

# Climate adaptation and its impacts in aviation infrastructure planning

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**Your safety is our mission.**

# Introduction

- Preliminary information on adaptation
- Adaptation at the infrastructure level
- Adaptation at the airport level: challenges and barriers

# Statement from WMO-aeronautical

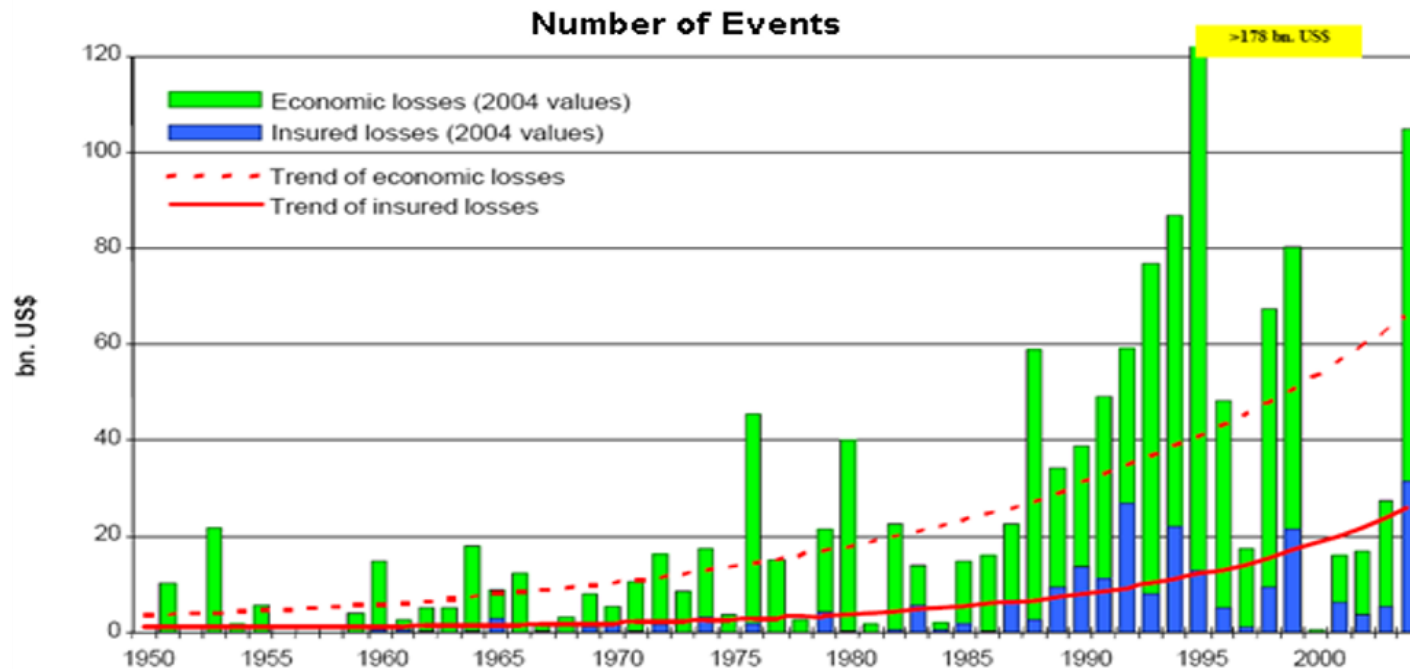
“A changing climate scenario may render some of today's aerodrome, airspace and airframe design and operation standards inadequate in the years or decades to come. Using past climatological records alone as an indicator of future climate at an airport, say, may be insufficient given the (current) rate at which the world's climate is changing (warming).”



