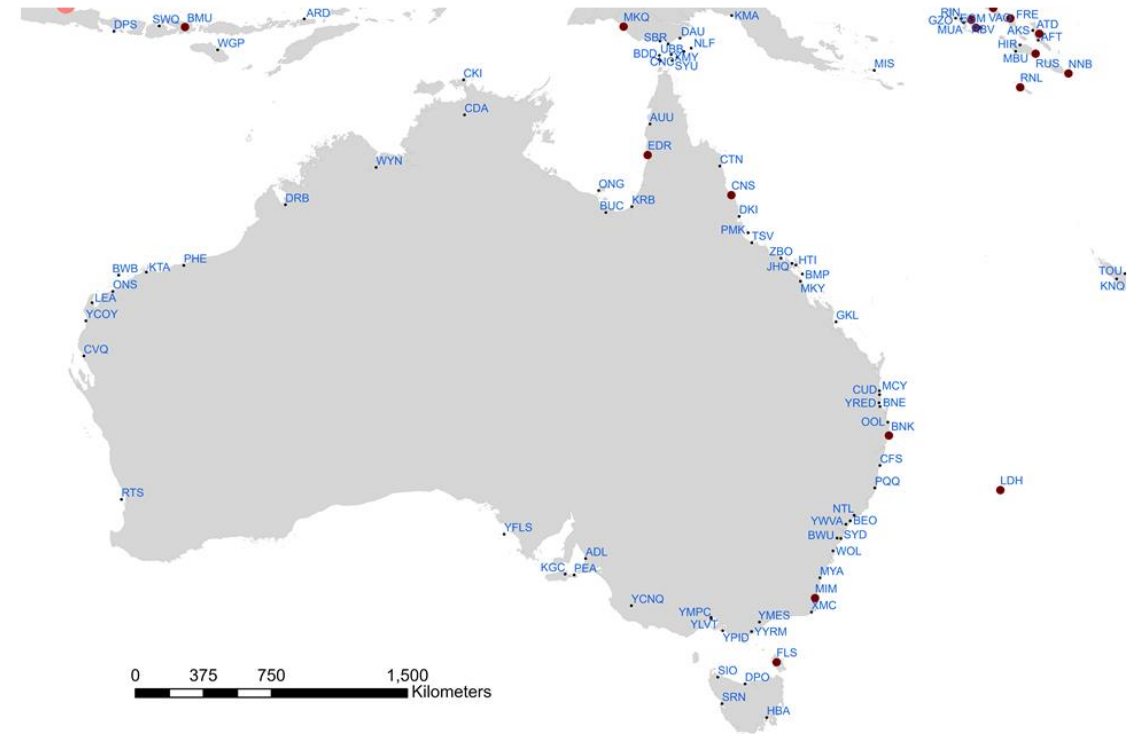
Sea-level rise & storm surge



- Disruption to operations
 - Delay and disruption from runway inundation
 - Network disruption
- Permanent / temporary loss of airport capacity /infrastructure

Sea-level rise: global impact

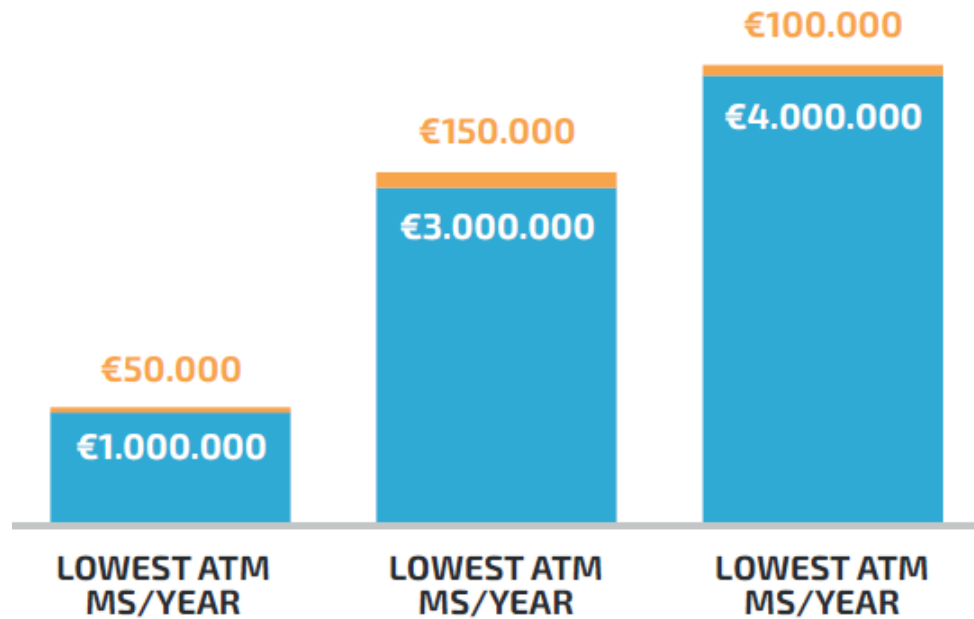
- SLR of 0.62m (consistent with a warming scenario of 2°C by 2100): 100 airports below mean sea level, 364 airports in the coastal floodplain, over 900 routes at risk of disruption (Yesudian & Dawson, 2021).
- SLR of 1.8m: 572 airports in the coastal floodplain and over 3500 route disruptions (Yesudian & Dawson, 2021).
- Includes many hub-airports serving major cities and handle millions of passengers a year at risk.



