

ICAO Green Airports 2019

Climate Adaptation and Resilience – The Process

May 8-9, 2019 Lima, Perú

John A. Lengel Jr, P.E. ENV SP
Vice President

RS&H



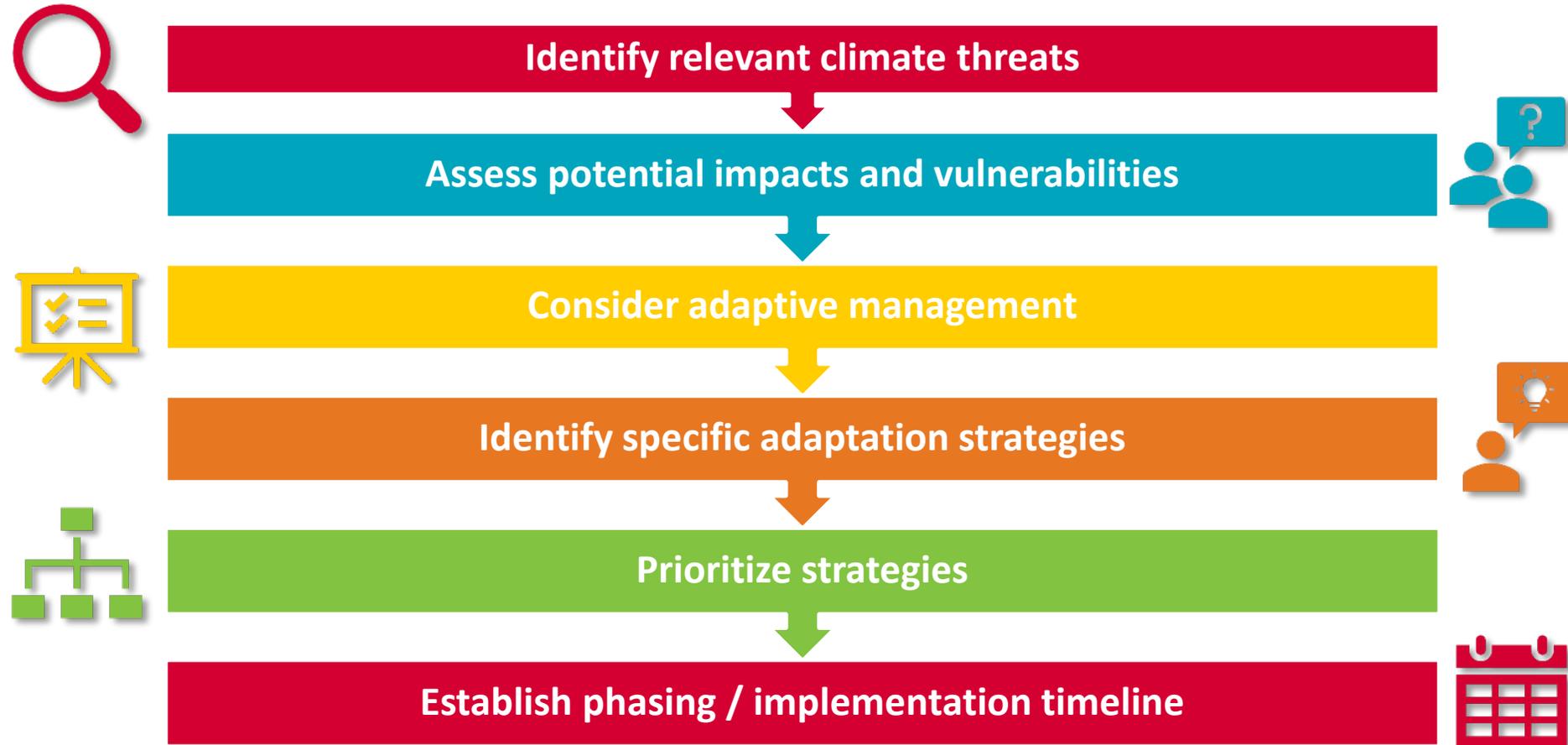
Adaptation and Resilience: The Process