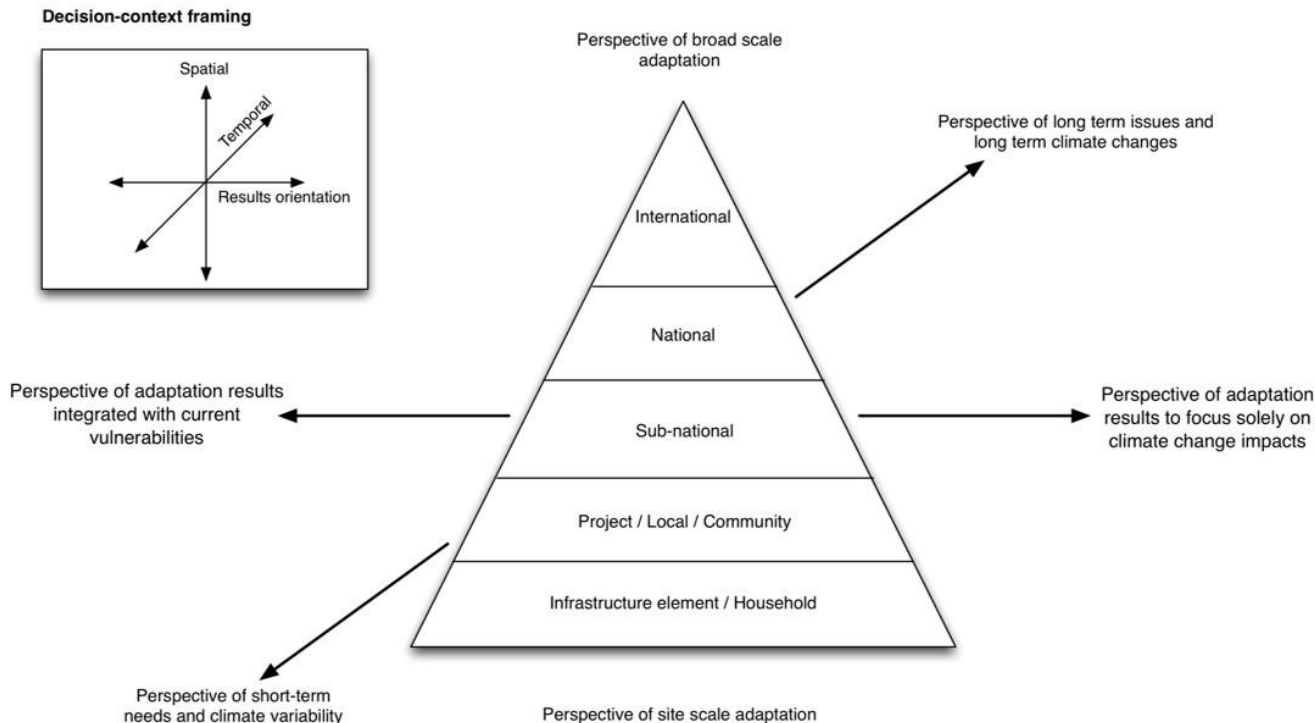
**World  
Meteorological  
Organization**

