Building Resilience to a Changing Climate:

A Technical Workshop in Water Utility Decision Support and Adaptation

WUCA
Water Utility Climate Alliance

Practical Considerations for Climate Adaptation: Know before you go …

Laurna Kaatz, Denver Water / WUCA

Julie Vano, Aspen Global Change Institute

Climate Adaptation Conundrum

- Can’t be prepared for everything
- Can’t afford to be prepared for the worst case
- Can’t afford to be unprepared

How do you approach this challenge?

Getting Started in Four Steps

- **Understand:** Climate science and model projection capabilities and limitations
- **Assess:** Water system vulnerability to potential change
- **Plan:** Incorporate climate uncertainty into water utility planning
- **Implement:** Adaptation strategies

Source: www.wucaonline.org

Climate Adaptation Actions

to promote climate-resilient water utilities and thriving communities.

Source: www.wucaonline.org

Before You Jump In – Clearly Articulate…

- What is your endgame? What question(s) do you want to answer
  e.g., what variables, levels of confidence
- How will you get there?
  - Method – simple, sophisticated
  - Data – type, scale, magnitude of change, level of uncertainty
  - Tools – current, new?
- Will it be useful?
- New science?
- Messaging – internal, external

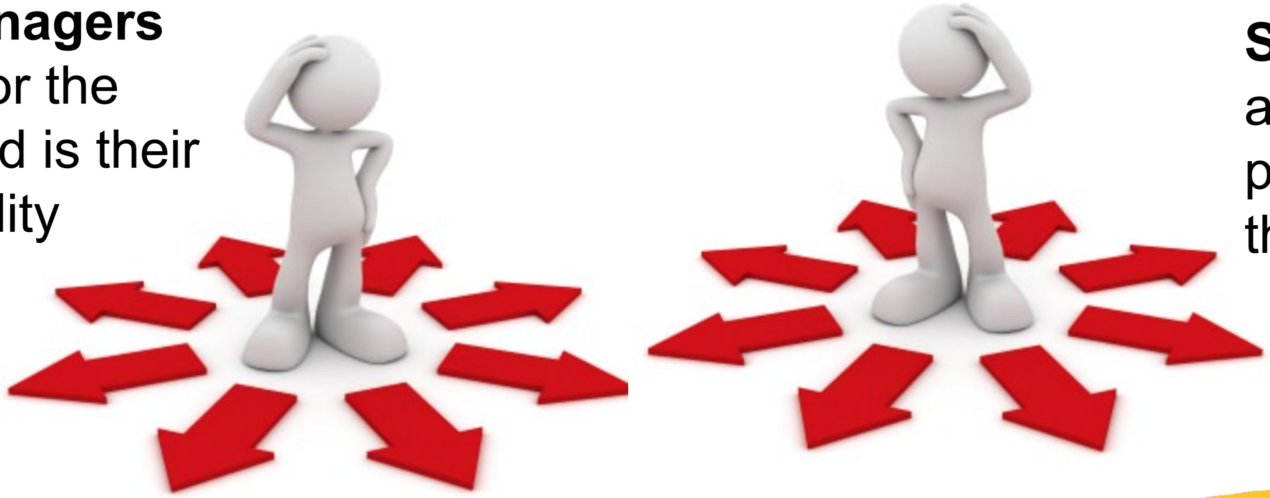
Source: L. Kaatz, Denver Water

Goal is to Avoid Analysis Paralysis

Guiding Principles: The Dos and Don'ts

I. **It is important to evaluate climate risk**
II. **Models can be helpful tools, if used appropriately**
III. **Uncertainty is everyone's responsibility**

Water managers planning for the unexpected is their responsibility

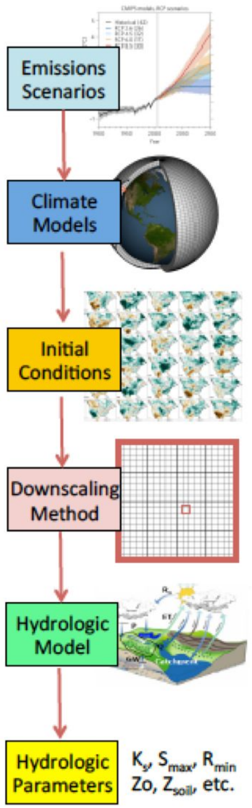


Scientists being clear about uncertainties and placing them in context is their responsibility

