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AIRPORTS' ADAPTATION AND RESILIENCE TO CLIMATE AND DISASTER RISKS

(Presented by Airports Council International (ACI))

EXECUTIVE SUMMARY

This paper presents the views and initiatives of airports related to climate change adaptation and resilience. It emphasizes the importance of this topic, as climate events are already affecting airport infrastructure and operations, and will continue to have a growing impact in the short-, mid-, and long-term. The paper recognizes the work undertaken by ICAO and presents the ongoing progress of airports and ACI, in coordination with other organizations, to advance risk assessments and to develop and implement adaptation and resilience strategies and measures. Finally, it underscores the need for accelerated and intensified actions, while taking into account the context of airports and ensuring that retroactive requirements do not impose undue burdens on existing infrastructure.

<i>Strategic Goals:</i>	This working paper relates to Strategic Goals – <i>Aviation is Environmentally Sustainable</i> and <i>Every Flight is Safe and Secure</i> .
<i>Financial implications:</i>	
<i>References:</i>	A42-WP/279, <i>Meeting growing airports' energy demand to enable decarbonization</i> ACI Policy Brief: <i>Airports' resilience and adaptation to changing climate</i> , 2018 ACI, <i>Climate change resilience and adaptation survey report</i> , 2021 ACI LAC, Manchester Metropolitan University, Report, <i>Adapting airports in Latin America and the Caribbean to a changing climate</i> , 2024 ACI Europe, EUROCONTROL, European Aviation Climate Change Adaptation Working Group (EACCA-WG) briefing <i>Adapting Aviation to a Changing Climate</i> , 2024 ACI APAC & MID, <i>Tendering guideline for Climate Resilience Planning</i> , 2022 ACI APAC & MID, ICAO DGCA/60 Paper, <i>Climate Adaptation Guidance and Tools for Airports</i> , 2025 CDRI, <i>Global Study on Disaster Resilience of Airport</i> , 2023-2025 ACRP, <i>Assessing Climate Change Vulnerability at Airports: A Primer</i> , 2024

1. INTRODUCTION

1.1 The path of sustainable aviation towards 2050 requires both robust mitigation measures to achieve decarbonization, and decisive action to adapt to and remain resilient against climate effects and more frequent and severe weather events. Ensuring the adaptation and resilience of airports is essential not

only to maintain safe and continuous connectivity but also to enable them to fulfil their critical role as socio-economic actors and hubs for relief operations and safe shelters in times of crisis.

1.2 Major climate effects and extreme weather events, such as sea-level rise, higher average and extreme temperatures, desertification, changing precipitations and icing conditions, increased intensity of storms, changes in wind patterns and biodiversity, have already caused major disruptions both in the air and on the ground, causing safety risks, flight delays, runway shutdowns, infrastructure failures, power shortages, airport access challenges, and economic damage, therefore affecting operations, air traffic control systems, infrastructure, communications, passenger and workforce. Multiple stressors often occur together or in sequence, amplifying disruption by creating compound impacts on airport operations and infrastructure. Such events have cascading effects, disrupting passenger and cargo traffic and impacting entire economies well beyond the airport.

1.3 It is imperative to recognize that the impacts depend on airports' local context, exposure levels and vulnerabilities. One hazard will entail different consequences depending on the airport's circumstances (geography, regulatory framework, awareness, size, ownership, infrastructure, available resources, etc.), leading to different levels of maturity and readiness in managing climate and disaster risks.

2. AIRPORTS' AND ACI INITIATIVES RELATED TO CLIMATE ADAPTATION AND RESILIENCE

2.1 The industry is increasingly engaged on this topic, with many airports taking action to strengthen their resilience through the implementation of prioritized and tailored adaptation strategies, such as integrating infrastructure resilience practices into planning, design, construction, and operations. CO₂ emission reduction (mitigation) and climate adaptation can also be mutually reinforcing: indeed, the use and production of renewable energy can support both aviation decarbonization and airports' resilience, as mentioned in [ACI's Working Paper 279 to the 42nd Assembly – Meeting Growing Airports' Energy Demand to Enable Decarbonization](#). Many airports also have business continuity and emergency plans that include planning and responding to adverse climate-related events. However, despite this increase in adaptation action, many airports have yet to engage with the issue due to challenges such as limited resources, insufficient data, and competing priorities.

