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**THE RESILIENCE OF THE ITALIAN AIRPORT SYSTEM
IN RELATION TO CLIMATE CHANGE**

(Presented by Italy)

EXECUTIVE SUMMARY

The COVID-19 pandemic was an important lesson for the airport system, highlighting the need to respond promptly to crises to avoid serious human and economic consequences. Resilience must remain a top priority for airports, especially in the face of climate change, which can cause disruptions, safety risks, and infrastructure damage.

The Italian Civil Aviation Authority has launched several strategic initiatives and pilot projects to address environmental risks, including technological innovation for flood and landslide management, protection of water resources and biodiversity, and measures to mitigate hydrogeological risks.

Operational procedures have also been developed to manage critical events, reduce risks, and ensure continuity of airport operations. Monitoring activities ensure that resilience levels evolve in line with the airport system and its stakeholders.

<i>Strategic Goals:</i>	This information paper relates to the Strategic Goal – <i>Aviation is Environmentally Sustainable</i> .
<i>Financial implications:</i>	-----
<i>References:</i>	Annex 14 – <i>Aerodromes</i> EUROCONTROL Challenges of growth 2013 ISO 14091:2021 Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment.

1. INTRODUCTION

1.1 Climate change influences the future of critical infrastructures due to a variety of factors, including rising temperatures and sea level, heavy precipitation, and an increase in the frequency of extreme weather events. To prevent interruptions and guarantee long-term resilience of airport systems is essential to address the impact of climate change on critical infrastructures.

1.2 Climate change poses different risks to infrastructures, demanding strategic planning, investment and adaptation efforts.

1.3 Airports are particularly subjected to weather-related disruptive occurrences whose frequency and severity have been amplified by climate change.

2. BACKGROUND

2.1 Since airports are complex infrastructures composed of many interrelated systems, they are becoming more vulnerable to the effects of climate change. This condition exposes airports to significant risks for their operations, safety, economic sustainability, and long-term resilience.

2.2 Therefore, in 2017 the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD - founded in 2015 on the initiative of the Financial Stability Board, provides 11 recommendations divided into four pillars: governance, strategy, risk management, and metrics and targets, to enable organizations to be transparent with their stakeholders about the risks associated with climate change) classified climate-related risks for enterprises in two major categories: risks related to the transition to a lower-carbon economy, and risks related to the physical impacts of climate change, whose severity can be classified as acute or chronic.

2.3 Acute physical risks are those that are caused by specific events, such as an increase in the frequency and intensity of extreme weather events like hurricanes, floods, or cyclones. Chronic risks represent longer-term changes in climate patterns, such as persistently high temperatures that could lead to sea level rise or recurring heatwaves.

2.4 TCFD acknowledged that risks associated with climate change could have a substantial financial impact on the balance sheet due to changes in assets and liabilities and rising pressure on capital and financing, as well as on the income statement due to reduced revenues and increased expenses.

2.5 Recent occurrences, such as the 2024 floods in Spain and the heavy rainfalls in Fortaleza at the beginning of the current year, pointed out the urgent need to accelerate the response of the aviation industry to this specific issue.

2.6 Considering this context, the Italian CAA has developed an integrated resilience strategy to enhance airport infrastructure and operations against pandemics and climate-related risks.

3. NATIONAL REGULATORY FRAMEWORK

3.1 The need to address climate change risks for infrastructures in a systematic and comprehensive way has been highlighted by the most important international organizations, including

several United Nations (UN) agencies, the Organization for Economic Cooperation and Development (OECD) and the European Union (EU).

3.2 Since 2013, the International Civil Aviation Organization (ICAO) has discussed in its tri-annual Environmental Report the need of addressing adaptation to climate change in the aviation industry, and has suggested several adaptation actions, building on the work of EUROCONTROL “Challenges of growth 2013”. In a subsequent report issued in 2021, EUROCONTROL has published the results of a study organized in five work packages addressing several aspects of climate change effects on the European aviation industry, including from short-term weather impacts, changes in storm patterns and intensity, sea level rise, tourism attractiveness and wind patterns.

3.3 ICAO published its first Climate Adaptation Synthesis Report in 2018, to synthesize “...existing information on the range of projected climate impacts on the aviation sector to better understand risks to airports, air navigation service providers (ANSPs), airlines, and other aviation infrastructure.” Building on this work, in 2022 ICAO published three interconnected documents to provide more detailed guidance to airports, aircraft operators and navigation system providers, under the umbrella report “Climate change: Climate Risk Assessment, Adaptation and Resilience”.

3.4 UNI EN ISO 14091:2021 is a standard that adopts ISO 14091:2021 “Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment.” and provides guidelines for assessing risks related to the impacts of climate change. Specifically, it offers tools to understand organizational vulnerability, to develop and implement a robust risk assessment, and to plan for climate change adaptation.

4. DISCUSSION

4.1 The Italian CAA, in pursuit of its mission, has introduced the concept of transformative resilience into its strategic tools, a notion that fits well within the context of air transport and, in particular, to airports. With this vision, the concept of resilience is understood not only as the ability to adapt to sudden changes in external conditions but also as a reconsideration of policies for the management and development of airport infrastructure.

4.2 Therefore, the Italian CAA asks aerodrome operators to adopt an open-minded approach to the design and construction of airport facilities, going beyond the minimum regulatory compliance levels regarding environmental sustainability, and undertaking a broad rethinking of typically proposed design choices, in a sustainable and resilient sense.

4.3 The Italian CAA has identified some starting points for implementing various interventions aimed at increasing sustainability and resilience, such as the upgrading of infrastructures to enable airline operators to use alternative fuels, the introduction of energy audits of airport infrastructure as a first step toward sustainable development and encouraging the use of digital models to achieve a positive impact in every aspect of airport reality.

4.4 The aerodrome operator Aeroporti di Roma (ADR), under a concession agreement with the Italian CAA, manages the Capital airport system which consists of two separate airports: "Leonardo Da Vinci" in Rome-Fiumicino (FCO), one of the main European airports in terms of number of passengers, benefiting from a large area of traffic attraction on the national territory and high degree of connectivity with the main European and international destinations and "G.B. Pastine" in Rome-Ciampino (CIA).

4.5 Under the supervision and oversight of the Italian CAA, Aeroporti di Roma developed a long-term strategy to implement innovative solutions that can improve both the resilience of airport infrastructures and processes. The Company has developed a comprehensive Climate Change Risk Analysis methodology, aligned with international best practices, such as ICAO guidelines and ISO 14091:2021

4.6 The primary focus is now on the physical risks, considering the scenario of the Copernicus Climate Data Store that foresees an average increase of global temperature around 2.7°C by the end of the century (rif. Chronic risks par 2.3).

4.7 The analysis process begins with a thorough screening of relevant climate hazards, using the classifications defined in the EU Taxonomy, which includes a list of hazards related to temperature, wind, water and solid mass. This is followed by the identification of critical airport assets - such as runways, taxiways, aprons, and drainage systems - and an evaluation of their exposure, sensitivity, and capacity to adapt. A dynamic risk modelling phase then assesses how these assets might be affected under different climate scenarios and time horizons, considering the possible implementation of mitigation measures.

4.8 The measures identified for the mitigation of the main physical risks related to climate change for Fiumicino and Ciampino airports have been grouped in 4 main categories, as follows:

- Design: developing measures to integrate design requirements to respond to evolving climate conditions (e.g., adoption of new design standards for the new constructions and the refurbishment of existing assets).
- Monitoring: implementing strategies for integrating/developing control/monitoring models of the evolution of the climatic phenomena to support the definition of future mitigation actions (e.g., increased use of simulation models in the field of hydraulics and air conditioning).
- Maintenance measures: defining measures to strengthen current maintenance activities of assets (e.g., increase of the frequency of scheduled maintenance and monitoring activities, introduction of new monitoring methodologies).
- Equipment: identifying solutions to improve asset resilience by introducing more climate-resilient materials and systems (e.g., solar farms, insulating and permeable materials).

5. CONCLUSION

5.1 Climate change represents a growing challenge for European Airports, requiring the aviation industry to innovate and adapt to reduce its environmental footprint and to find new operational and infrastructural solutions to address the impacts of climate change, including rising temperatures, extreme weather events, and shifting patterns of precipitation.

5.2 In response, airports are making sustainability a top priority by putting policies in place like green infrastructure, energy-efficient technology, and integration of renewable energy. These efforts aim to minimize emissions, enhance resilience to climate risks, and align with broader European climate goals. As the aviation industry seeks to navigate the complexities of climate change, European airports are evolving to become key players in mitigating environmental impacts while ensuring the continuity and safety of air travel.