Source: J. Vano, Dos and Don'ts

Do Be Aware of Multiple Ways to Evaluate Future Changes

Scenario studies



Clark et al. 2016; connect models in a chain

Stochastic hydrology

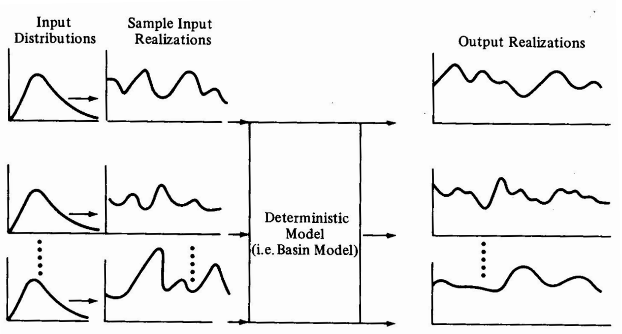
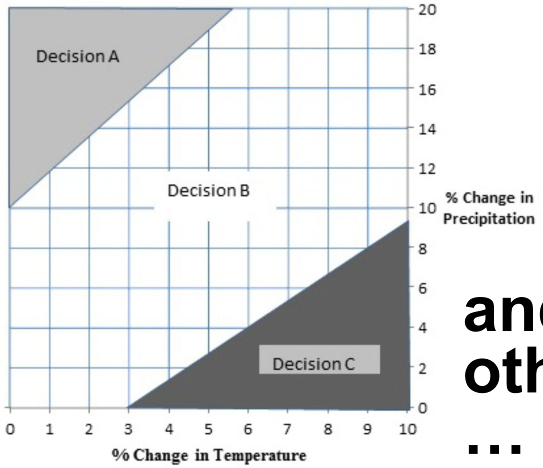


Figure 1.3 Concept of Monte Carlo experiments.

Bras and Rodriguez-Iturbe, 1985; generate synthetic timeseries using statics from the past

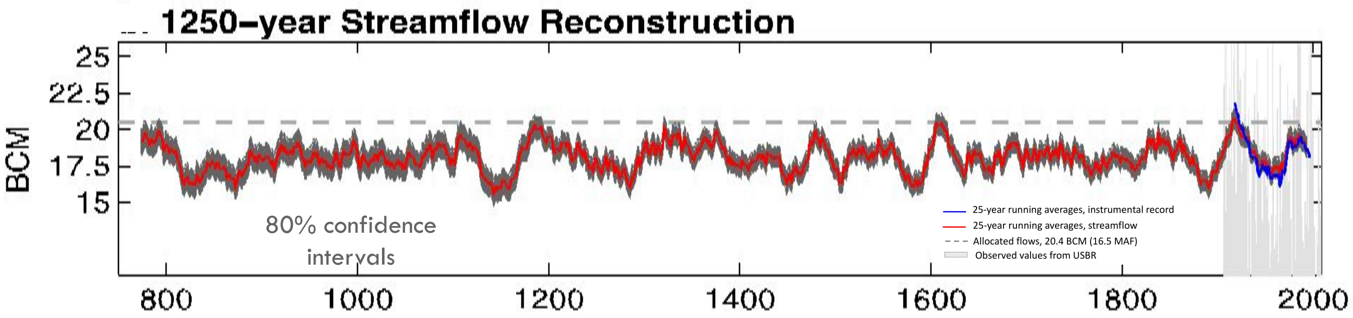
Climate-informed vulnerability analysis



Brown et al., WRR, 2016; explore system vulnerabilities with perturbations

and others …

Paleoclimate studies



Vano et al., BAMS, 2016; generate timeseries using reconstructions of the

Source: J. Vano, Dos and Don'ts

Do Understand How the Decision Being Evaluated is Important to Model and Approach Selection

What are the questions we are trying to answer?

