Resilience and Adaptation to Climate Risks Workshop: Stennis Space Center Area

Breakout Session #1

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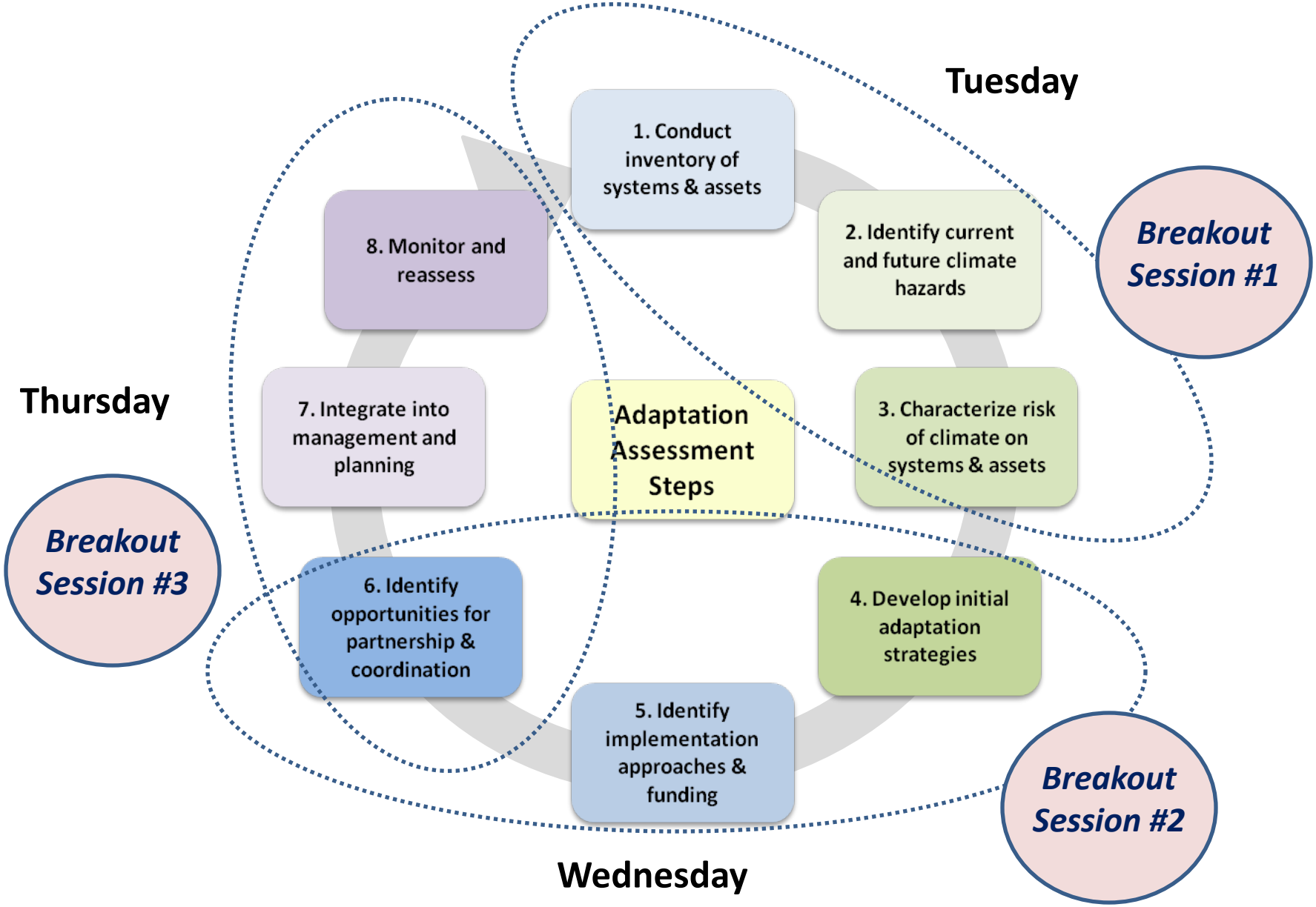


Breakout Session Tools

Breakout Session Guide

- Tasks, deliverables, time allocated
- Reference tables
- Report back guidance

Resources

- Facilitators
- System leads and Scribes
- Subject matter experts ---- EACH OTHER ----
- Templates
- Flip charts
- Report back PowerPoint templates

Activities & Deliverables

Breakout Session #1

This afternoon ……

- **Take information on mission, systems and assets**
- **Apply current and future climate hazard knowledge**
- **<u>Characterize risk of climate change on systems and assets</u>**
- **Deliverables**: Completed templates for multiple assets. Information to be used in Breakout Session #2.

Breakout Groups:
Built Systems
People / Community Systems
Natural Resource Systems

WEDNESDAY AM
Report Back: Potential climate impacts on system and assets

1. Conduct inventory of systems & assets

Take Systems / Asset / Capability

Built
- Test Stands
- Fleet
- Canal system
- Bridge system
- Horizontal infrastructure

Natural Resources
- Waterways (surface & storm water systems)
- Soil and groundwater
- Landscaped Grounds
- Wooded & Natural
- Archaeology
- Wildlife
- Air
- Landfill
- AST/UST
- Clean up sites
- Energy management

People / Community
- SSC civil servants
- SSC contractor team
- SSC provided services
  - Health & Safety
  - Emergency Response & Management
  - Security
  - Communications
- Family
- Community

Emergency Operations Center
- Medical clinic
- Fire department
- Security
- EMCS
- Incident command post and emergency operations center

2. Identify current and future climate hazards

Review and Use Climate Handout

projected changes

The Climate Science Context
Scientists have collected weather and climate data and indicators of longer-term climate patterns (such as ice cores and tree rings) from the entire globe. Based on analyses of these data, plus a growing understanding of physical processes that control climate, scientists have developed sophisticated models that project future climate changes. Many climate models project that climate change will accelerate this century. The US Global Climate Research Program's report summarizes these results at http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts. NASA climate scientists are an important part of the international research effort. NASA is a key player in modeling climate variables and collecting both earth-based and space-based data used to develop and validate climate models and identify climate impacts.

Climate Scenarios

The United Nations Intergovernmental Panel on Climate Change (IPCC) developed several greenhouse gas (GHG) emissions scenarios based on differing sets of assumptions about future economic growth, population growth, fossil fuel use, and other factors. The emissions scenarios range from "business-as-usual" (i.e., minimal change in the current emissions trends) to more progressive (i.e., international leaders implement aggressive emissions reductions policies). Each of these scenarios leads to a corresponding GHG concentration, which is then used in climate models to examine how the climate may react to varying levels of GHGs. Climate researchers use many global climate models to assess the potential changes in climate due to increased GHGs. In this case, 3 emissions scenarios were used in 16 different global climate models, to provide a range of possible outcomes and provide a sound basis for policy decisions and adaptation planning.

Stennis Area Climate and Weather Today
The climate at Stennis Space Center and its surrounding region is classified as humid subtropical. Average temperatures in the area range from around 49°F in January to about 82°F in July. Annual precipitation is about 64 inches and precipitation is relatively evenly distributed throughout the year. Local weather hazards that affect the center include hurricanes and thunderstorms. Several hurricanes affected Stennis operations in recent history – Betsy in 1965, Camille in 1969, and Katrina in 2005.

Future Climate Projections
Based on local temperature and sea level records, scientists from NASA's Goddard Institute for Space Studies adjusted regional climate models to make projections more specific and useful for Stennis. This "downscaling" process can provide a more precise projection for a specific location (in this case, the Stennis Space Center area) than modeling for an entire region, such as the southern US. Using these models, scientists project higher average annual temperatures and rising average sea levels for the Stennis area. While little change is expected in average annual precipitation, storms may be more intense, leading to increased risks of flooding.