# The costs linked to non-adaptation

## Great Natural Disasters 1950-2004



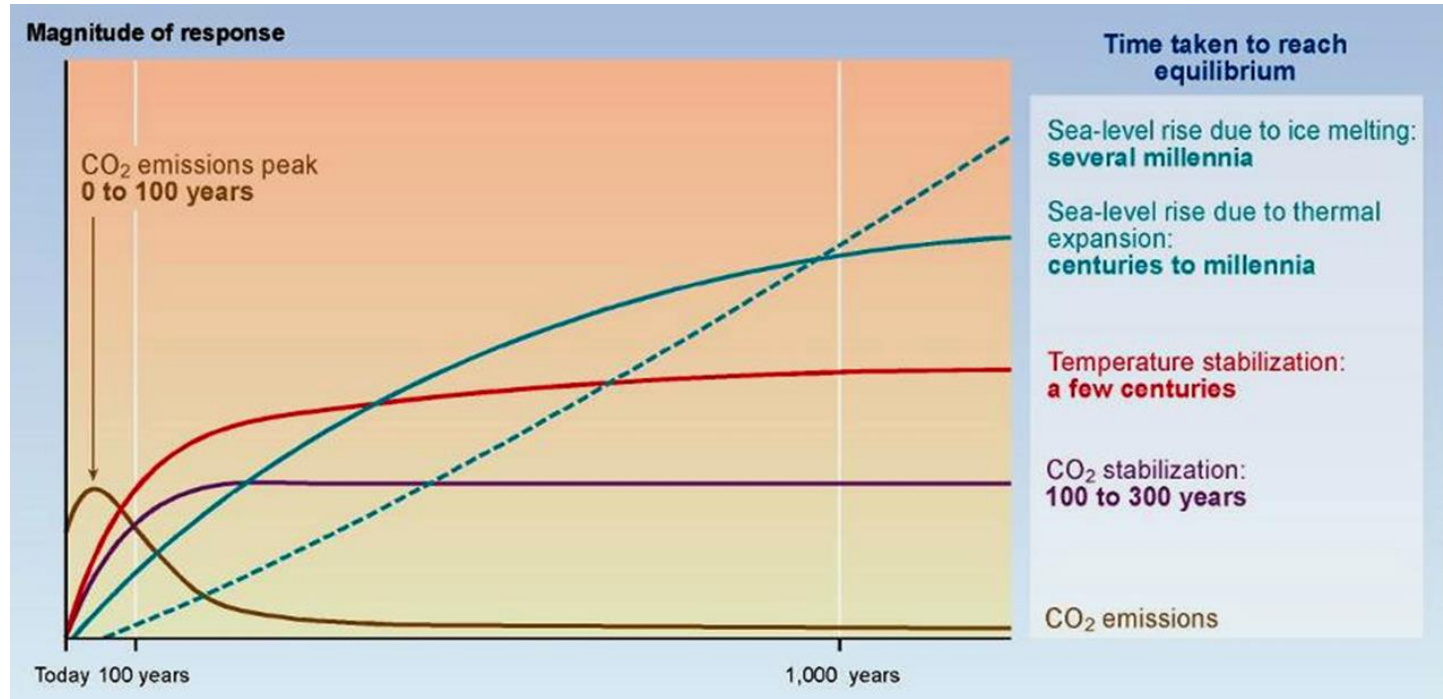
# To tackle adaptation you have to frame it...



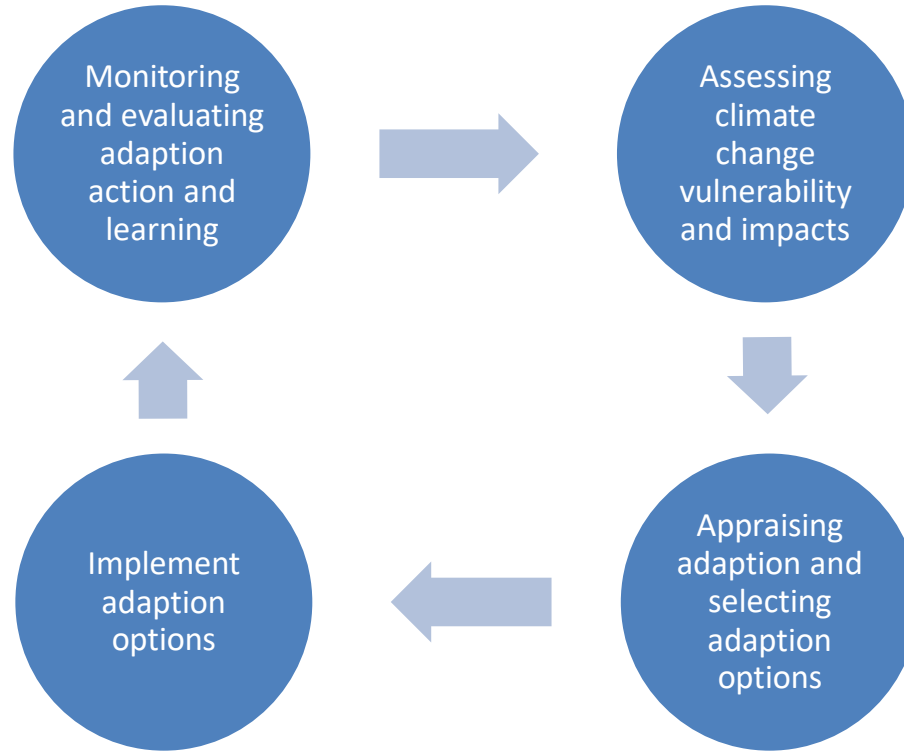
# Translation of the previous slide into words

- You have to work together
- All stakeholders need to be involved
- A plan shall be agreed and designed asap
- The plan shall include climate vulnerability matrix
- The plan shall include how to tackle with disaster risk

# To tackle adaptation you have to plan... long lasting planning



# Adaptation as a life cycle process





# Adaptation is a reality to cope with

Climate change is already something to deal with, something we can not ignore. Therefore, adaptation allow anticipating and reducing threats, potential damages and disruption.