How will flows in April-September change in the future?

How should facilities be sized to prevent sewer overflows?

How will the magnitude, duration, and frequency of drought change?

How much warmer will streams be in 20 years?

water supply, streamflow timing, drought, stormwater, wastewater

FIT FOR PURPOSE

Source: J. Vano, Dos and Don'ts

Do Start by Determining the Level of Details that Fits Your Need and Resources

Additional Considerations:

- How much will it cost?
- How long will it take?
- To what extent will the analysis improve the decision?
- Can appropriate data and information be obtained?
- Who will undertake the analysis?
- How much information can you manage?




Source: J. Vano, Dos and Don'ts + one from WUCA

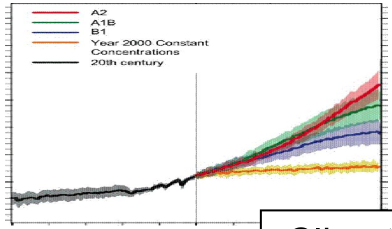
One water management

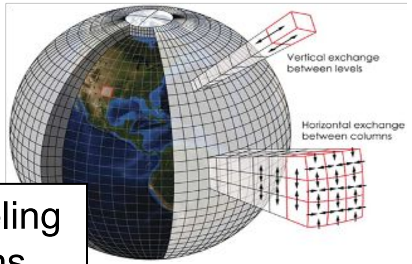
Julia

PHILADELPHIA WATER DEPARTMENT

Alan

NYC Environmental Protection

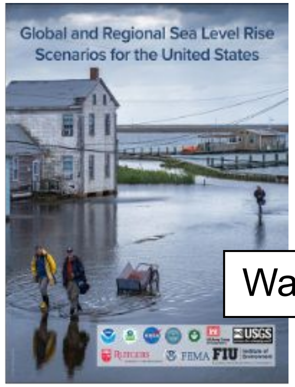




Climate Modeling & Projections

Dan

Abby



Water sector context

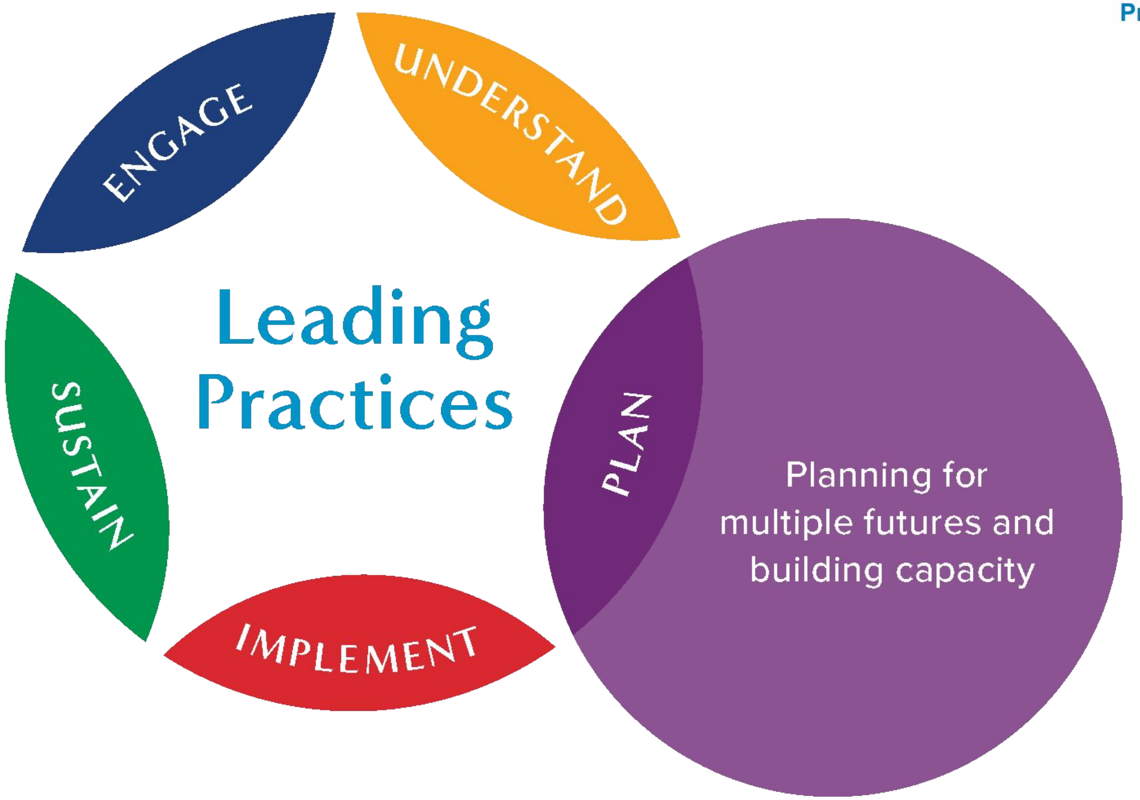
Amy

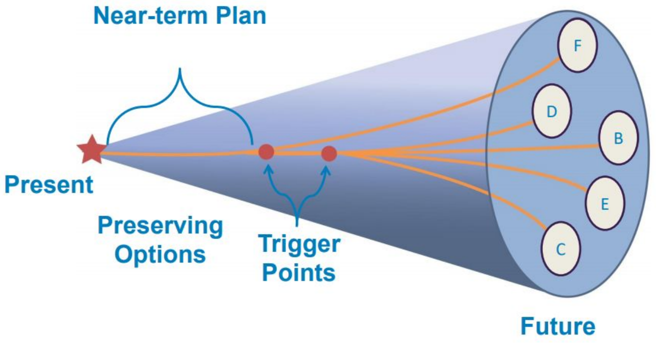
Basin-scale impacts

Delaware River Basin Commission

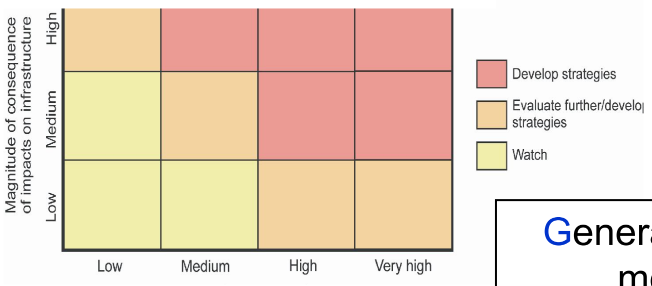
DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

Managing, Protecting and Improving the Basin's Water Resources Since 1961



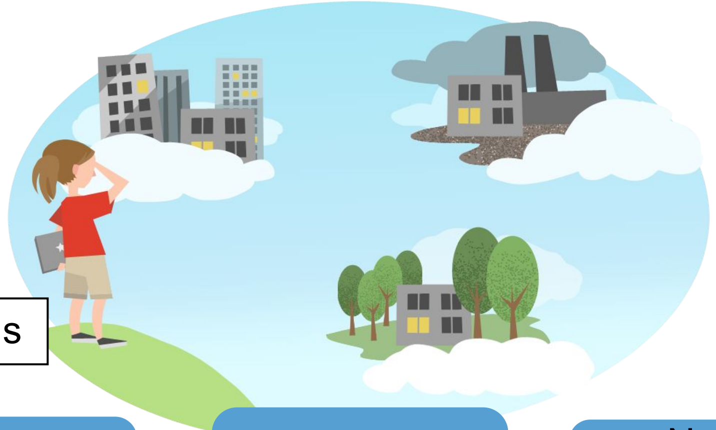


The Game!