The Case for Adaptation
Because of its location on the Gulf Coast, sea level rise and storm surge may be the biggest threats to SSC. The area has always been subject to hurricanes, and the associated high winds and flooding. The combination of rising sea level and severe storms could produce catastrophic impacts on SSC and the surrounding high profile infrastructure assets, human capital, and natural resources. Land subsidence in the area worsens the impacts of rising seas and storm surges. Projected changes in the frequency of some extreme events like hot and cold days (see tables below) may also lead to large impacts. Most people are likely to notice the impacts of extreme events – more heat waves, more downpours, more flooding – rather than the gradual rise in average annual temperatures and sea levels. The Center's future is intricately connected with broader social, economic, and environmental trends expected throughout the region, so SSC stewards developing adaptation strategies will also need to work together with regional decision-makers on the Gulf Coast.

Rapid Melting of Land-Based Ice

Data collected over the past several years reveal that land-based ice, such as that on Greenland or the Western Antarctic Ice Sheet, is melting faster than most Global Climate Models project. Because this could change sea levels substantially, climate scientists developed an alternative model component that incorporates observed and longer-term historical land-based ice melt rates. This rapid ice melt approach suggests that sea levels could rise three times as fast, adding several feet along the nearby coast by the 2080s. (see Rapid Ice Melt data in the Climate Variables chart to the left.)

A Note on Interpreting Climate Projections
Model projections suggest a significant and progressive long-term warming trend for the Stennis area, but they cannot provide an exact temperature for a future date. For example, while it is inappropriate to assert that the average temperature at SSC will be 70.0°F in 2043, it is appropriate to say that between 2040 and 2070, temperatures may increase 2.5 to 4.5 degrees above the average baseline temperature.

Daily Temperatures	Baseline	2020s	2050s	2080s
Days/year at or above 100°F	2	3 to 6	6 to 20	10 to 50
Days/year at or above 90°F	82	93 to 106	106 to 131	120 to 155
Days/year at or below 40°F	62	49 to 54	40 to 50	31 to 45
Days/year at or below 32°F	25	16 to 20	12 to 17	8 to 14

Baseline is from Poplarville, MS

Hot and Cold Day Projections

The number of days per year exceeding 90˚F is projected to rise dramatically in the coming century, and the number of days with temperatures below 40˚F is projected to decrease. More hot days would affect outside work, energy use, agricultural practices, and habitats.

What can we expect locally?

	2020's	2050's	2080's
Average Annual Precipitation	-5% to +5%	-10% to +5%	-10% to +5%
Sea Level (inches)	+2 to +4	+6 to +10	+11 to +19
Sea Level–Rapid Ice Melt Possibility (inches)	+4 to +8	+18 to +27	+41 to +55
Average Annual Temperature (F°)	+1.5° to +2.0°	+2.5° to +4.5°	+3.5° to +7.0°

Temperature and precipitation projections reflect a 30-year average centered on the specified decade; sea levels are averages for the specific decade. Data for 1971-2000 from Waveland and Poplarville, MS provide a baseline for Temperature (66.5°F) and for Annual Precipitation (64.3 inches). Sea level data are for Waveland. Temperatures are rounded to the nearest half degree, precipitation projections to the nearest 5%, and sea level rise to the nearest inch. Shown are the central range (middle 67% of values) across the GCMs and GHG emissions scenarios. Data are from the NOAA National Climatic Data Center.

Average sea levels and temperatures are expected to rise.

Qualitative Changes in Extreme Events During This Century

Event	Direction of Change	Likelihood
Hot Days	↑	Very Likely
Intense Precipitation	↑	Likely
River Flooding	↑	Likely
Drought	↑	More likely than not
Intense Winds	↑	More likely than not

Based on global climate model simulations, published literature, and expert judgment

3. Characterize risk of climate change on systems & assets

Characterize Risk of Climate Change

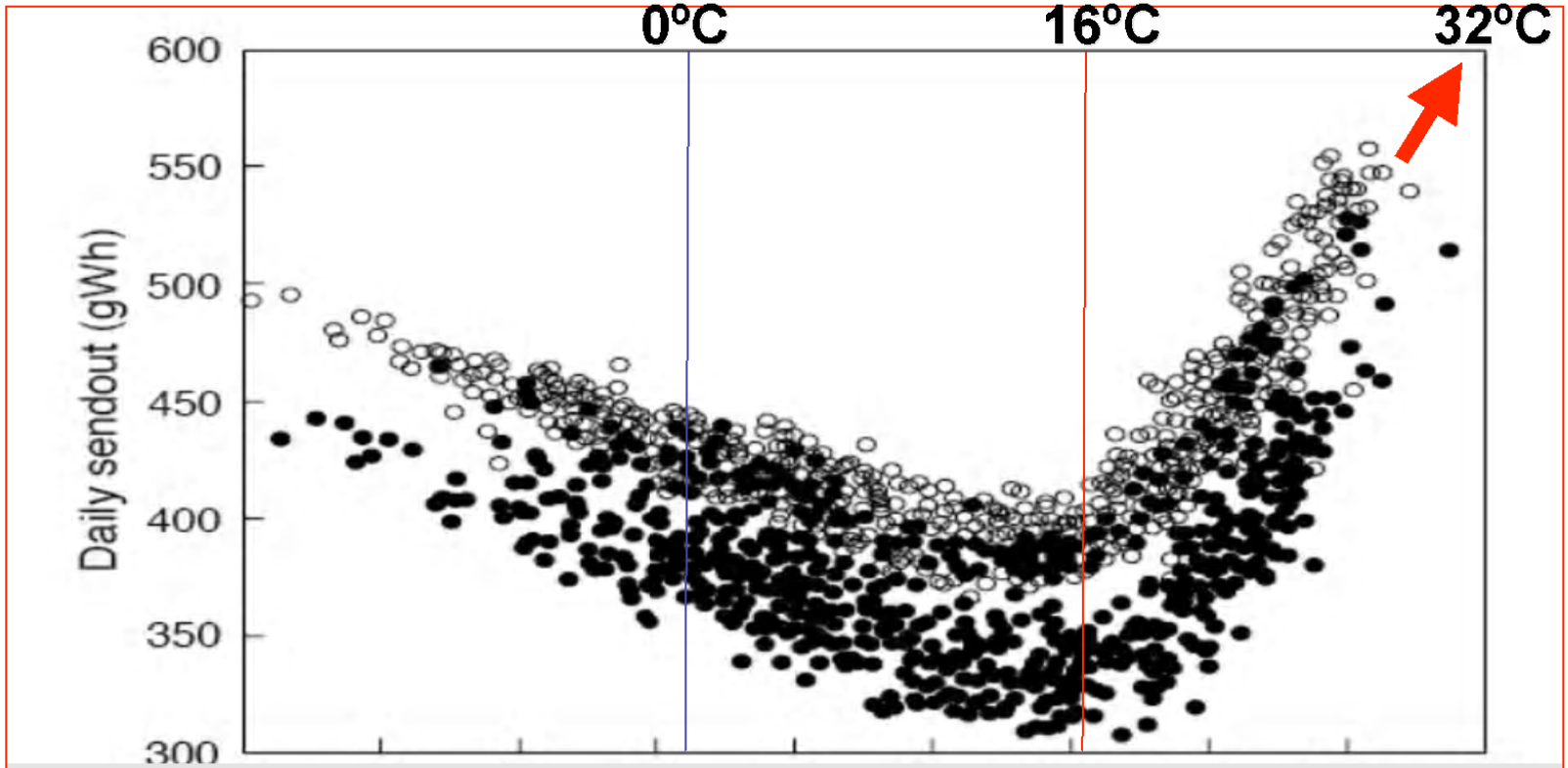
- For each relevant climate variable (e.g., sea level rise, storm surge, temperature)……
- Describe climate variable impact on asset
  - Current
  - 2020s
  - 2050s
  - 2080s

Remember: 30 yr average centered on decade; e.g., 2050s represents 2040-2069

- What are the current actions/work arounds?
- Current management status?

Document your answers on the Template

Don’t Forget About Thresholds



Daily Electric Energy Load (gigawatt-hours) in NY State, vs. Daily-Average Temperature. Solid Points=1966; Open Points=1997 =>

Peak Load Issues

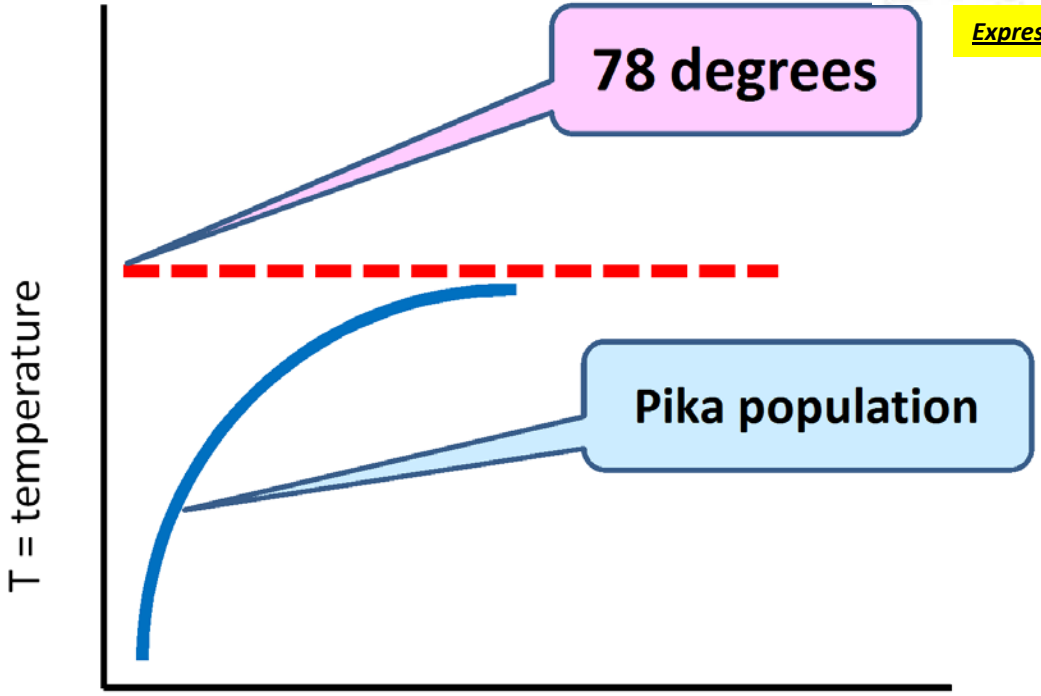
C Rosenzweig & W D Solecki (eds.) (2001 (July)) Climate Change and a Global City: The Potential Consequences of Climate Variability and Change

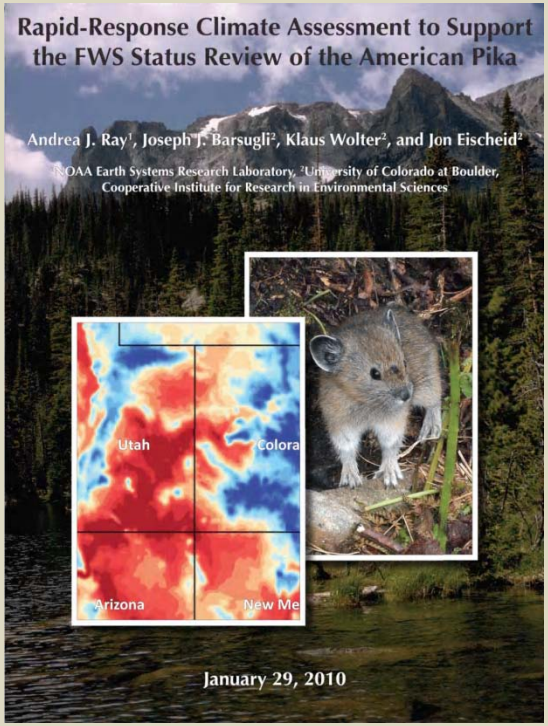
Don’t Forget About Thresholds

American Pika

(Ochotona princeps)

Express (publication of the, The Washington Post) 7 May 2009, page 4





Determine “Type of Response”

