



ICAO

ENVIRONMENT

ICAO SEMINAR ON  
**GREEN AIRPORTS**

# Adapting Airports to a Changing Climate

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# Aviation is used to disruptive weather – but if it's going to get worse?

(a)



(b)



**KEEP  
CALM  
AND  
TAKE  
ACTION**

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# Climate impacts at airports



## **Flooding and sea-level rise:**

Inundation of runways and taxiways  
Loss of ground transport access  
Inundation of electrical infrastructure

## **Increased convective weather:**

Increased delay / loss of capacity  
Lack of capacity at diversionary airports

## **Increased precipitation:**

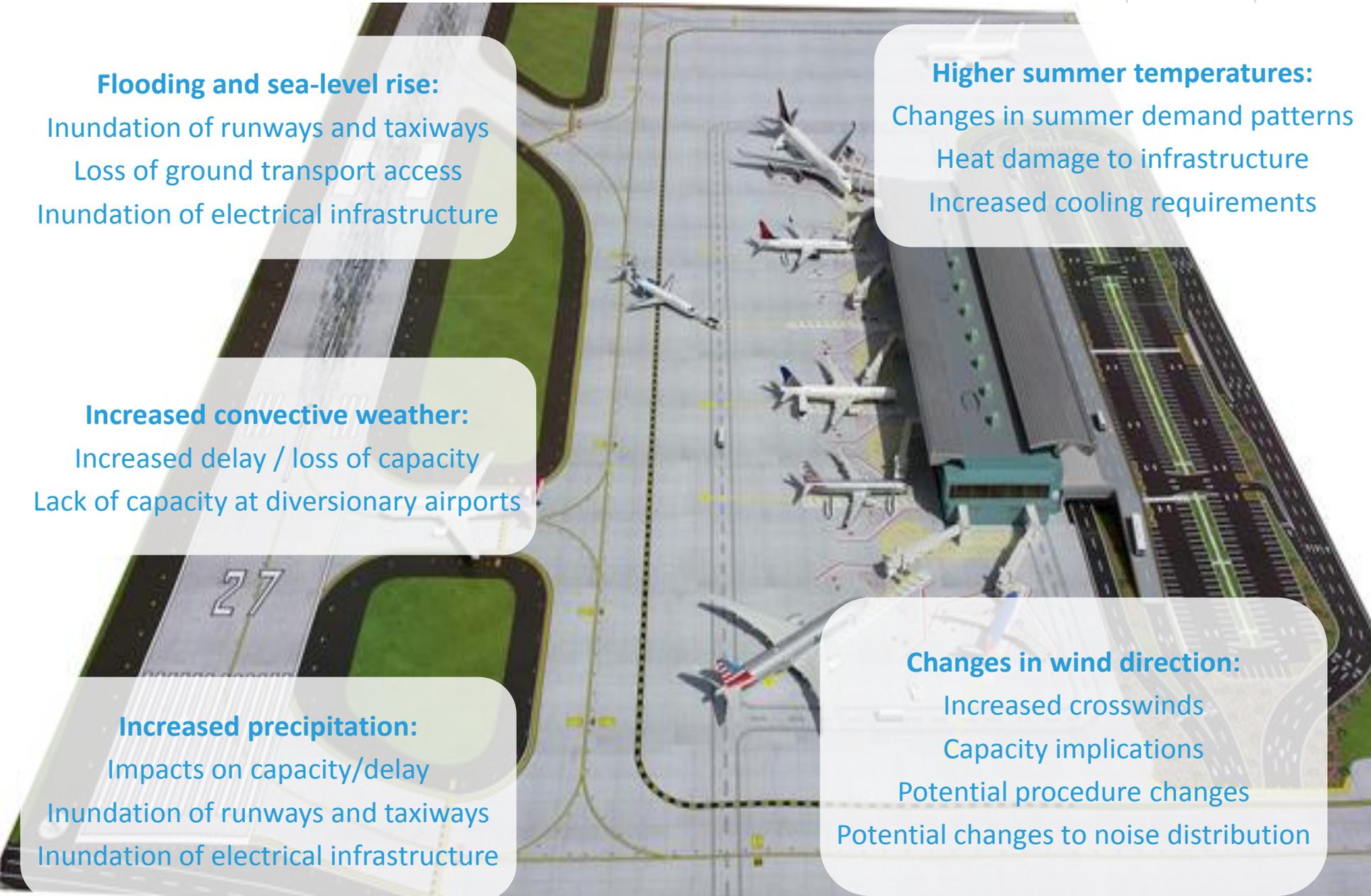
Impacts on capacity/delay  
Inundation of runways and taxiways  
Inundation of electrical infrastructure