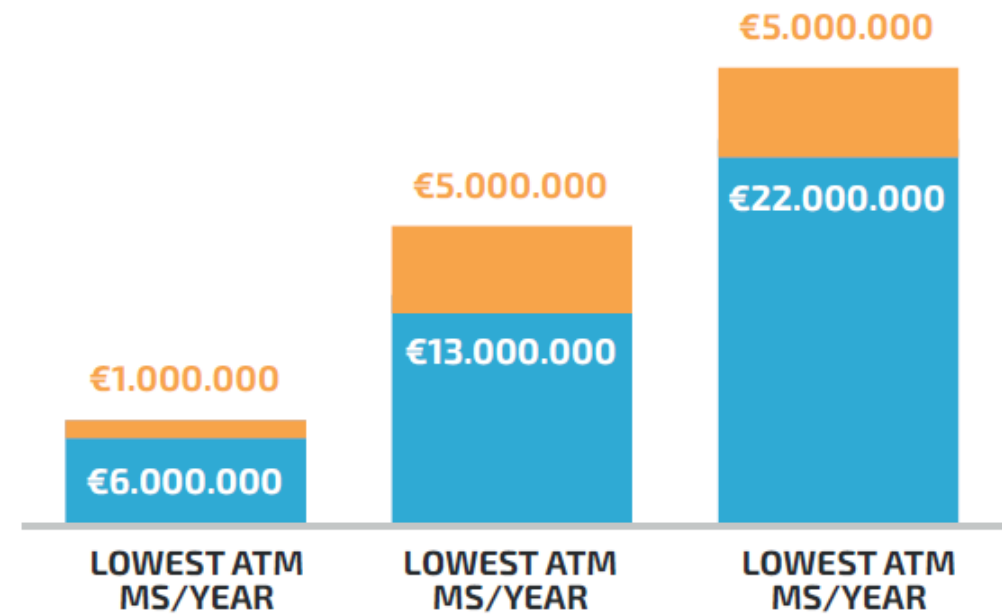
Source: Yesudian and Dawson (2021) Global Analysis of Sea Level Rise Risk to Airports, Figure SM.15 Regional map of Risk under the RCP8.5 scenario