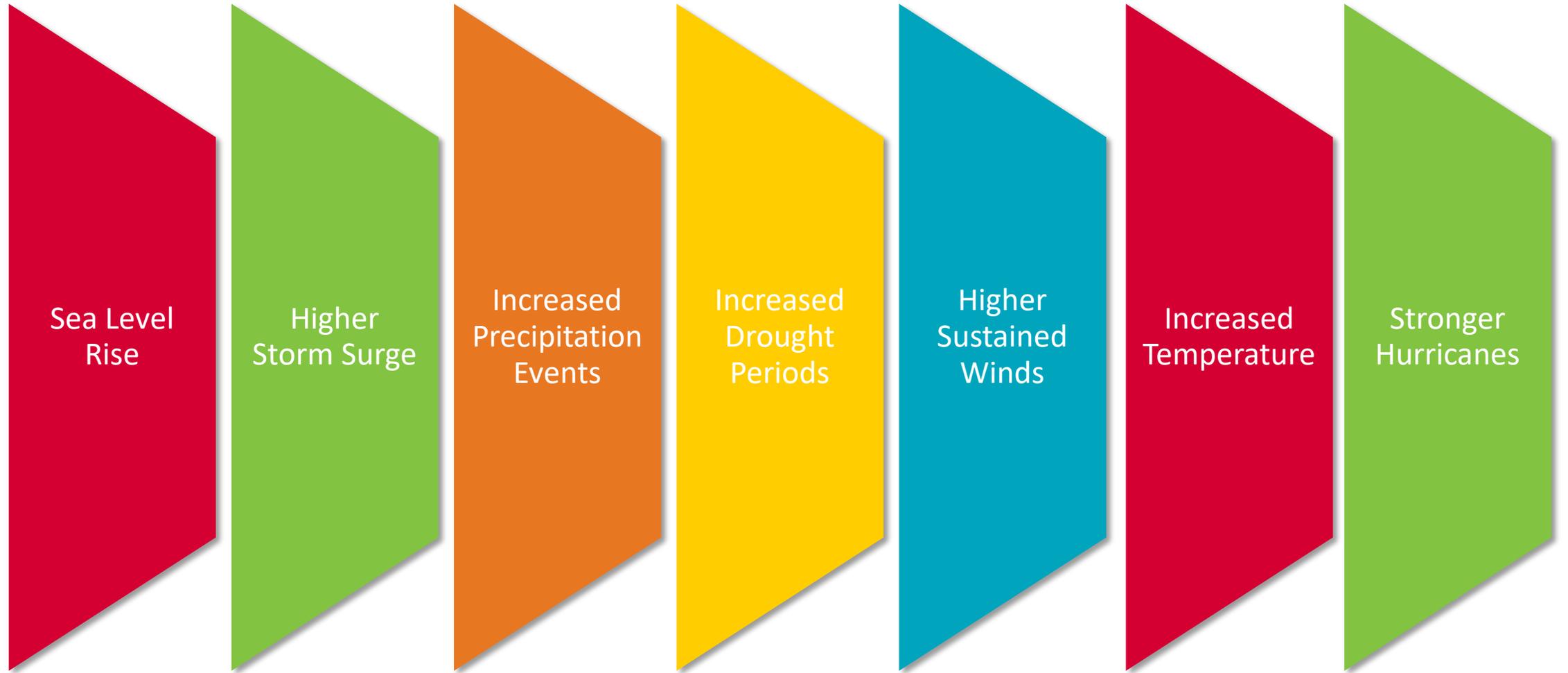
Topics

OVERVIEW OF ASSESSMENT PROCESS
POTENTIAL CLIMATE THREATS
POTENTIAL IMPACTS AND VULNERABILITIES
ADAPTIVE MANAGEMENT CONSIDERATIONS
IDENTIFICATION OF STRATEGIES