## **Higher summer temperatures:**

Changes in summer demand patterns  
Heat damage to infrastructure  
Increased cooling requirements

## **Changes in wind direction:**

Increased crosswinds  
Capacity implications  
Potential procedure changes  
Potential changes to noise distribution



## Summary of Passenger Traffic Forecasts by Region of Airline Registration

(Scheduled Services)

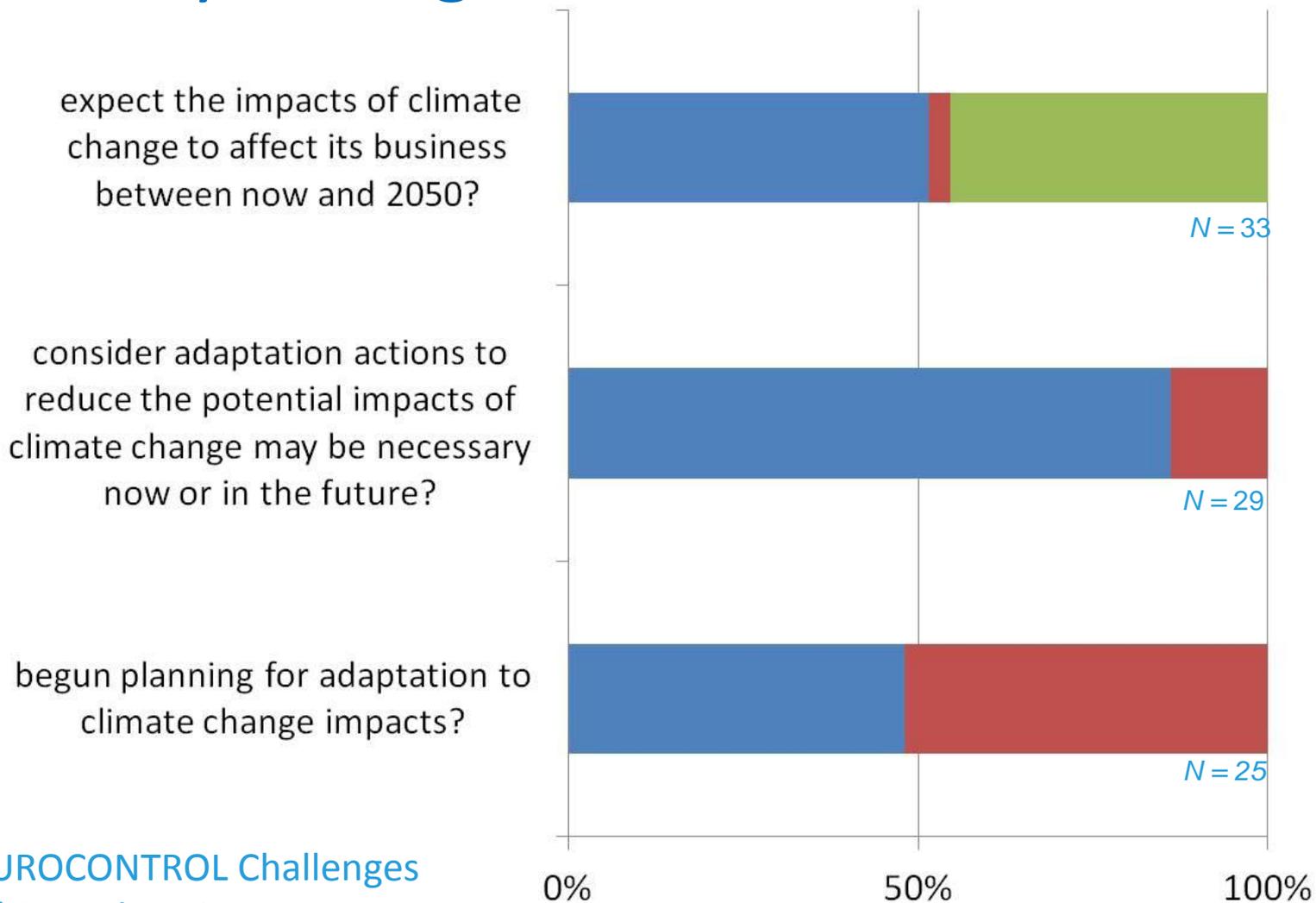
Passenger traffic results in terms of RPKs