Operational impacts = costs

COST IMPACTS FOR MEDIUM AIRPORTS



COST IMPACTS FOR LARGE AIRPORTS



% of average ATM in ECAC/day

■ Cancelled ATMs/day ■ Diverted ATMs/day

Estimated costs of a one-day closure for European Airports

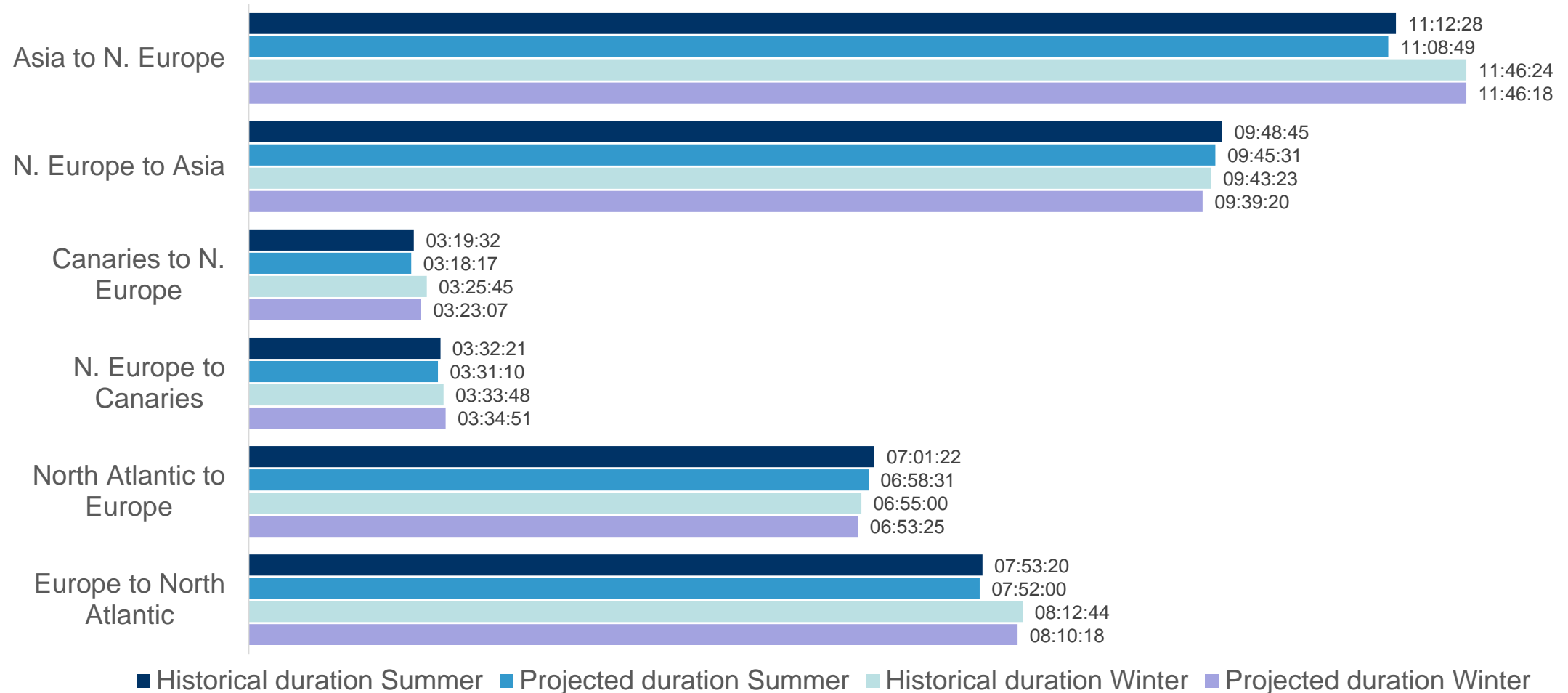
Changing wind patterns



- Changes to trans-Atlantic flight times and routings: airport slot management
- Increase in crosswinds due to shifts in prevailing wind direction
- Changes in procedure due to crosswinds - environmental impact?
- Reduction in capacity at airports with no crosswind runway
- Disruption to operations if winds are too strong to take-off or land for spec aircraft type
- More clear air turbulence: injuries and aircraft damage

Image: Thales

Overall flight durations will be shorter for both eastbound and westbound transatlantic flights by 2050



Average flight duration*

* Where apparent contradictions to the existing literature exist - this is due to more recent TP algorithm and climate models being used in present analysis, including multi-model.

Turbulence



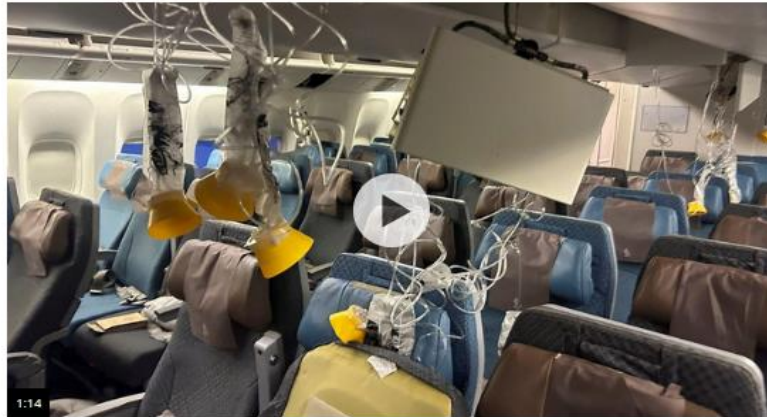
Singapore Airlines plane jolted up and down for five seconds - report

