

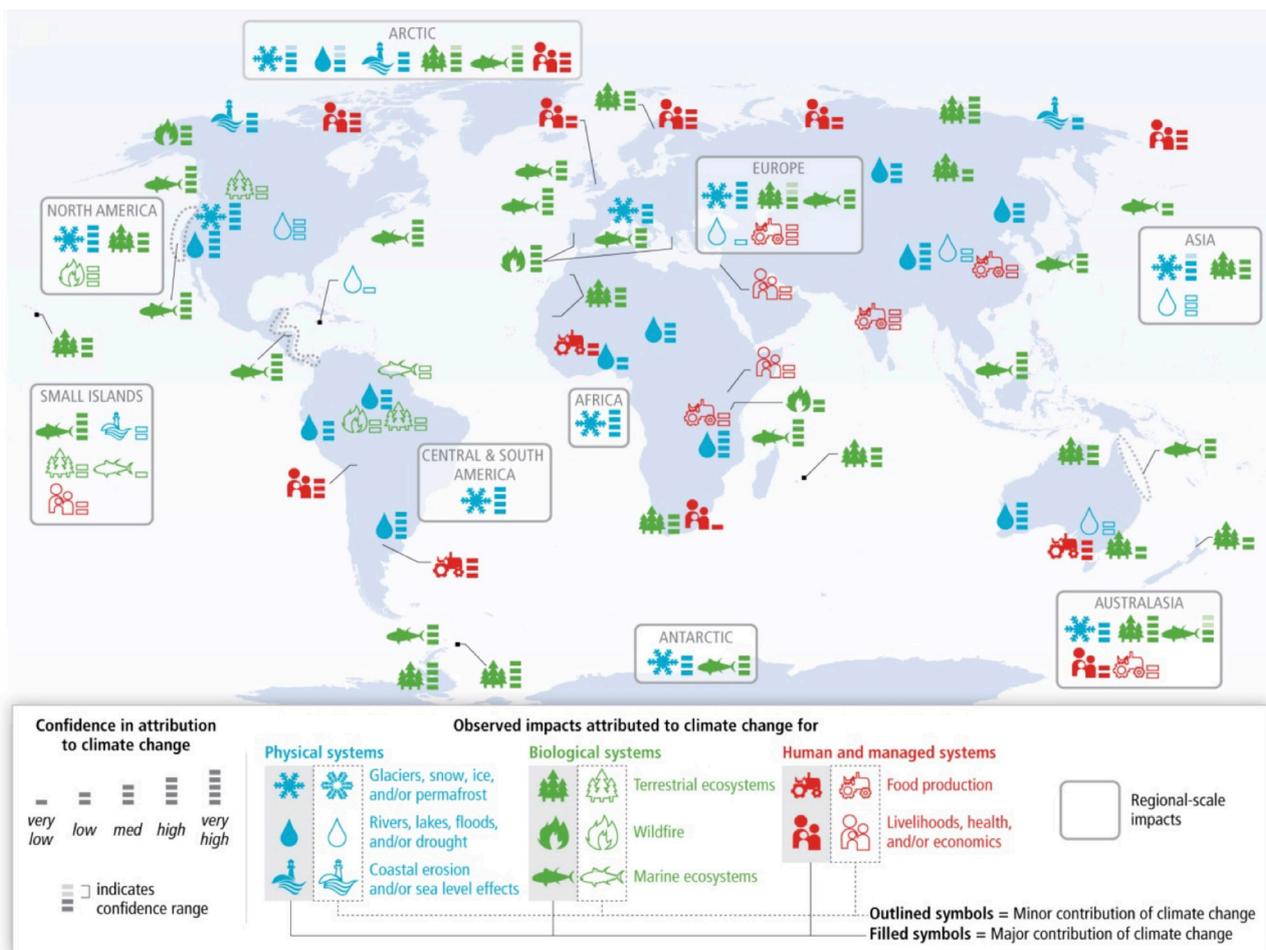
# CLIMATE ADAPTATION AND RESILIENCE IN INTERNATIONAL AVIATION

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Since the 2013 edition of the ICAO Environmental Report, the question of how to adapt to climate change has become prevalent within international organizations, governments and business. The landmark Paris Agreement adopted in December 2015 formulates a long-term goal of keeping the increase in global average temperature to well below 2°C above pre-industrial levels. It also aims to strengthen societies' ability to deal with the impacts of climate change.

Indeed, following the last scientific findings from the IPCC, greenhouse gases released in the atmosphere since the beginning of the industrial area are already warming the planet, inducing climate impacts. These impacts are different depending on the world regions and affect physical, biological and human systems at local level (**Figure 1**), forcing societies to develop tailor-made adaptation strategies.

As far as international aviation is concerned, the understanding of climate change impacts has reached different levels of maturity, depending on whether the impacts are to the physical infrastructure (e.g. airport buildings, apron, control tower, energy grid), ground operations or wether en-route operations are considered. However, predictions on the magnitude of sea-level rise by 2100 imply that the infrastructure of the world largest international airports could be affected, thus putting international aviation services at risk. This chapter provides an overview of these impacts, while highlighting the need for further research on the local effects of climate change on aircraft and airport operations (see articles page 205 and page 208).