“Watch”
“Evaluate Further / Develop Strategy”
“Develop Strategy”

Even “watch” could have activities that need to happen – e.g., monitoring

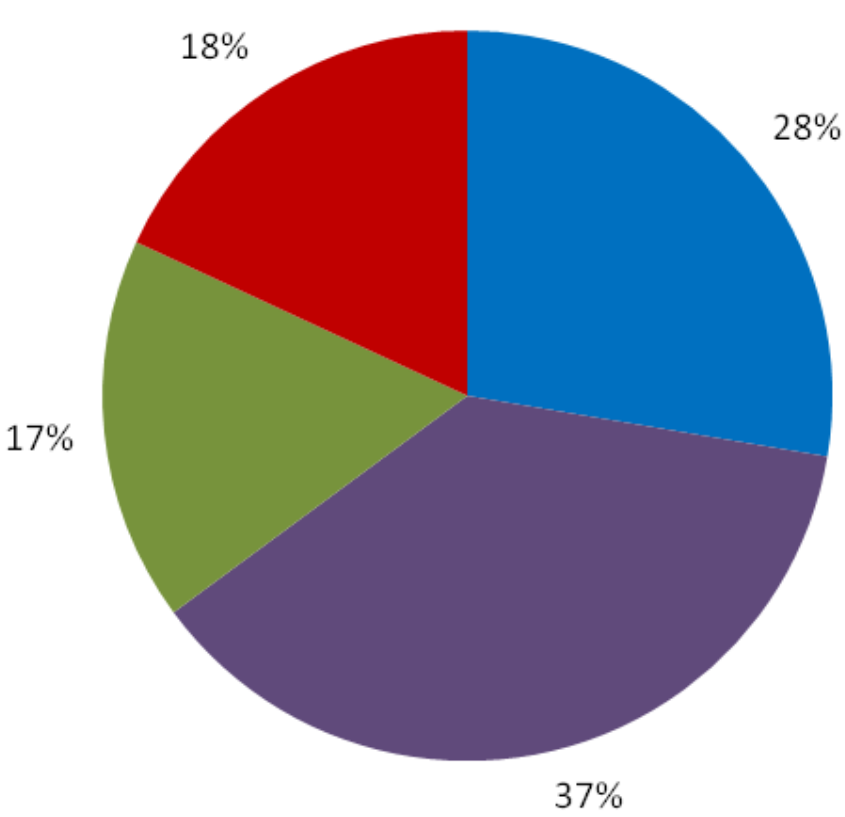
Report Back Guidance

- Give yourself enough time to prepare your System group for the brief back
- 10 - 15 minute presentation from each system
- **Focus on**:
  - **Summary** of main climate hazards
  - **Examples** of impacts, current work-arounds, etc.
  - What **plans** or **processes** were identified?
  - **Summary** of types of response.
  - **System Owner**: how will you continue the risk characterization process going forward?

Please hold on to all of the templates completed or drafted in your breakout group. They will be used in Breakout Session #2.

WEDNESDAY AM Report Back: Potential climate change impacts on system and assets

Registration Breakdown



- Built Systems (e.g., facility maintenance/operations, facility users or managers, utilities/energy/water managers or users, equipment owners)
- Mission and Mission Support/Management (e.g., science, engineering, research, program management, strategic planning)
- Natural Resources (e.g., environmental compliance, natural resources management/maintenance/use, wetlands management)
- People/Community (e.g., worker safety/health, emergency planning/response, human resource management, communications)

	People / Community	Natural Resources	Built
System Owner	Ron Magee	David Lorance	Mike Killam
System Scribe	Jeannie Frederick	Kelly Boyd	Robinette Lawler
Facilitator	Erik Tucker	Kim Gotwals	Christina Hudson
Climate Science Rep	Cynthia Rosenzweig	Radley Horton	Dan Bader
Climate Variable and Asset in 1st Breakout Session	Temperature changes (e.g., heat stress) on outdoor work	Precipitation changes on pine trees (acoustical buffer) – e.g., drought, invasive species, etc.	SLR and storm surge on roads