29 May 2024

Share Save

Thomas Mackintosh
BBC News

Katy Austin
Transport Correspondent



Watch: How chaos onboard Singapore Airlines SQ321 unfolded

Turbulence on Doha-Dublin flight leaves 12 injured

27 May 2024

Share Save

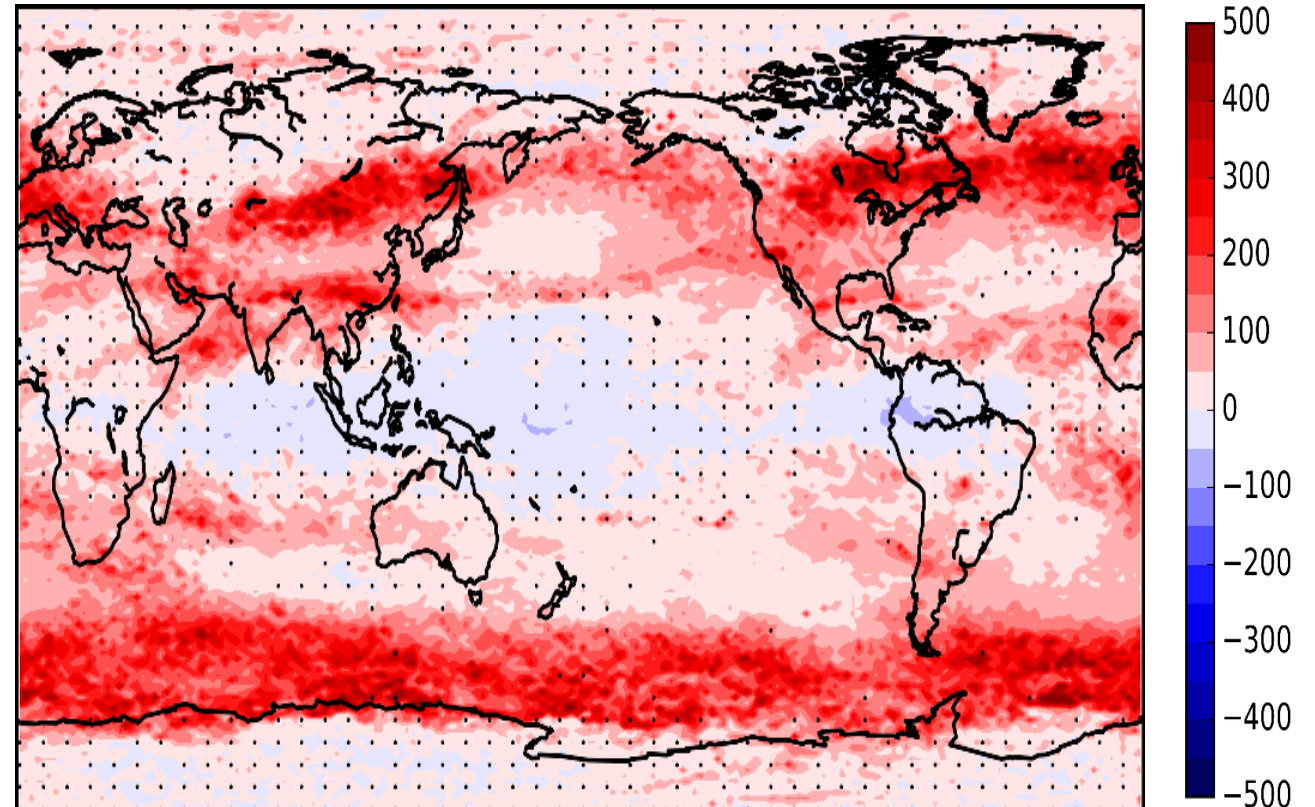
Matt Fox & Rebekah Wilson
BBC News NI



The plane was met by emergency services at Dublin Airport on Sunday

Clear-air turbulence

Change (%) by
2050–2080





Source: Storer, Williams & Joshi (2017) Global Response of Clear Air Turbulence to Climate Change

Summer 2023: the start of a new normal?

Will 'prime fire season' force a change to our summer holidays forever?

According to a recent poll two thirds (67%) of UK holidaymakers said the extreme heat of 2022 has seen them change their travel plans this year.

brussels AIRLINES 

A STAR ALLIANCE MEMBER 

A coolcation: THE summer trend

Choosing a coolcation means choosing a cooler, but no less cool, summer vacation. In a location in the north, where you can escape the typical summer heat. No idea what to discover there? No problem, we'll show you the way!