# Adaptation is a reality to cope with

Moreover, according to the “**EU smart, sustainable and inclusive growth strategy**” awareness of climate risks, including systematic analysis of these effects into the preparation and design projects can assure sustainability of projects.

In line with the Europe 2020 strategy, adaptation will bring the EU towards a low-carbon and climate resilient economy promoting sustainable growth and stimulating climate resilient investments.

# Adaptation is a reality to cope with

In addition, the cost of investing in the design phase will be much lower than the costs of inaction over the medium and long term.

That is particularly relevant for the infrastructure level where extreme weather damages, high maintenance costs and severe operation disruptions might be amongst the effects of failing to adapt.

# EU position on adaptation

The EU Strategy on adaptation to climate change adopted by the European Commission in April 2013 sets out a framework and mechanisms for taking the EU's preparedness for current and future climate impacts to a new level



# Objectives of the EU adaptation strategy

- **Promoting action by member states:** The Commission encourages all MSs to adopt comprehensive adaptation strategies, providing guidance and funds to help them building their adaptation capacities and take actions
- **Promoting better informed decision-making:** by addressing gaps in knowledge about adaptation and further developing the Climate Adapt
- **Promoting adaptation in key vulnerable sectors:** through cohesion policy, ensuring that Europe's infrastructure is made more resilient and encouraging the use of insurance against natural and man-made disasters

# European Climate Adaptation Platform

The screenshot shows the homepage of the European Climate Adaptation Platform (CLIMATE-ADAPT). The header features the European Union flag and the text "CLIMATE-ADAPT European Climate Adaptation Platform". Navigation links include "Sign in", "Glossary", "Contact", "Services", "Legislation", and "About". A search bar is located in the top right corner.

The main navigation bar includes links for "Home", "Adaptation information", "EU sector policies", "Countries and other areas", "Tools", "Links", and "Search the database".

The central content area is titled "Climate Change Adaptation in Europe". It includes a description: "The European Climate Adaptation Platform (CLIMATE-ADAPT) aims to support Europe in adapting to climate change. It is an initiative of the European Commission and helps users to access and share information on:"

- Expected climate change in Europe
- Current and future vulnerability of regions and sectors
- National and transnational adaptation strategies
- Adaptation case studies and potential adaptation options
- Tools that support adaptation planning

There are several interactive elements and links:

- Adaptation Support Tool:** A circular diagram with numbers 1-6, labeled "New to adaptation? Use the Adaptation Support Tool".
- Map of Europe:** A map titled "What are European countries doing?" with a "Choose your country" dropdown and a "GO" button.
- Search the database:** A search bar with a magnifying glass icon.
- Find case studies on adaptation in Europe:** A map of Europe with location pins.
- Share your information:** A diagram showing a central box with lines connecting to several people icons.

The footer contains four sections: "News", "Events", "EU sector policies" (with a sub-link for "Agriculture & Forestry"), and "EU information systems" (with a sub-link for "WISE Water").

# Adaptation at the infrastructure level

New infrastructure projects are built on decadal scales. It is critical to their lifespan that adaptation options be developed and implemented as soon as possible so that the infrastructure can cope with the expected climate changes.

Some options can be described as “**no regrets**” actions, defined as those actions where society would benefit from their implementation even if anthropogenic climate change did not take place (IPCC, 2001).

# Examples of no regret actions

These “no regrets” types of adaptation actions include measures to reduce and make redundant uncertainties in climatic design values and to update calculations, enforcement of engineering codes and standards, maintenance of the quality and length of climate change records and networks, consistent forensic analyses of infrastructure failures, regular maintenance of existing infrastructure and community disaster management planning. In other cases, the impacts of the future climate will lie outside of existing experience and the coping ranges of infrastructure. In these situations, adaptation options will need to be developed or learned over time through organized analyses of failures (adaptation learning). At the same time, all hazards approaches to disaster planning will need to become more widely adopted and rigorous.



# Infrastructure lifecycle timeframes examples

Structure	Phase	Typical expected lifecycle
Road	Maintenance	Yearly
	Resurface	5-10 years
	Reconstruction/Major Upgrade	20-30 years
Rail	Major refurbishment	10-20 years
	Reconstruction/Major Upgrade	50-100 years
Airports	Major refurbishment	10-20 years
	Reconstruction/Major Upgrade	50 years
Seaports	Major refurbishment	10-20 years
	Reconstruction/Major Upgrade	50-100 years

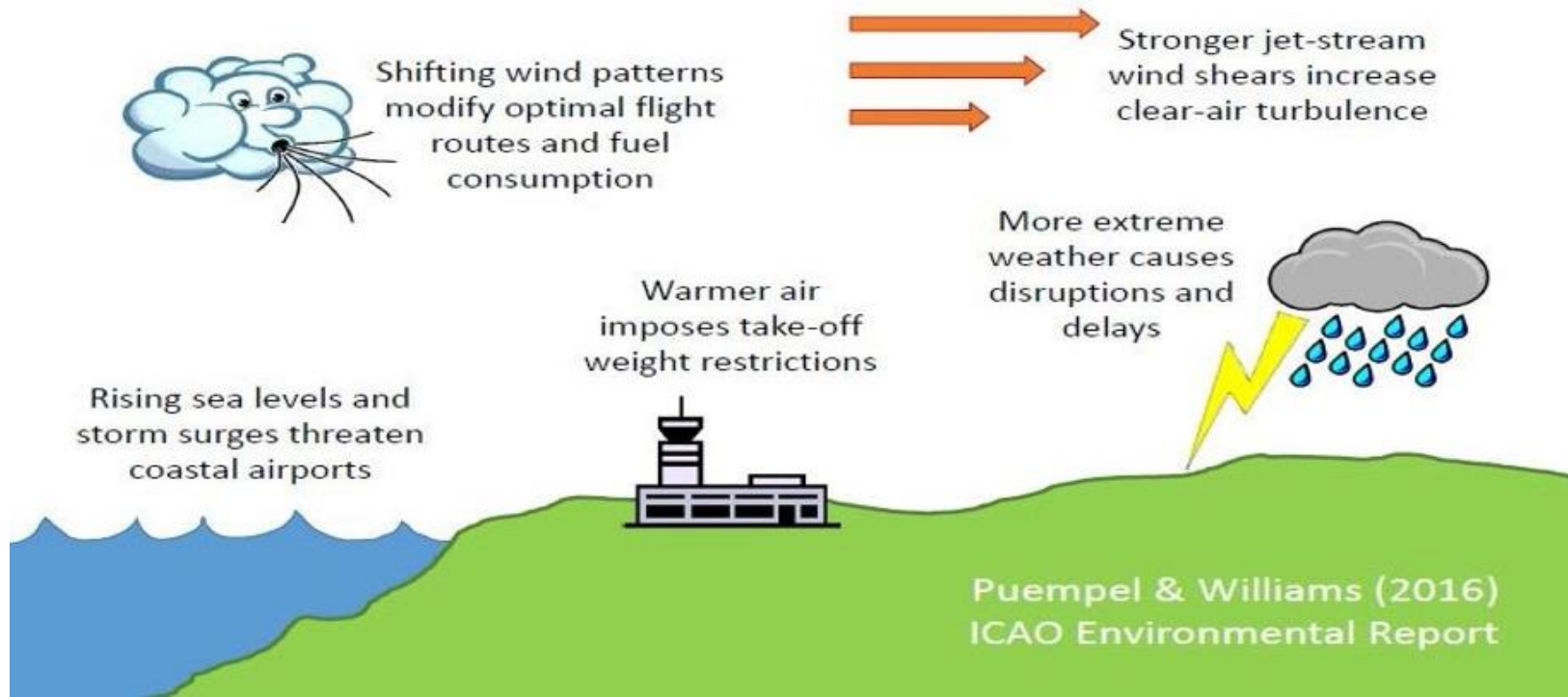
# Approach to be used to tackle adaptation

The many implications of the changing climate will require a structured approach for the reinforcement and retrofit of existing infrastructure, in planning for redundancy of critical infrastructure and in updating climatic design values and infrastructure codes and standards. Underlying these activities will be an ongoing need for careful monitoring of regional climate conditions to update priorities. This prioritization process will need to account for the variable lifecycles of structures and replacement cycles, including maintenance and upgrade cycles.

# Adaptation at the airport level

- Airports are affected by climate change and just like other transport sub-sectors Airports must put up measures to combat it.
- Airports are classified as nationally critical infrastructure as they facilitate both mobility and economic growth.
- Due to their fixed infrastructure and vulnerability to disruptive weather, they are particularly at risk from the potential consequences of climate change, with impacts such as sea levels rising, higher temperatures and greater weather extremes creating both an operational and business risk.

# Climate change impacts on aviation



# Examples of potential climate impacts at the airport level

→ Higher temperatures can have physical impacts on infrastructure.

For example, extreme summer temperatures may exceed design standards leading to heat damage on the surfaces, and runways or aprons can experience surfaces melting during peak heat periods.

This implies high costs due to the repairs of cracked pavements, caused by increased temperatures and moisture compositions.

# Examples of potential climate impacts at the airport level

## → Rise of sea-level

This is a problem that strongly affects the ASEAN region where most of the airports are located in proximity to the sea.

This will lead to loss of airport capacity, impacts on en-route capacity due to lack of ground capacity, loss of ground transport access.

BUT this will affect your national income as this will touch the flow of tourists coming in your country.

# Examples of potential climate impacts at the airport level

## → Extreme weather events

This will lead to disruption of operations, disruption to ground transport access, disruption of supply of utilities.

This will impact your national income as this will affect the flow of tourists coming in your country.

# Infrastructure vulnerability risk assessment

Impact parameter	Vulnerability	Adaption
Precipitation	Reduction in sight	Early warning systems
	Flood damage	Barriers
Wind	Sea-level rise	Routine maintenance
	Disconnection	Anchoring
Humidity	Collapse	Portable pumps
	Rupture of equipment	Insulation
Temperature	Insulation damage	Equipment replacement
	Operational delay	Extra air conditioning

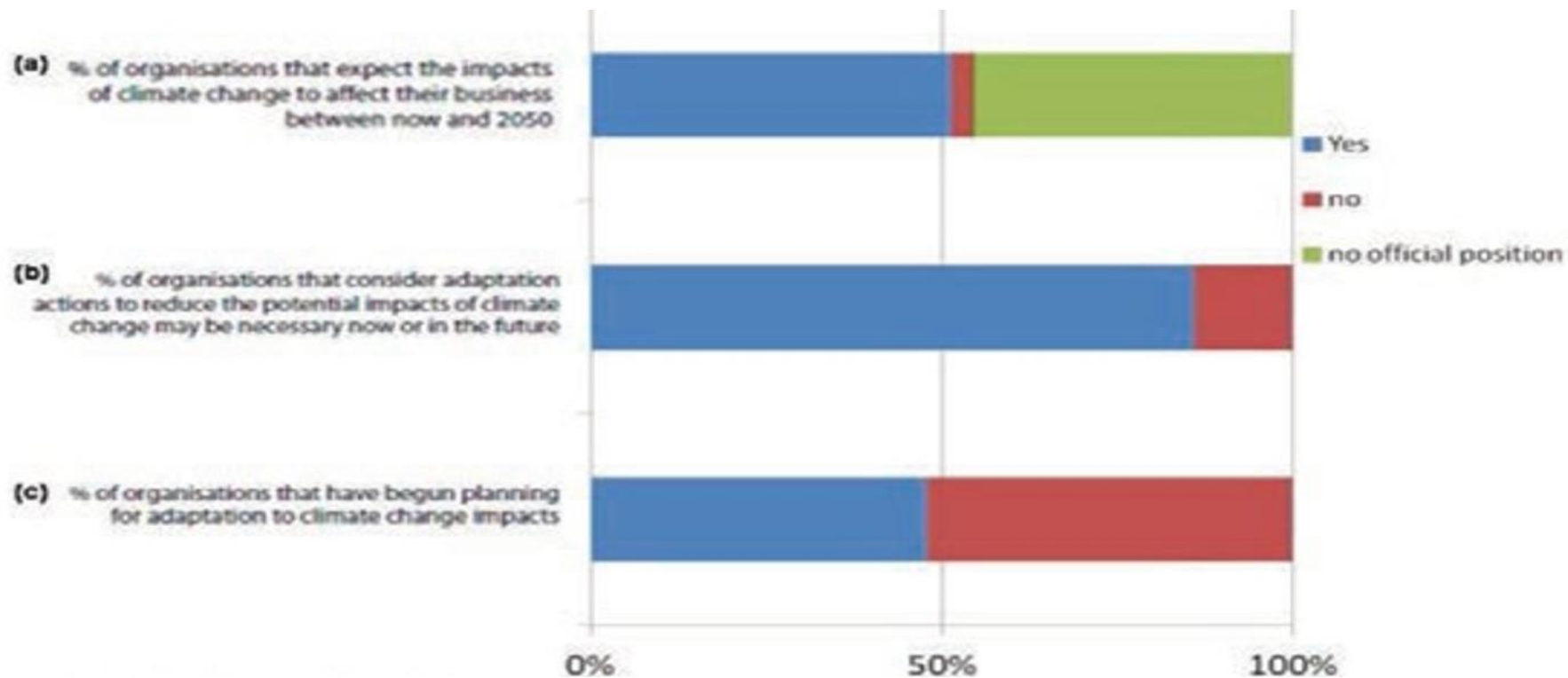


# Adaptation readiness in Europe

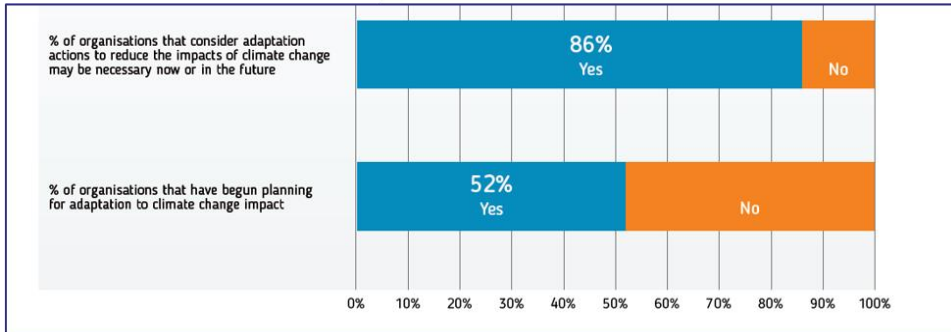
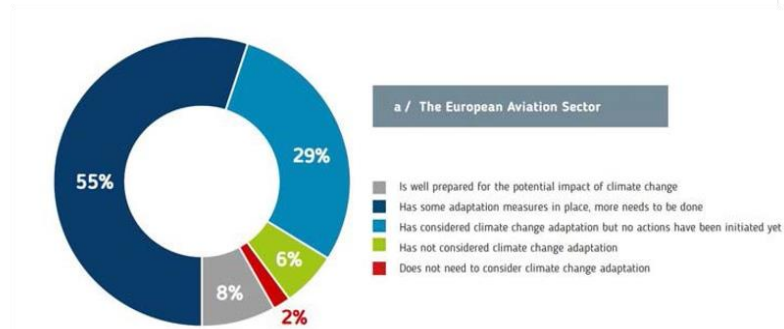
In 2013 Eurocontrol carried out a consultation of European aviation stakeholders as part of its Challenges of Growth 2013 work.

The survey was sent to approximately 100 European aviation operational stakeholders. 35 valid responses were received, mainly from ANSPs and airport operators.

The survey identified that over 80% of respondents consider that resilience measures to adapt to climate change will be necessary now or in the future. However, just under half of respondents replied that their organization does not yet have an official position and less than half of the organizations that responded had begun planning for adaptation to climate change.



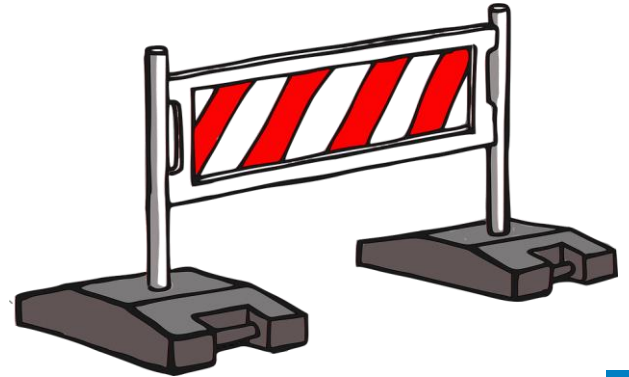
# Challenges of Growth 2018



# What are the obstacles of adaptation at infrastructure level?

Moser and Ekstrom (2010) describe barriers to adaptation as:

“obstacles that can be overcome with **concerted effort, creative management, change of thinking, prioritization**, and related shifts in resources, land uses, institutions, etc.”



# Cooperation between stakeholders



ATM



# Barriers to adaptation at the aviation level

As applied to aviation sector, the survey from EUROCONTROL demonstrates that the challenges are mainly 2:

- 1) Lack of information or guidance** as a result of which an organization either doesn't know how to take appropriate action or doesn't know if they have to act;
- 2) Barriers at the organizational level** whereby the lack of an official position prevents action, the resources are not available for adaptation measures, or the organization has decided it does not need to take action at this stage.

# So adaptation is a continuous work: how?

- **Addressing the drivers of vulnerability:** Activities seek to reduce climatic and other non-climatic stressors that make people and infrastructure vulnerable.
- **Building response capacity:** Activities seek to build robust systems for problem solving.
- **Managing climate risks:** Activities seek to incorporate climate information into decision-making.
- **Confronting climate change:** Activities seek to address impacts associated exclusively with climate change.

# What has Eurocontrol suggested?

Eurocontrol identified four consensus key priorities for action to develop climate change resilience for the European, and global, aviation sector.





# Eurocontrol's suggestions

1. Understanding the problems
  - Identify vulnerabilities to current and future climate risks;
2. Assess the problem and its magnitude
  - Build resilience to current climate risks;
3. Action to adapt
  - Take action to address future climate risks;
  - Build adaptive capacity integrating adaptation into routine management;
4. Communicate and collaborate
  - Inclusion of the adaptation process into the routine operation of the organization

# How the others are acting?

## **Resolution 3/2018 on resilience and adaptation to climate change:**

In June 2018 in Brussels, ACI members adopted a resolution recognizing the potential impact of climate change on airport infrastructure and operations, and encouraging member airports to conduct risk assessments, develop mitigation measures and communication channels, and take climate resilience and adaptation into consideration for their master plans.

# Conclusions (1)

Transport sector **and the aviation sector in particular** will be strongly affected by climate adaptation in the following years.

Therefore, **special considerations and particular attention should be dedicated to this topic in all the next feasibility studies and designs** dealing with aviation infrastructure as characterized by a long life span and high costs which need to withstand the current and future impacts of climate change.

Most of all, adaptation should be regarded as a matter of **good practice** which implies considering all risks that are posed to the current assets, project and programs, and consequently increasing the infrastructure's resilience by taking into account climate change impacts in its design, management, standards, operation and planning phases.

# Conclusions (2)

Soft adaptation options, in terms of common sense should be always considered:

- **Maintenance:** in terms of including adaptive measures into the scheduled maintenance of the infrastructure;
- **Reporting and communication:** Revision of the standards reporting structure to include climate impacts;
- **Culture of risks and uncertainty:** Definitions of risks and uncertainty guidelines. What can be deemed acceptable, and what risk will require prompt action?
- **Socio-economic changes:** Will climatic impacts affect the socio-economic conditions, changing circumstances?
- **Monitoring:** The state of the infrastructure provides data concerning the need of adaptation. Who monitor? How often? How data are shared?

**THANK  
YOU**

Thank you for your attention!