Climate Resiliency Assessment Process



Potential Climate Threats



Potential Impacts and Vulnerabilities

Potential Airfield Vulnerabilities

Loss of Pavement Integrity

Reduced Aircraft Rate of Climb

Reduced Visibility

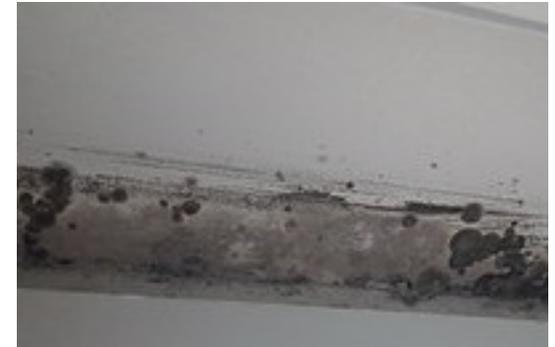


Potential Terminal Vulnerabilities

Flooding and Primary System Failures

Increased Mold Exposure

Roofing Material and Exterior Seal Degradation



Potential Utility Vulnerabilities

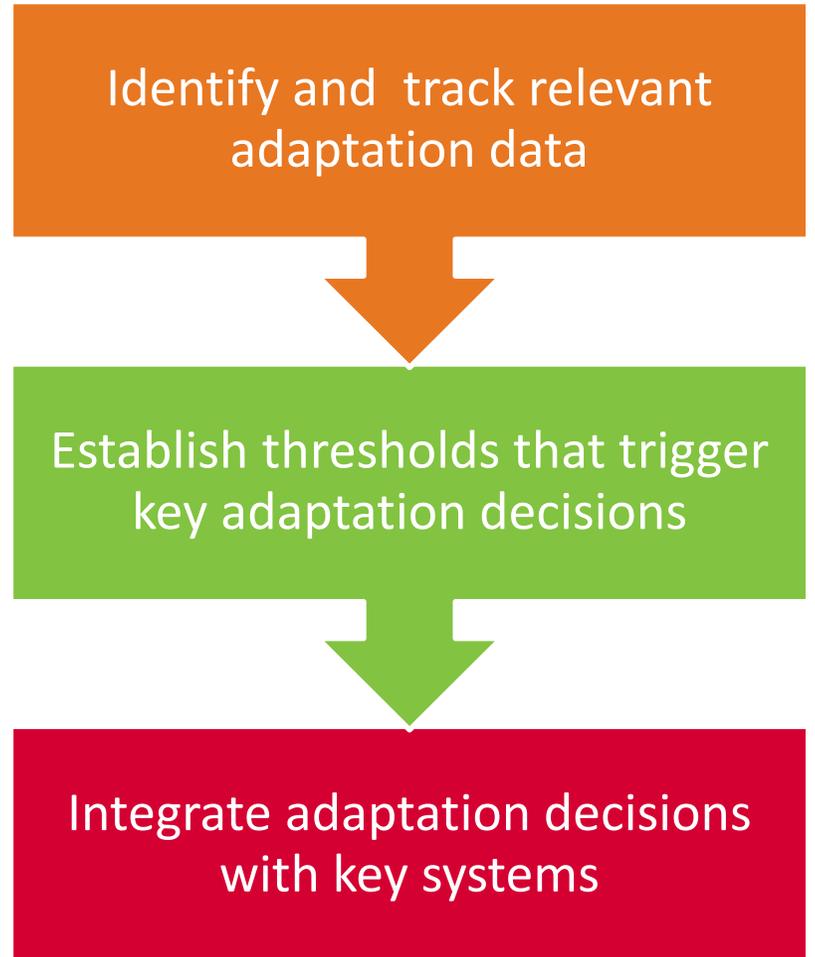
Reduced Vegetation and Increased Erosion

Power and Jet Fuel Supply Disruptions



Adaptive Management

- A systematic approach to managing uncertainty promoting flexible decision-making as information evolves. (ACRP 2015a, U.S. DOI 2009)
 - Used in budget reviews, property condition assessments, etc.
 - Incorporating climate change increases the value proposition of Adaptive Management



Adaptive Management

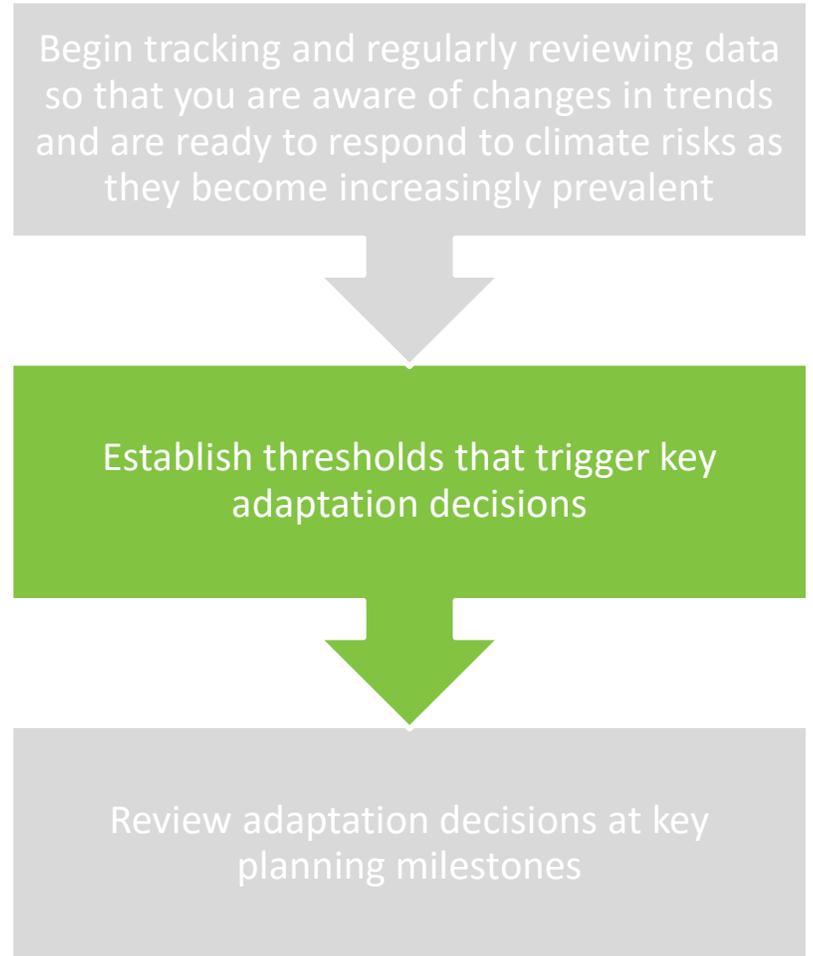
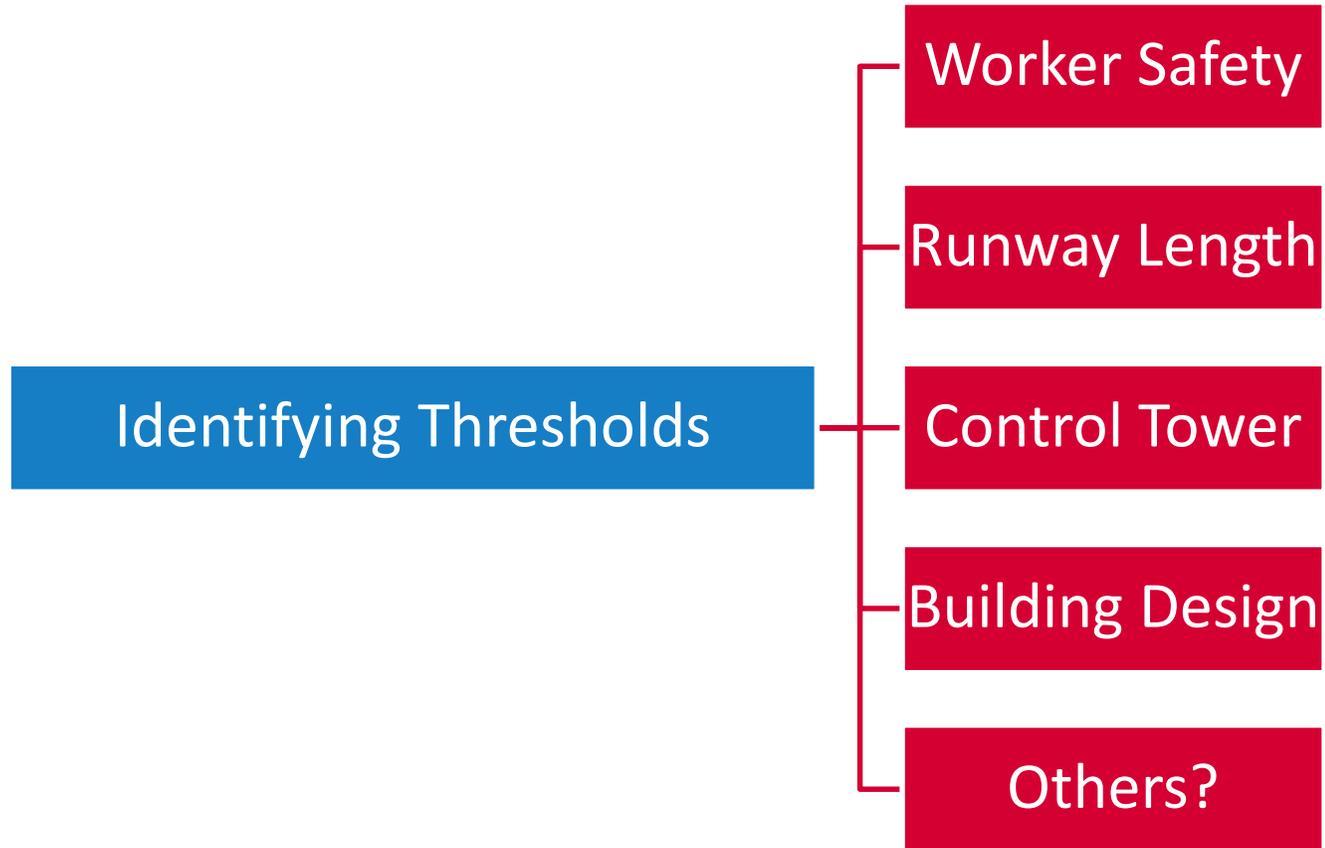
Assets	Duration of damage / closure
	Pavement condition
Operations	Energy use
	Weather-related flight delays / cancellations
Costs	Staff time spend on weather events
	Cost of damages to infrastructure
Weather	Frequency of storm events
	Frequency of extreme temperature events

Identify and track relevant adaptation data

Establish thresholds that trigger key adaptation decisions

Integrate adaptation decisions with key systems

Adaptive Management



Thresholds – Worker Safety

- Outdoor workers (i.e. construction/maintenance employees) exposed to hot and humid conditions are at risk of heat-related illnesses

Wet Bulb Globe Temperature Category Work/Rest and Water Intake

08/07/15

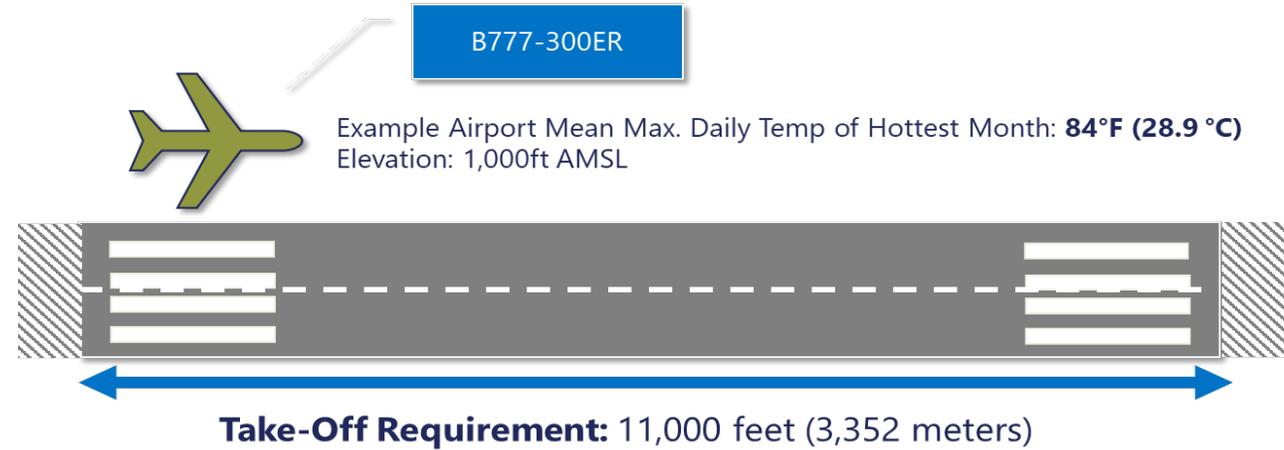
Unacclimated and Acclimated Work/Rest and Water Intake Chart

Heat Risk Category		Wet Bulb Globe Temp	Light Work		Moderate Work		Heavy Work	
			Work/Rest	Water Intake (quart/hr)	Work/Rest	Water Intake (quart/hr)	Work/Rest	Water Intake (quart/hr)
No Risk	Unacclimated	78 – 79.9	50/10 min	1/2	40/20 min	3/4	30/30 min	3/4
	Acclimated	78 – 79.9	continuous	1/2	continuous	3/4	50/10 min	3/4
Low	Unacclimated	80 – 84.9	40/20 min	1/2	30/30 min	3/4	20/40 min	1
	Acclimated	80 – 84.9	continuous	1/2	50/10 min	3/4	40/20 min	1
Moderate	Unacclimated	85 – 87.9	30/30 min	3/4	20/40 min	3/4	10/50 min	1
	Acclimated	85 – 87.9	continuous	3/4	40/20 min	3/4	30/30 min	1
High	Unacclimated	88 – 90	20/40 min	3/4	10/50 min	3/4	avoid	1
	Acclimated	88 – 90	continuous	3/4	30/30 min	3/4	20/40 min	1
Extreme	Unacclimated	> 90	10/50 min	1	avoid	1	avoid	1
	Acclimated	> 90	50/10 min	1	20/40 min	1	10/50 min	1

Adapted from: 1) USGS Survey Manual, Management of Occupational Heat Stress, Chapter 45, Appendix A. 2) Manual of Naval Preventive Medicine, Chapter 3: Prevention of Heat and Cold Stress Injuries. 3) OSHA Technical Manual Section III: Chapter 4 Heat Stress. 4) National Weather Service Tulsa Forecast Office, Wet Bulb Globe Temperature.

Thresholds – Runway Length

- Increased temperatures require increased take-off distances required



Thresholds – Wind



Airfield Wind Thresholds: XX MPH

Control Tower Wind Thresholds: YY MPH

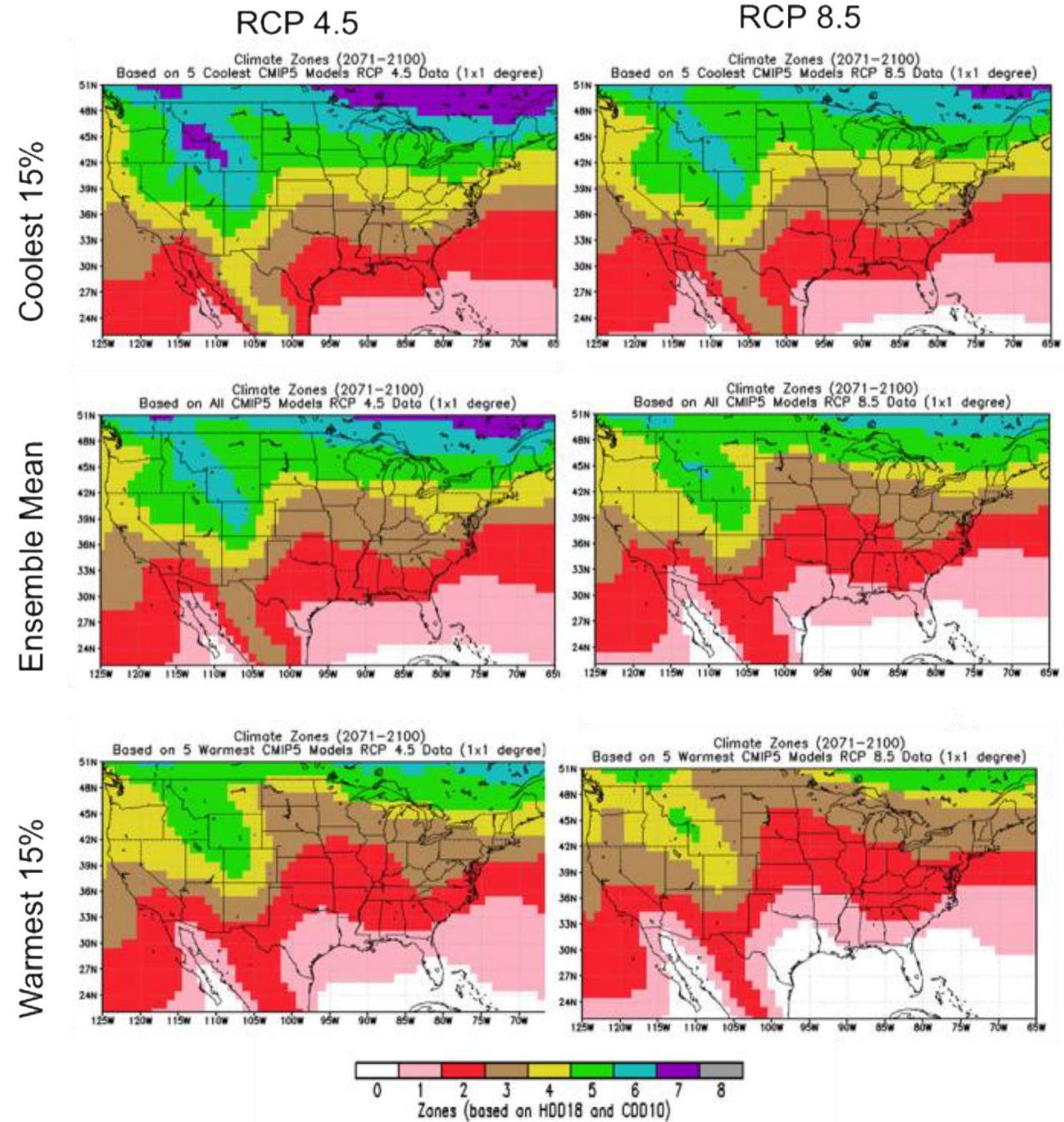


People Mover Wind Thresholds: ZZ MPH



Thresholds – Building Design

- Building Climate Zones and general migration of climate zones northward



Adaptive Management

- Establish a planning framework for incorporating climate change considerations.

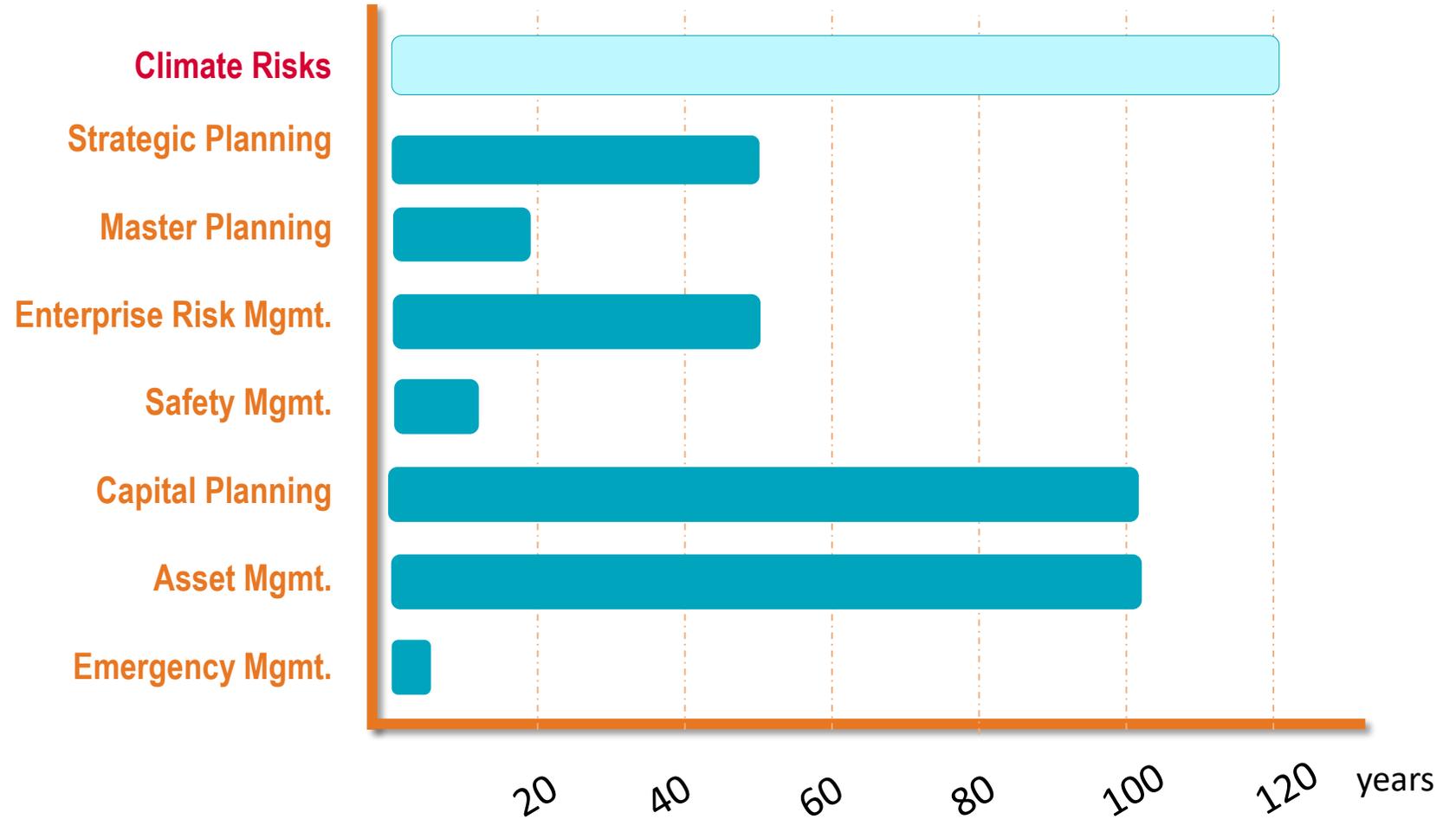
Begin tracking and regularly reviewing data so that you are aware of changes in trends and are ready to respond to climate risks as they become increasingly prevalent

Establish thresholds that trigger key adaptation decisions

Review adaptation decisions at key planning milestones

Adaptive Management

- How does the time horizon of different airport management systems correspond to climate risks?



Adaptive Management

- What is the appropriate timeframe to consider:
 - 2040, 2060, 2100, Beyond?
- Considerations for:
 - Time-value of Money
 - Opportunity Cost