[More info](#)

Extreme heat in Europe is becoming the new normal — prompting tourists toward cooler destinations

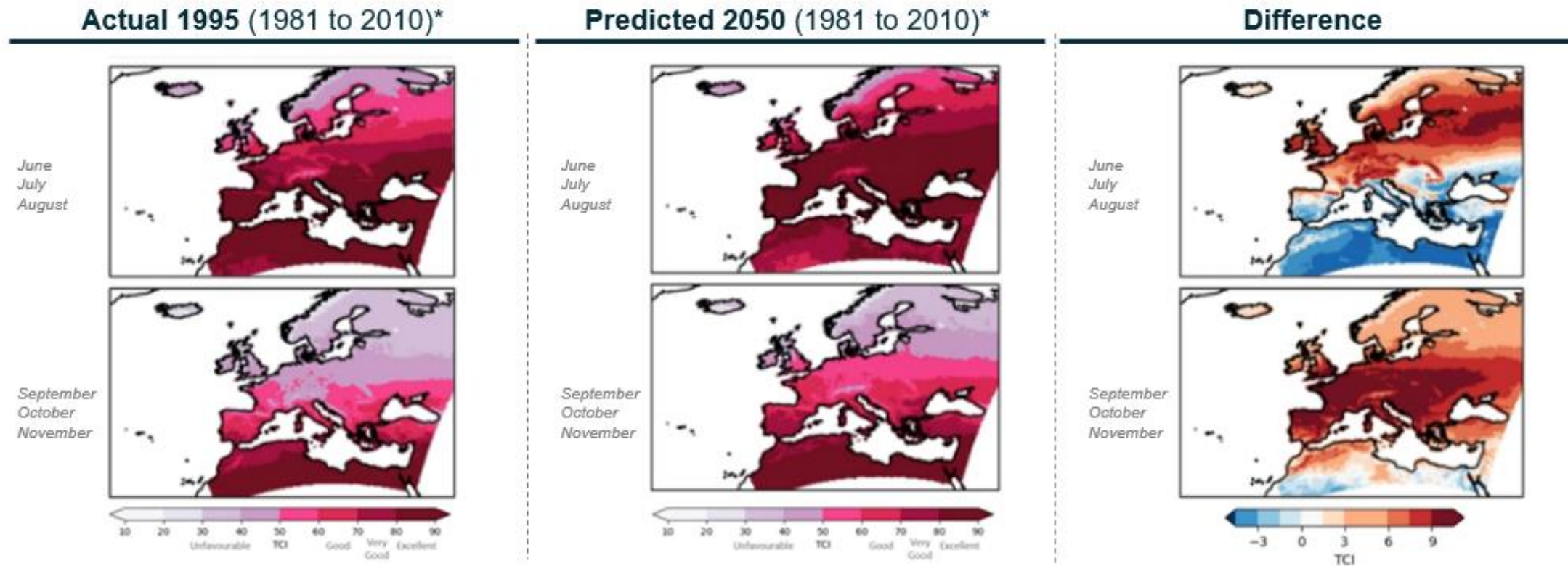
More tourists are thought to be prioritizing milder temperatures or even off-season travel to avoid spending their time away in oppressive heat.



Mallorca tourists run for their lives as terrifying storms send deckchairs flying

The holiday hotspot has been battered by a vicious storm that caused a cruise ship crash and has turned dream getaways into nightmares for many Brits caught in the chaos

EUROPE: Longer periods of 'good' to 'ideal' climate for general, low level tourist activity



Source: EUROCONTROL Climate Change Risks for European Aviation 2021

BUT... more extremes, intense summer storms, wildfires...?

We have to adapt to reduce future damage, disruption and costs...



European Aviation Climate Change Adaptation Working Group



HETP, ENVIRONMENT AND DEVELOPMENT FOR A CHANGING WORLD

A role for research: key areas for action to address knowledge, awareness and implementation gaps

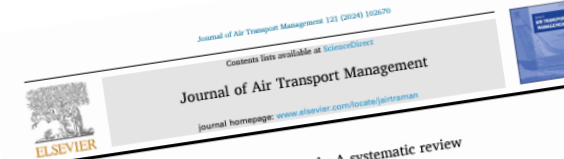
- Broaden geographical coverage, particularly to address the current lack of studies addressing climate risks and responses in Central and South America, Africa and the Middle East;
- Extend knowledge of physical impacts;
- Address known-unknowns such as the risks associated with unprecedented or compound extreme events;
- Extend knowledge of adaptation including cost-benefit analysis and consideration of integrated mitigation and adaptation;
- Identify and apply relevant research from other disciplines;
- Sector bodies to support and facilitate collaboration between researchers and practitioners to co-develop accessible user-oriented climate adaptation services.