Region	Flight Stage	AAGR		worldwide distribution	
		1995–2010	2011–2030	2010	2030
Europe	<i>Total</i>	5.4%	3.4%	27%	22%
	<i>International</i>	6.3%	3.4%	38%	31%
	<i>Domestic</i>	2.0%	2.8%	8%	6%
Africa	<i>Total</i>	5.7%	4.1%	2%	2%
	<i>International</i>	6.1%	4.0%	3%	3%
	<i>Domestic</i>	3.3%	4.7%	1%	1%
Middle East	<i>Total</i>	11.6%	7.6%	7%	13%
	<i>International</i>	12.4%	7.6%	11%	19%
	<i>Domestic</i>	4.2%	7.7%	1%	2%
Asia/Pacific	<i>Total</i>	6.2%	6.2%	29%	38%
	<i>International</i>	5.1%	5.8%	28%	31%
	<i>Domestic</i>	8.2%	6.6%	32%	49%
North America	<i>Total</i>	2.8%	2.3%	29%	19%
	<i>International</i>	3.6%	2.8%	16%	11%
	<i>Domestic</i>	2.8%	2.1%	52%	33%
Latin America and the Caribbean	<i>Total</i>	4.8%	6.1%	5%	6%
	<i>International</i>	2.9%	5.6%	4%	4%
	<i>Domestic</i>	6.3%	6.5%	6%	9%
<b>WORLD</b>	<b>Total scheduled</b>	<b>5.0%</b>	<b>4.6%</b>	<b>100%</b>	<b>100%</b>
	<i>International</i>	5.7%	4.8%	100%	100%
	<i>Domestic</i>	3.9%	4.4%	100%	100%

Global Air Transport Outlook to 2030

# Growth and adaptation: a GLOBAL challenge

## Does your organisation.....





# Adapting Aviation to a Changing Climate

## What does it tell us?

- What are the key risks for aviation?
- How can you assess whether climate change is a risk for your organisation?
- What are other organisations doing (case-studies)
- Where can you get further information (resource list)
- Website with additional information [www.eurocontrol.int/resilience](http://www.eurocontrol.int/resilience)

### Climate risk

**Case Study: Avinor - wetter and wilder**  
Preparing for more water at Norwegian airports

Most of Avinor's airports are scattered along the coastline, with several having runways less than 4m wide. In general, expected, I runways, phase of apron, for need of 1990s, discover the floor. Heathrow's the airport low in the cant term date and the UK

**Case Study: I**  
As a result of di well as changin the impact of c implement in resilience to H whereby und separations; Wind is a ke

A comprehen systems and In general, expected, I runways, phase of apron, for need of 1990s, discover the floor. Heathrow's the airport low in the cant term date and the UK

**Extreme events?**

### Aviation Climate Adaptation Resource List

A selection of resources for climate change risk analysis and adaptation planning. See the website [www.eurocontrol.int/resilience](http://www.eurocontrol.int/resilience) for further resources and full document references.

**Resources on Climate Impacts for Aviation**

**Airport Cooperative Research Programme Synthesis: Airport Climate Adaptation and Resilience**  
[http://onlinepubs.trb.org/onlinepubs/acrp/acrp\\_syn\\_073.pdf](http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_073.pdf)  
Comprehensive review of the range of risks to airports from projected climate change and the emerging approaches for handling these risks.

**EEA Adaptation in Europe** <http://www.eea.europa.eu/publications/adaptation-in-europe>  
Provides policymakers across Europe, at different levels of governance and stages of policy formulation, with information that can be used to support adaptation planning and implementation.

**EEA/EionET: Adaptation to Climate Change in the Transport Sector** [http://cca.eionet.europa.eu/reports/TP\\_3-2013](http://cca.eionet.europa.eu/reports/TP_3-2013)  
Maps current actions in EEA countries for adapting the transport system to climate change and identifies opportunities for further action at the European level in the next years.

**EU Adaptation Strategy Package – Adapting Infrastructure to Climate Change**  
[http://ec.europa.eu/clima/policies/adaptation/what/docs/swd\\_2013\\_137\\_en.pdf](http://ec.europa.eu/clima/policies/adaptation/what/docs/swd_2013_137_en.pdf)  
Annex 1 provides an overview of climate risks and impacts for transport infrastructure, including aviation.

**EUROCONTROL Challenges of Growth 2013: Climate Change Risk and Resilience**  
<http://www.eurocontrol.int/articles/challenges-growth>  
Reviews climate change risks out to 2050 and identifies key actions which the industry can take to reduce those risks.

**EUROCONTROL Challenges of Growth 2008: Challenges of Growth Environmental Update Study and Climate Adaptation Case Studies** <http://www.eurocontrol.int/articles/challenges-growth>  
Analysis of climate change risks for the aviation sector. Case studies take an in-depth look at the potential impacts of sea-level rise, increased convective weather and climate change-related changes in demand.

**European Climate Adaptation Platform "Climate-Adapt"** <http://climate-adapt.eea.europa.eu/>  
Support in adapting to climate change. Access and sharing of information on expected climate change in Europe, vulnerability of regions and sectors, National and transnational adaptation strategies, adaptation case studies and potential adaptation options tools that support adaptation planning.

**ICAO Environment Report 2013 Chapter 7: Adaptation**  
<http://www.icao.int/environmental-protection/Pages/EnvReport13.aspx>  
Series of articles on the possible adverse effects which aviation activity may experience as a result of climate change and the adaptation measures which the sector can implement.

**Resources on Risk Assessment for Aviation**

**DGAC Airport vulnerability on climate change**  
<http://www.stac-aviation-civile.gouv.fr/publications/documents/vulclim-rit-A4-en.pdf>  
Overview of climate change risk assessment methodology for airports developed by DGAC France.

**Heathrow Airport Climate Change Adaptation Reporting Power Report**  
<http://archive.defra.gov.uk/environment/climate/documents/adapt-reports/08aviation/heathrow-airport.pdf>  
Overview of climate change risk assessment carried out by Heathrow Airport Ltd.

**NATS UK Climate Change Adaptation Report**  
<http://archive.defra.gov.uk/environment/climate/documents/adapt-reports/08aviation/nats-climate-change-report.pdf>  
Overview of climate change risk assessment carried out by the UK ANSP National Air Traffic Services (NATS).

**Working Group for the Analysis of the Climate Change Adaptation Needs of the Core Network of Transport Infrastructure in Spain. Final Report.**  
<http://www.csdes.es/IR/rdon/lync:977032c9-00f8-40f4-bfa3-63c0083e8dfe/1122814/ACCITFinalReportSeptember2013.pdf>  
Report on analysis of needs to adapt the core network of transport infrastructure in Spain to climate change, including the core aviation network of 46 airports and two heliports.

# Risk assessment: where to start?

Do you know how the climate will change in your area?

Can your drainage system handle any projected increase in rainfall?

Do you know how much it will cost to implement the climate adaptation measures you need?

Will local climatic changes increase or decrease tourism demand in your region?

Can your cooling system handle any projected increase in temperature?

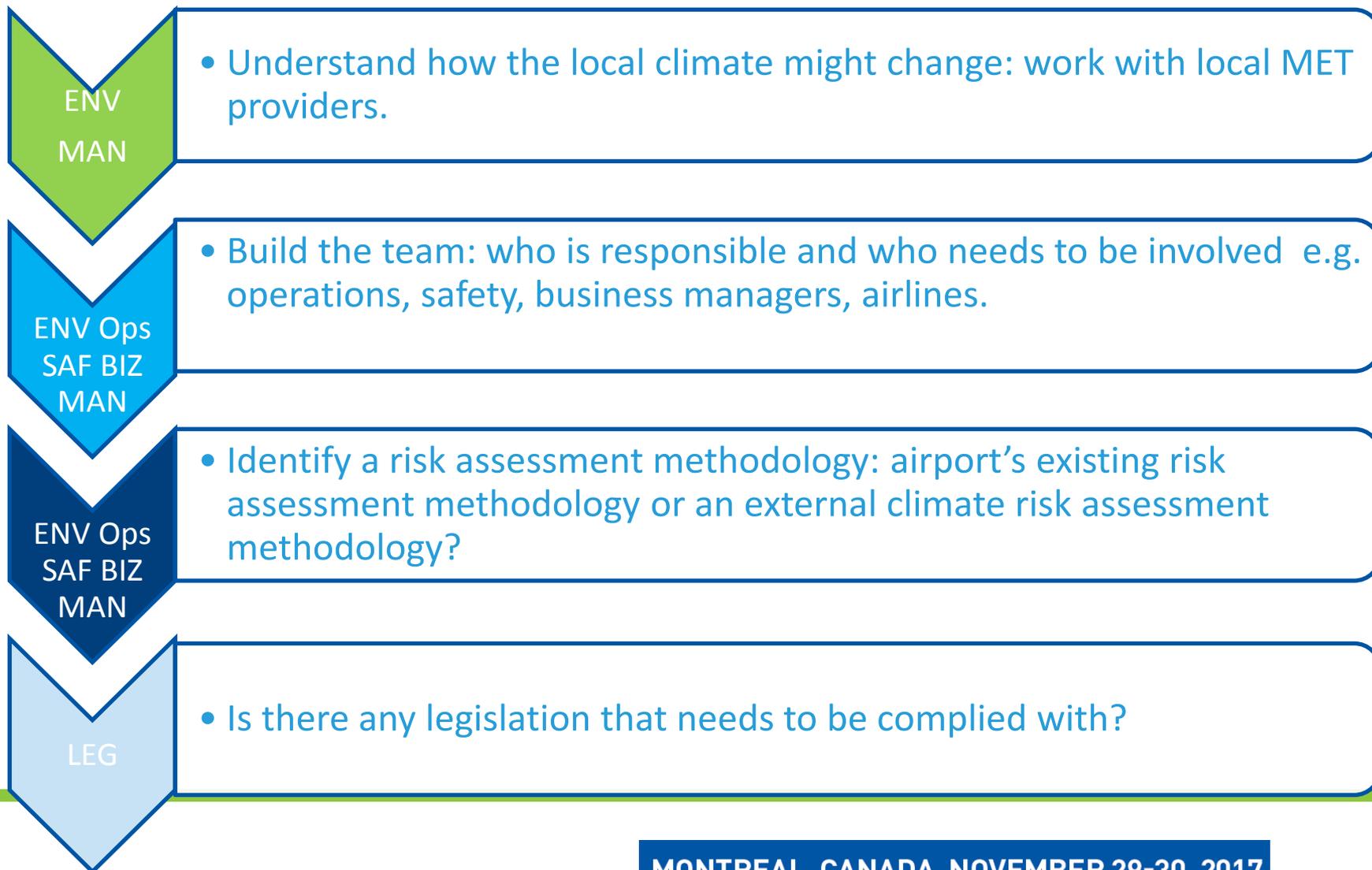
Can your electricity supply and critical systems (e.g. IT) be maintained in more frequent and extreme disruptive weather?

Can ground access to the airport be guaranteed in case of increased precipitation (rain or snow)?

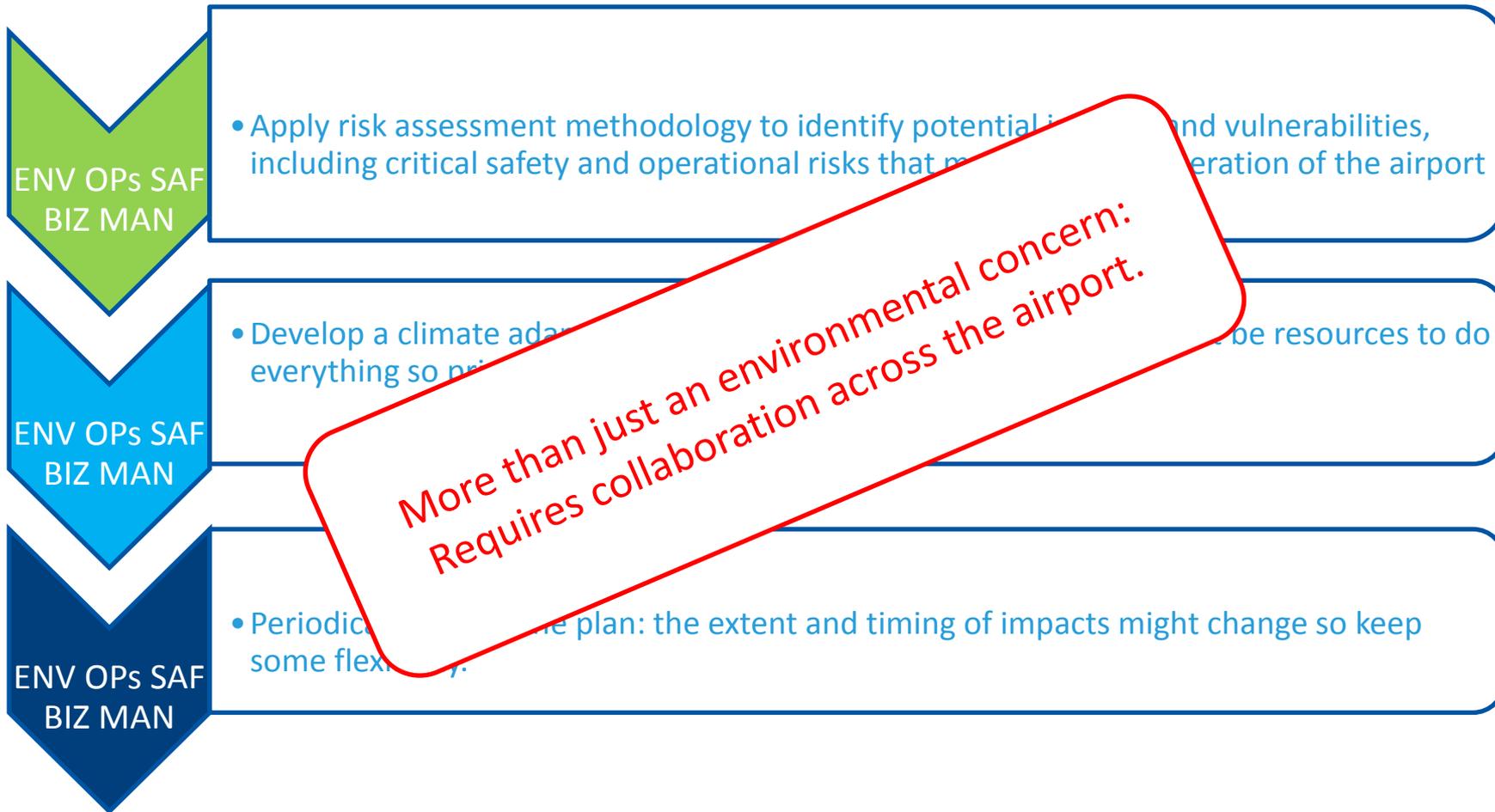
Who is responsible for climate change adaptation within your organisation?



# Risk assessment: building collaboration



# Risk assessment: getting into detail



# If you've seen one airport...

Q: Are you at risk from sea-level rise?

A: Can you allow some inundation? Can you build defences? Do you need to relocate?

Q: Are you expecting an increase in disruption?

A: Do you have adequate MET forecasts? Do you have systems to manage demand? Operational measures to increase capacity? Do you have resilient systems?

Q: Are you expecting an increase in extreme weather events?

A: Is your drainage system adequate? Do you have contingency plans? Do you keep your ground transport links open?

Q: Are you expecting an increase in intensity and frequency of storms?

A: Is your contingency plan sufficient? Is your infrastructure reinforced?

Q: Are you expecting an increase in temperatures?

A: Are your surface materials adequate? Will demand change?

*But – people and collaboration are key!*

## Different airports: different solutions...



## Global challenge: global action

ISG

- Knowledge on impacts from a science perspective
- Knowledge on risk and resilience

WG2

- Update to airport planning manual
- New task for CAEP/11: Climate Adaptation Synthesis Report

And?

- Limit global network vulnerability
- Awareness raising/best practice: learn from each other

# Adapting airports to a changing climate: what do we need to do?

## What we need to do:

- Identify risks and vulnerabilities: global, regional, local
- Risk assessment is a good place to start
- Implementation of local and network resilience measures
- Build resilience into *current* infrastructure and operations planning: routine part of operational and business planning
- Balance resilience, costs and criticality
- “No-regrets” and “soft” measures (e.g. training) are cost-effective

***Preemptive action can be cost-effective – but don't act in haste!***

## And what next?

- Global industry = global perspective
- Uncertainties remain: what else do we need to know?
- Quantification of risks into operational impacts
- Communication and collaboration

**• Keep on mitigating!**

***Information and awareness-raising is key***