Joel

General Planning methods



Rob

DMDU methods

Strategy & Context → Stress Test → New & Revised Strategies

Case Studies

Brandon

Akin

FLORIDA Water & Climate Alliance

Tirusew

Ellen

Community building

YOU

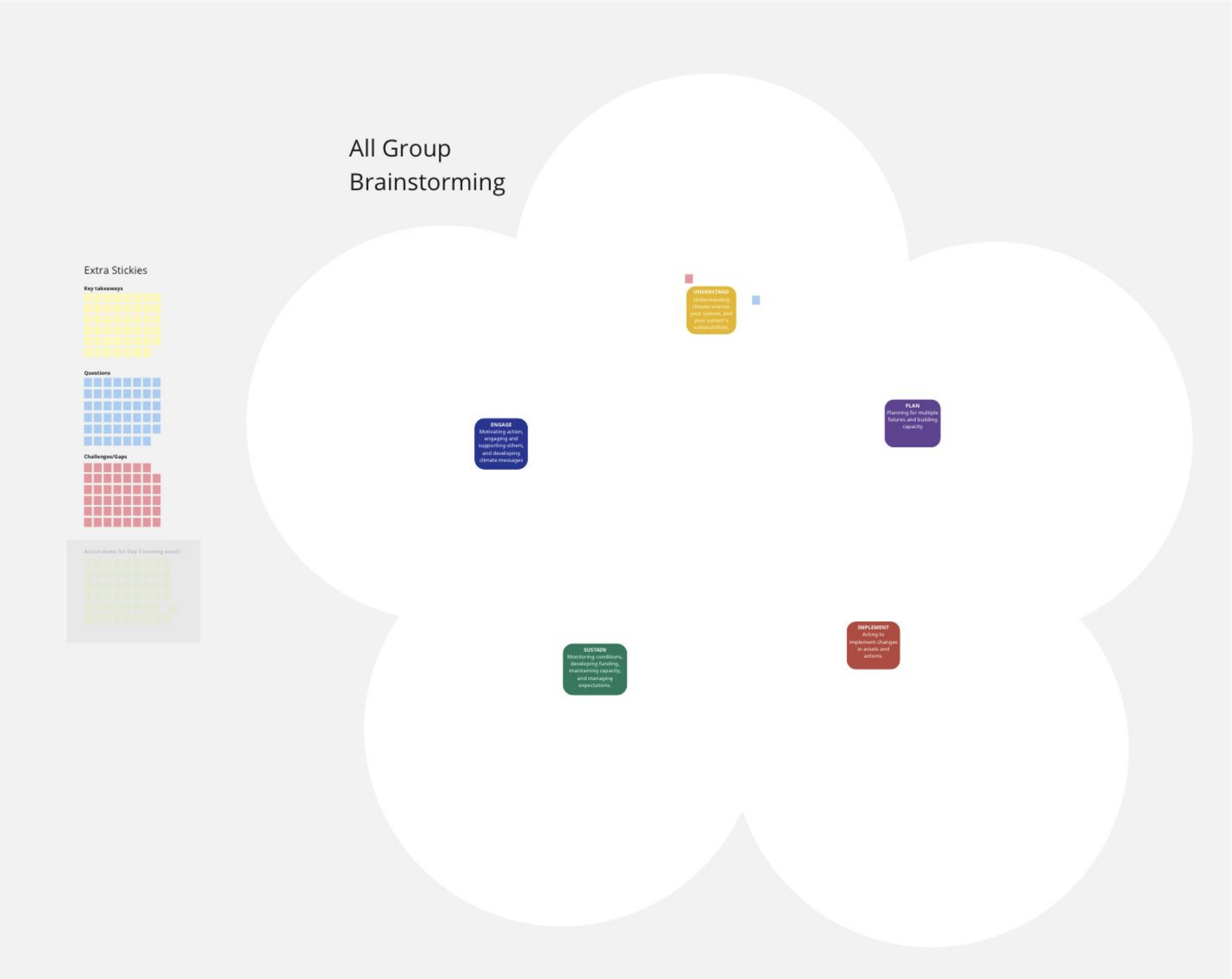
Person on your right

Person on your left

Person diagonal to you…

All of us

Our virtual whiteboard



All of us

Throughout the workshop, we want to collect your ideas on the board.

We will capture key takeaways, questions, gaps/challenges, and (eventually) action item.

Heidi

Franco

All of us

Panel discussion

Howard

Marc

Jen

Are you ready?