Broaden Geographical Coverage



Region	Impacts	Adaptation
ICAO regions		
N America, C America, & Caribbean	46	38
Asia Pacific	26	18
Europe & N Atlantic	26	17
W & C Africa	1	1
E & S Africa, Middle East, S America	0	0
Other		
Global	13	11
Transatlantic	7	3
Non-specific	12	10
Total	131	98

Source: Burbidge et al (2023) A systematic review of adaption to climate change impacts in the aviation sector



Australasian aviation climate change hazards: A systematic review
 Mark E. Holmes^a, Tim Ryley^b, Aletha Ward^c, Erich C. Fein^d, Sophia Martin^e

ABSTRACT
 This systematic review identifies Australasian aviation climate change hazards to guide evidence-based climate risk management for the Australasian aviation industry. Identifying evidence-based climate hazards is imperative to inform local adaptation strategies. Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach, literature from 2005 to 2023 was searched and a qualitative systematic analysis of results undertaken. The search identified 22 records, including grey literature, and discussed climate change hazards to flight operations include changes to wind, turbulence, dust, smoke, icing and hail. Hazards to airport operations include changes to precipitation, heat, saltwater inundation, tsunamis, lightning and volcanic ash. A first pass risk assessment was conducted to prioritise those climate change hazards to further guide industry risk management. In response, the Australasian aviation industry needs to introduce evidence-based climate risk management systems and disparate climate literature transferred to the aviation knowledge base. Research from the northern hemisphere needs to be adapted and contextualised to the Australasian setting where freight, or regional to meet specific regional needs, enhancing the climate resilience of the local aviation subsector.

1. Introduction
 The Australian aviation industry, consisting of the Exclusive Economic Zones (EEZs) of Australia and New Zealand, is a well-developed and long-established complex system of systems (Smith and Strathairn, 2013). This sophisticated network integrates humans, society, technology and the environment which all interact to ensure safe and efficient aviation operations. This intricate system is vital for the region's connectivity and economic development (Commonwealth of Australia, 2023). The Australian system comprises of commercial, international, trans-Tasman, domestic, regional and remote regular public transport operations alongside general and fixed-wing charter, fly-in-fly-out flying including freight and fixed-wing charter, aeromedical and emergency services operations. The complex network is supported by many coastal airports commensurate with population density (Lisk et al., 2019). The Australian airline market is highly concentrated around three major Airline Groups. The Qantas Group, made up of low cost subsidiary



We need to adapt: but how much and how fast?



What is the role of policy?



Biden-Harris Administration Announces Nearly \$300 Million in Awards for Sustainable Aviation Fuels and Technologies as part of Investing in America Agenda

Friday, August 16, 2024

WASHINGTON — The Federal Aviation Administration (FAA) is announcing \$291 million from the Inflation Reduction Act for projects that will help achieve the goal of net-zero greenhouse gas emissions from aviation by 2050 as part of President Biden's Investing in America Agenda.



Effective in driving decarbonisation?

Time for a mandate?



Strategic aviation operators

[Climate adaption reporting third round: Heathrow Airport](#)

1 August 2023 Research and analysis

[Climate adaption reporting third round: Glasgow Airport](#)

1 August 2023 Research and analysis

[Climate adaption reporting third round: Birmingham Airport](#)

8 February 2022 Policy paper

[Climate adaption reporting third round: Cardiff Airport](#)

8 February 2022 Research and analysis

[Climate adaption reporting third round: Edinburgh Airport](#)

14 February 2022 Research and analysis

[Climate adaption reporting third round: Gatwick Airport](#)

14 February 2022 Research and analysis

[Climate adaption reporting third round: Luton Airport](#)