2.2 ACI supports these efforts by providing tools to assess climate risks and guide the identification of effective measures. [ACI World Annual General Assembly Resolution 5/2024](#) reminds airports of the “urgency to build climate adaptation and resilience into their strategies and to prepare for more frequent extreme weather events, taking a risk management approach”. In 2018, ACI World produced a [Policy Brief: Airports' resilience and adaptation to changing climate](#) to encourage airports to conduct risk assessments and consider various adaptation measures. In 2019, ACI conducted a [climate change resilience and adaptation survey](#) examining airports' climate impacts, risk and vulnerability assessments, awareness of climate-related financial disclosure, effects on insurance premiums, and capacity-building needs (refer to Appendix A).

2.3 In 2022, ACI Asia-Pacific and Middle East (ACI APAC & MID) published the [Tendering Guideline for Climate-Resilient Planning](#). In January 2025, it launched a *Study on Climate Adaptation Approach for APAC & MID Airports*, a high-level initiative to strengthen airports' climate resilience and support them in assessing climate risks, tracking and evaluating impacts, and applying effective adaptation measures. As of June 2025, 59 airport operators representing 223 airports from 27 countries/regions have confirmed their commitment to the initiative, reflecting strong regional interest from Asia (26), the Pacific (20), and the Middle East (13). At the 60th Conference of Directors General of Civil Aviation, Asia and Pacific Regions in 2025, ACI APAC & MID presented [a paper on its regional work](#); as a result, the

Conference encouraged States/Administrations to engage with regional initiatives for climate resilience at airports and support regional knowledge sharing.

2.4 ACI EUROPE, together with EUROCONTROL, co-chairs the European Aviation Climate Change Adaptation Working Group (EACCA-WG), which launched in 2024 the briefing [*Adapting Aviation to a Changing Climate*](#), on the effects and impacts of climate change on the aviation sector and also provided guidance for airports to prepare for adverse weather conditions typically encountered in [*winter*](#) and [*summer*](#).

2.5 ACI Africa supports progress on this topic by offering [*training programs and resources*](#), such as *Building Climate Resilient Airports: Airport's Perception of Risk Mitigation and Adaptation*, to help airports assess risks, build climate resilient planning, and emphasize the importance of disaster response plans. Other trainings are available on *Environmental Management Systems*, *Water Management in times of scarce resources* and *Energy Management in times of high risk*, also linked to airports' resilience.

2.6 In Latin America and the Caribbean (LAC), ACI LAC developed a [*study, Adapting Airport in Latin America and the Caribbean to a Changing Climate*](#), published in 2024, evaluating the climate risk assessment and adaptation status at airports in the region. The study showed that 83% of respondents to a survey of LAC airport stakeholders are already experiencing the effects of climate change, while 100% expect to be affected by 2050. It provided five recommendations, including awareness-raising, coordination, promotion of climate change risk assessments, implementation of climate change adaptation and resilience measures, and support of regionally focused research.

2.7 Airports in North America, with the support of ACI North America, are also active in conducting vulnerability assessments, adopting design guidelines, implementing infrastructure upgrades, and integrating weather risk considerations into infrastructure planning, emergency response protocols, and continuity strategies. ACI NA also cooperates with the Airport Cooperative Research Programme (ACRP) in developing publications, such as a guide and toolkit published in 2016 on [*Addressing Significant Weather Impacts on Airports*](#), as well as a primer published in 2024 on [*Assessing Climate Change Vulnerability at Airports*](#), which includes case studies.

3. COOPERATION AMONGST STAKEHOLDERS TO PROGRESS ON ADAPTATION AND RESILIENCE

3.1 The ICAO Committee on Aviation Environmental Protection (CAEP) has published several useful documents to support the efforts of aviation stakeholders (e.g., [*Climate Adaptation Synthesis Report*](#), [*Climate Risk Assessment*](#), and [*Adaptation and Resilience Guidance*](#)). As part of this work, ACI co-leads the [*Eco-Airport Toolkit e-collection*](#), which provides practical and ready-to-use information on airports' environmental challenges, including an e-publication dedicated to [*Climate Resilient Airports*](#), which will be updated during the CAEP/14 cycle (2025-2028). ACI also collaborates with ICAO to regularly organize the ICAO Seminar on Green Airports, and moving forward, it would be valuable to devote greater attention to climate adaptation and resilience to enhance cooperation and the exchange of best practices.

3.2 ACI has been collaborating with the Coalition for Disaster Resilient Infrastructure (CDRI) on a [*Global Study on Disaster Resilience of Airports*](#) (cf. [*2025 ICAO Environmental Report*](#)). 111 airports from 54 countries participated in [*the first phase of this study*](#), aimed at understanding current approaches and levels of maturity in climate resilience across regions, airport sizes and ownership. The results of the study highlighted the importance of conducting periodic risk and vulnerability assessments through [*Five Steps towards Resilience of Airports*](#). It underlined challenges in data access, regulatory support, and resource availability for integrating adaptation and resilience measures, which can include advanced

technologies (e.g., data analytics and predictive modelling), climate-resilient designs, green infrastructure, nature-based solutions, renewable energies, as well as collaboration and knowledge sharing. Phase 2 provided comprehensive recommendations on disaster risk management and resilience financing mechanisms for small, medium and large airports. Under Phase 3 of the project, CDRI developed technical guidance outlining structural and non-structural measures for 18 specific hazards and risks affecting airports, either independently or in combination. This guidance document is being complemented by case studies, policy recommendations, and guidance to assist airports in conducting risk assessments and developing procurement frameworks.

3.3 ACI and the World Economic Forum are partnering under the [Airports of Tomorrow](#) initiative, which includes a workstream on climate adaptation, including workshops and publications.

3.4 All transport sectors face similar challenges in building resilience and ensuring operational continuity. As transport modes are interconnected, resilience must also be considered from a broader transportation network perspective. ACI is a member of the International Task Force on Transport System Resilience, which enhances cross-modal action coordinated by the World Association for Waterborne Transport Infrastructure (PIANC), the World Road Association, the International Union of Railways (UIC), and EUROCONTROL.

4. CONCLUSION

4.1 The industry is proactively addressing the pressing need for adaptation and resilience, and ACI will continue to raise awareness, promote climate change risk assessments, and support the implementation of risk-based adaptation and resilience measures. In this context, State support is key, to enhance awareness, build technical expertise, ensure financial resources and improve coordination across stakeholders. Strengthening the quality, availability, and use of climate and hazard data is also essential, as robust data underpins accurate risk assessments and informed decision-making.

4.2 ICAO and its Regional offices play an important role in supporting industry initiatives, ensuring efficient dissemination of documents and best practices, and encouraging States and Regions to strengthen support for airports' adaptation and resilience. This must take into account that there is no one-size-fits-all solution, as airports face diverse local circumstances and capabilities.

4.3 [ACI's WP/53 – Consideration of Climate Change in Aerodrome Standard Setting](#) to the 14th Air Navigation Conference, supported by the Conference, highlighted that potential climate change impacts should be taken into account when developing future ICAO provisions, while “careful consideration should be given to retroactive actions towards existing aircraft requirements and aerodrome infrastructure”. Priority should be placed on embedding adaptation and resilience in new construction projects, without imposing retroactive changes that could affect existing aerodrome infrastructure.

4.4 Collaborating with other UN or international organizations, including the World Meteorological Organization, the Sand and Dust Coalition, UN Tourism, CDRI, and funds (e.g., Global Environment Facility (GEF), Green Climate Fund) will enable a coordinated and efficient action globally.

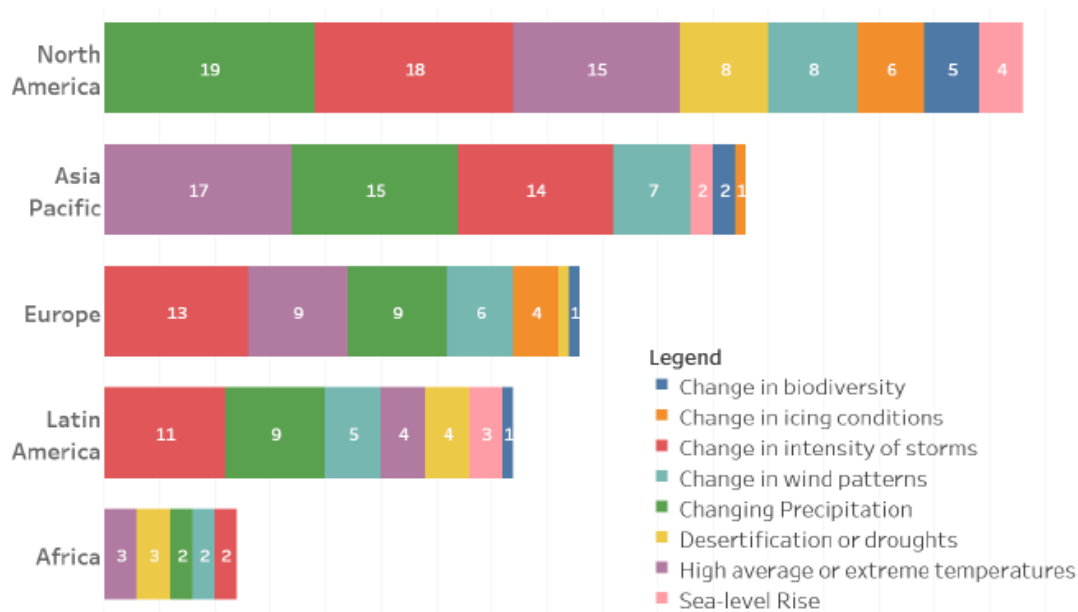
APPENDIX A

Key outcomes of ACI Climate Change Resilience and Adaptation Survey Report

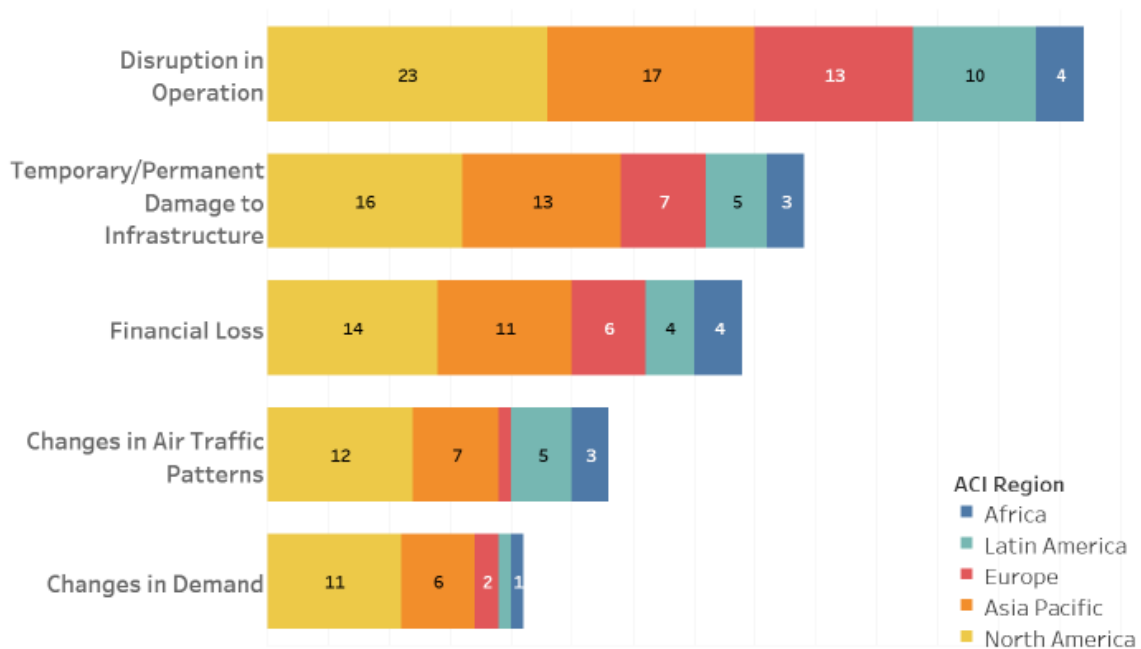
This appendix aims at providing key findings from the 2019 ACI survey on climate change resilience and adaptation, showing that all regions are impacted by adverse weather events and describing the type of impact on their functioning. Given that the results date from 2019, it should be noted that impacts have increased since then, as indicated by more recent studies, including the updated CAEP Climate Adaptation Synthesis, which is yet to be published.

A.1. Impacted by adverse weather events, patterns and conditions

By region, then split by impact type within each region



A.1.2. The impact of adverse weather (multiple answers)



APPENDIX B

Examples of airports' adaptation and resilience initiatives

This appendix aims at providing few examples of airports' adaptation and resilience initiatives in different regions for information. This table is not exhaustive. This summary is a preview based on the Case Studies developed by the Coalition for Disaster Resilient Infrastructure (CDRI), which will be published by the end of 2025.

Regions	Country	Airport	Climate event	Initiatives
Europe	Netherlands	Schiphol (AMS)	Pluvial Flooding	Water Vision 2030: climate adaptation strategy, flood protection measures, sustainable airport operations and adaptive airport city planning. Green roofs, innovative water storage, new standards for drainage, and water-permeable surfacing.
			Fog	Implementation of Low Visibility Procedures during foggy conditions.
			Extreme Heat	Temperature tracking sensors on the runways; identification of hotspots and water spraying.
	Italy	Venice Airport (VCE)	Windstorm	Operating procedures to secure ramp vehicles and equipment, local extreme weather forecast models, messaging alert systems for all airport operators.
			Rainstorm	Upgrading of weather water drainage systems, redesign and redevelopment of the collection and weather water treatment system, emergency pumping and drainage systems.
			Heatwaves	Water dispensers for apron operators, distribution of salts and supplements, clothing review, and provision of air-conditioned and equipped rooms for rest and breaks.
		Milan Malpensa and Linate Airports (MXP/LIN)	General	Climate Change Adaptation Plan for MXP and LIN, based on local Climate Change Model IPCC scenarios (RCP4.5, RCP8.5) 2040-2060. Further energy efficiency actions and updating of the sizing criteria for the drainage networks of new infrastructures.

Regions	Country	Airport	Climate event	Initiatives
			Rainstorm	Re-MXP CEF Project to improve the stormwater drainage system and implement a Smart Monitoring System (SMS) for continuous monitoring of the water drainage network. LIN: River Lambro training and bank stabilization in the section adjacent to Linate airport and update of hydraulic studies on the surface water drainage system. Definition of an operating procedure for the management of the Lambro flood risk.
			Heatwaves	Update of the Pavement Resurfacing Standards for flight infrastructures (increased heat resistance).
North America	United States	Los Angeles (LAX)	Wildfires	Fire-resistant landscaping; enhanced fire detection systems; infrastructure protection; flight diversions and ground delays; travel waivers; coordination with firefighting efforts; passenger advisories; air quality monitoring.
Africa	France – La Reunion	La Réunion Roland Garros (RUN)	Coastal Erosion Sea-level Rise	Coastal protection project; coastal protection structure construction.
Latin America and the Caribbean	Jamaica	Sangster International Airport (MBJ)	High temperatures Water scarcity Sea-level rise	Runway extension; drainage improvements; water management; well water processing.
	Peru	Jorge Chavez International Airport (JCIA)	Fluvial Flooding Sea-level rise	Installation of containment barriers; pumping equipment; technical hydrogeological studies; subsurface drainage system; annual maintenance program; emergency response team.
Asia Pacific and Middle East	Japan	Kansai International Airport (KIX)	Water fluctuations Typhoon	Water barriers building; flood simulation tool; circle tool; mitigation plan; cost-effective adaptation measures.
			Earthquake Tsunami	Business continuity plan; regular earthquake and tsunami drills; anti-earthquake reinforcement for viaducts; trainings; crisis management team; new evacuation routes and guidance procedures.

Regions	Country	Airport	Climate event	Initiatives
	Saudi Arabia	King Abdulaziz International Airport (JED)	Desertification and Drought	Weather monitoring systems; regular assessments of airport infrastructure; sustainable water management (e.g. water-saving technologies); drought-resistant landscaping; green building standards; Saudi Green initiative.

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