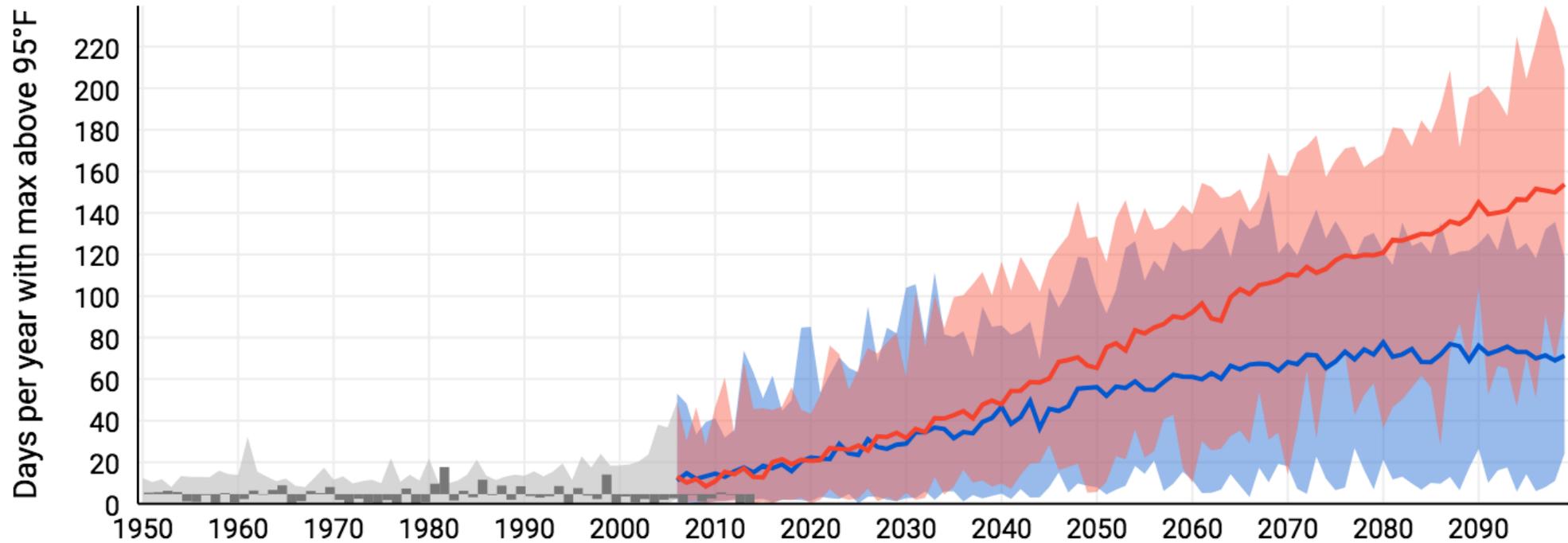
Begin tracking and regularly reviewing data so that you are aware of changes in trends and are ready to respond to climate risks as they become increasingly prevalent

Establish thresholds that trigger key adaptation decisions

Review adaptation decisions at key planning milestones

Adaptive Management

- Future Emissions Scenario
 - Business as usual vs. Paris Accord?



Adaptation Strategies

- Identify opportunities to integrate with:
 - Strategic Planning
 - Master Planning
 - Enterprise Risk Mgmt.
 - Safety Mgmt.
 - Capital Planning
 - Asset Mgmt.
 - Emergency Mgmt.
- Align Revisions to Sustainability Management Plan & Sustainable Design Criteria Manual Updates
 - Establish a preference for sustainability / resilience co-benefits

Planning

Infrastructure

Energy

People

Collaboration

Adaptation Strategies

- Systematically identify risks, criticality and adaptive capacity for infrastructure
- Establish resilience strategies and priorities
- Establish resilience recovery criteria
- Extend analysis regionally (e.g. access, supply chain, etc.)
- Establish a policy for integrating thresholds into design criteria, standard specifications, procurement, etc.

Planning

Infrastructure

Energy

People

Collaboration

Adaptation Strategies

- Evaluate vulnerabilities related to energy (e.g. fuel supply, power distribution, etc.)
- Evaluate energy infrastructure (e.g. location of power systems, mechanical equipment, generators, etc.)
- Consolidate advantages / identify opportunities for diversification of energy systems to minimize risk (e.g. alternative fuels, on-site power generation, microgrids, redundancy of systems, etc.)

Planning

Infrastructure

Energy

People

Collaboration

Adaptation Strategies

- Understand health impacts for employees, passengers, tenants and other stakeholders:
 - Heat-related illness / injury
 - Wind-related risks
 - Mosquito borne illness
 - Respiratory illness, e.g., asthma, allergies
 - Other vector impacts

Planning

Infrastructure

Energy

People

Collaboration

Adaptation Strategies

- Regional considerations, e.g., ground transportation network, water and wastewater services, stormwater, land use, and other utilities
- Collaborate with local, regional and state partners
 - City
 - Metropolitan Planning Organization
 - Regional Resiliency Coalition
 - Ground Transportation Agency
 - Federal Office of Resilience and Coastal Protection

Planning

Infrastructure

Energy

People

Collaboration

Today's Decisions can have Generational Consequences