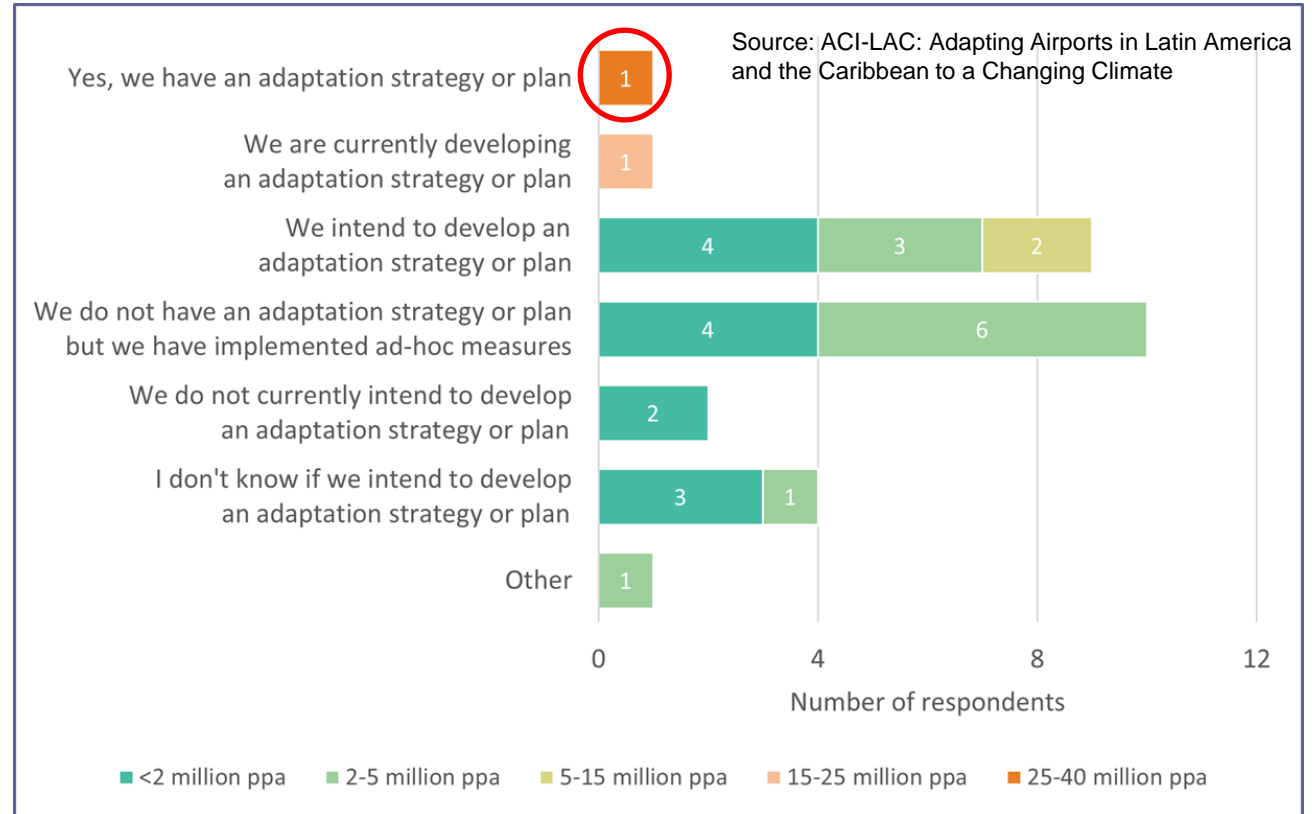
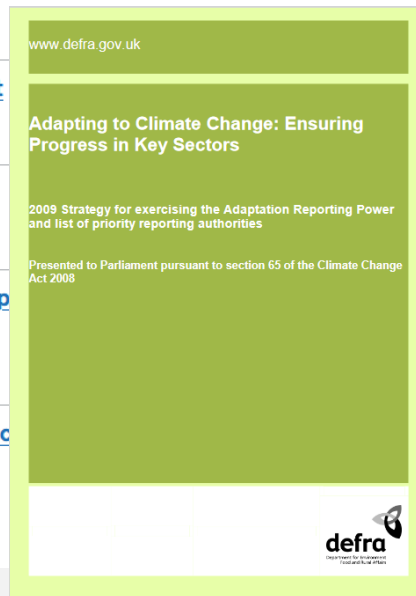
14 February 2022 Research and analysis

[Climate adaption reporting third round: Manchester Airports \(Manchester, Midlands, London Stansted and Manchester Airports\)](#)

28 January 2022 Research and analysis

[Climate adaption reporting third round: NATS \(Air Traffic\)](#)

24 February 2022 Research and analysis



Thank you for your attention

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Find more information here:

