Building Resilience to a Changing Climate:

A Technical Training in Water Sector
Utility Decision Support

WUCA
Water Utility Climate Alliance

Practical Considerations for Climate Analysis and Adaptation: Know before you go …

Laurna Kaatz, Denver Water / WUCA

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

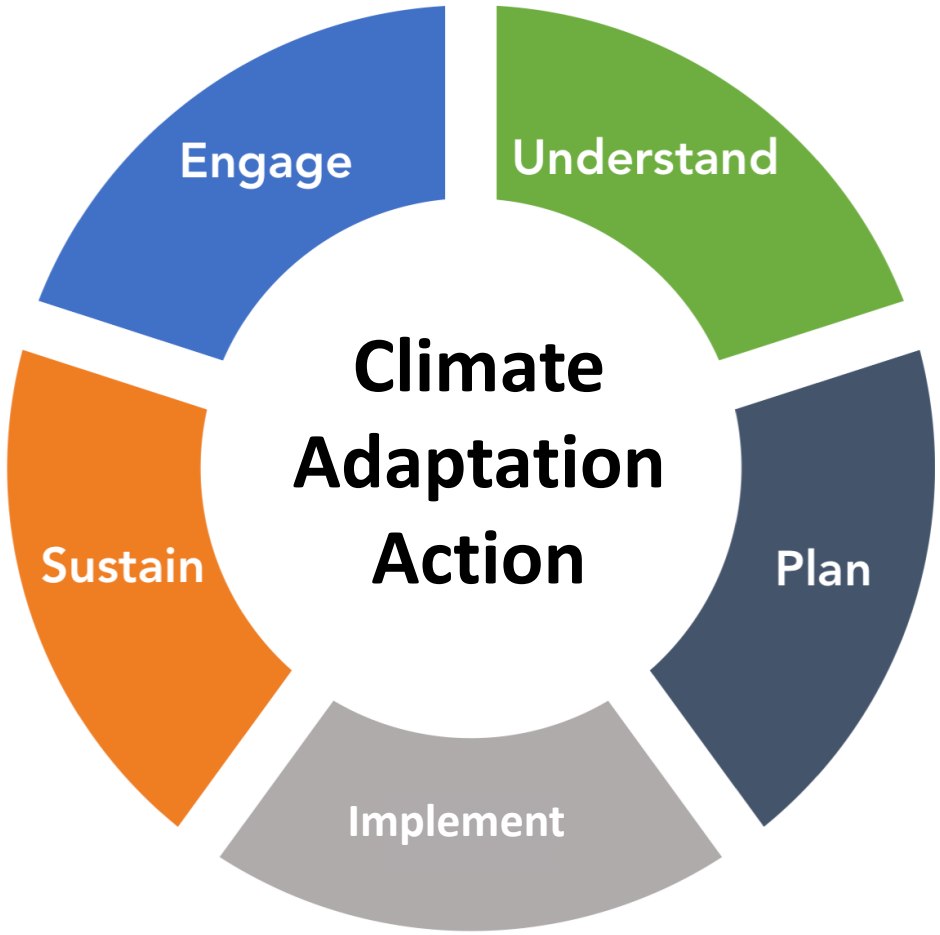
How do you approach this challenge?

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

Spectrum of 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 end game? What question(s) do you want to answer?
- How will you get there?
  - Method – simple, sophisticated
  - Data – type, scale
  - Tools – current, new?
- Will it be useful?
- New science?
- Messaging – internal, external