**Figure 1.** Global pattern of observed climate change impacts (source: IPCC Working Group I, 5th Assessment Report, Summary for Policymakers)

## Climate Adaptation and ICAO

During the last triennium, ICAO initiated research activities on the impacts of climate adaptation on international aviation at the request of its Member States. The ICAO Committee on Aviation Environmental Protection (CAEP) Impact and Science Group reviewed the projected impacts of climate change on aviation and research was carried out to better understand the possible effects of climate change on air navigation services over the North Atlantic. In 2016, it was decided that as part of its work programme, CAEP would conduct the necessary research and get an understanding of the environmental impacts of climate adaptation. Any other issues identified during the process would be directed to the relevant ICAO panels.

In addition, mindful of the need to develop aviation-specific guidance on climate adaptation during airport planning, ICAO has included a new Chapter on Climate Adaptation and resilience in the ICAO Airport planning Manual, Part 2 (Doc 9184). For the first time, climate change impacts were included in airport planning considerations, alongside with aircraft noise, which have historically been the main environmental concern around airports. Therefore, the updated ICAO Airport Planning Manual, Part 2 is considered as the first building block of a wider climate adaptation synthesis to be conducted by the ICAO Committee on Aviation Environmental Protection.

Although the scientific basis driving climate adaptation strategies should continuously be refined and updated to ensure that action is timely and heads in the right direction, the observation of severe impacts has already led operational stakeholders and governments to take initial steps towards better preparedness, designing a pathway for climate change adaptation in aviation. Brisbane Airport in Australia and the network of airports operated by Avinor in Norway illustrate possible such initial adaptation actions (see articles page 211 and page 214).

The experience gained by States, airport operators, ANSPs and aircraft operators multiplies the opportunities to exchange good practices on adaptation and enhance cooperation. ICAO can play a role in proposing a common approach to risk assessment and possible practical solutions.

## Financing

The implementation of these solutions is bound to resource availability. A global study conducted by the World Bank and released in 2008 estimated that between 2010 and 2050, the cost of adapting to an approximately 2 degree Celsius warmer world by 2050 would be in the range of USD 70 billion to USD 100 billion a year<sup>1</sup>. In 2014, the United Nations Environmental Programme (UNEP) provided a revised estimate of these costs in its *Adaptation Gap Report*<sup>2</sup>, based on new national and sector-specific studies. According to this study, the costs of adaptation for Least Developed Countries would approximate USD 50 billion per year by 2025/2030 and could reach US\$100 billion per year by 2050. This poses the question of adaptation financing, as the *Adaptation Gap Report* also highlights that Least Developed Countries and Small Island Developing States are likely to have far greater adaptation needs than developed countries.

While adaptation measures in aviation may rank from low-resource options (e.g. training and raising awareness) to resource-intensive ones (e.g. relocation of airport), some vulnerable States need external financing to implement their adaptation strategies. International multilateral funds, bilateral funds and private capitals are available to facilitate access to adaptation financing, should it be through development funds or funds targeting support activities to climate adaptation. The organizations below provide funding to climate adaptation programme development and implementation (**Table 1**).

Fund	Purpose	Administered by
<b>Pilot Programme for Climate Resilience</b>	It aims to integrate climate resilience into States' development strategies and to support the implementation of their plans.	Climate Investment Funds
<b>Least Developed Countries Fund</b>	It finances the development and implementation of the National Adaptation Plan Actions (NAPAs).	Global Environmental Facility
<b>Special Climate Change Fund</b>	Finances projects relating to: adaptation; technology transfer and capacity building; energy, transport, industry, agriculture, forestry and waste management; and economic diversification.	Global Environmental Facility
<b>Adaptation Fund</b>	Finances concrete adaptation projects and programmes in developing countries and in countries that are particularly vulnerable to the adverse effects of climate change.	Adaptation Fund Board
<b>Green Climate Fund</b>	It funds low-emission and climate-resilient projects in developing countries, through the mobilization of financial resources from advanced economies.	UNFCCC
<b>Global Climate Change Alliance+</b>	Acts as a platform for dialogue and exchange of experience and provides technical and financial support to increase developing countries' capacity to adapt to the effects of climate change	European Commission

**Table 1.** Funding Sources for Climate Adaptation Projects in Developing Countries

## CHAPTER 7

### CLIMATE CHANGE ADAPTATION AND RESILIENCE

#### The Way Forward

It is noteworthy that early responses to climate risks are more cost-effective than *ex post* remediation actions. Integration of climate adaptation considerations into existing aviation infrastructure development plans should be systematically considered, with a view to designing and building an adaptive aviation system. Resources are scarce and therefore, the priorities and timing for action need to be refined with more in-depth research of the impacts of climate change on aviation. This is exactly what ICAO is pursuing through CAEP.

ICAO's role is to support States in this endeavor in providing concrete guidance to the States that need it most.

The inclusion of a new chapter on Climate Adaptation in the ICAO Doc 9184 *Airport Planning Manual, Part 2* is an effective vehicle for disseminating information and for raising awareness on possible risk-assessment and adaptation actions amongst airport planners and developers (see article page 60).

While adaptation strategies will have to be integrated into all aspects of States' economic and social development plans, the most effective approach to limit the costs of adaptation is to limit climate change, through comprehensive mitigation actions. ICAO is committed to pursuing the implementation of its basket of mitigation measures, with a view to achieving global aspirational goals for CO<sub>2</sub> emissions.

Showing leadership on both fronts supports the United Nations Sustainable Development Goals, and contributes to a more resilient planet in a manner that fosters the socio-economic development of the most vulnerable communities.

#### Sustainable Development Goals



#### References

1. Economics of Adaptation to Climate Change: synthesis report, the World Bank, 2008
2. UNEP 2014. The Adaptation Gap Report 2014. United Nations Environment Programme (UNEP), Nairobi