Source: L. Kaatz, Denver Water

Goal is to Avoid Analysis Paralysis

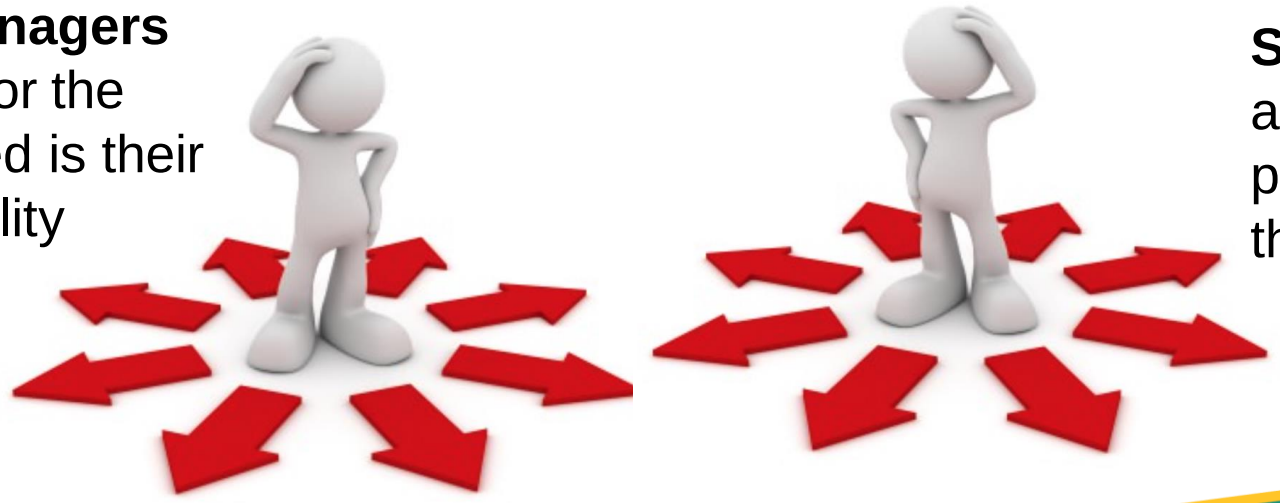
Guiding Principles: The Dos and Don'ts

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

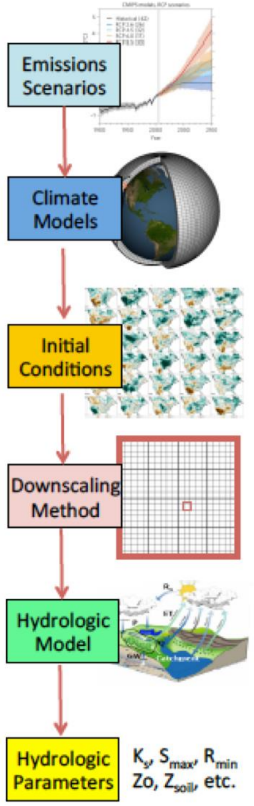


Scientists being clear about uncertainties and placing them in context is their responsibility

Source: J. Vano, NCAR

Do Be Aware of Multiple Ways to Evaluate Future Changes

Scenario studies



Clark et al. 2016; connect models in a chain

Stochastic hydrology

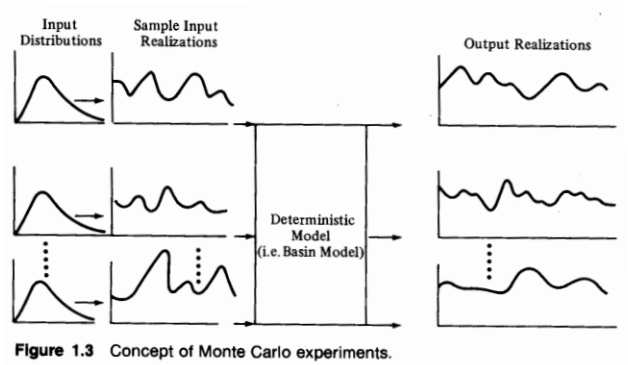
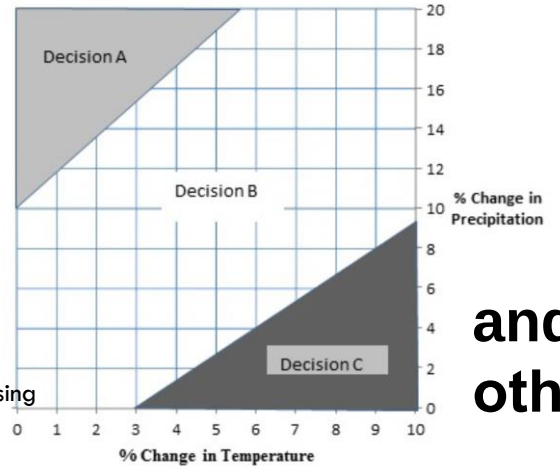


Figure 1.3 Concept of Monte Carlo experiments.

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

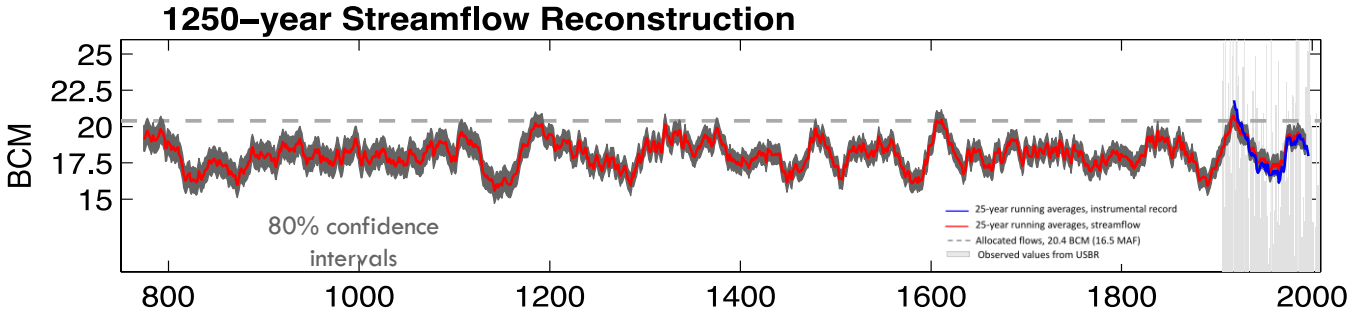
Climate-informed vulnerability analysis



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 distant past

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

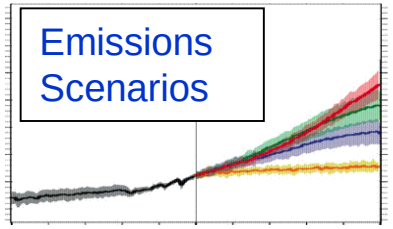
Do Start by Determining the Level of Details that Fits Your Need and Resources

Additional Considerations:

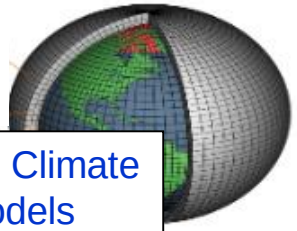
- How much will it cost?
- How long will it take?
- To what extent will the analysis improve the decision?
- Can appropriate data and information be obtained?
- Who will undertake the analysis?
- How much information can you manage?




List from UK Climate Impacts Programme's report Climate adaptation: Risk, uncertainty and decision-making (+ one from WUCA)

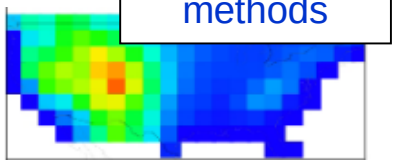


Emissions Scenarios

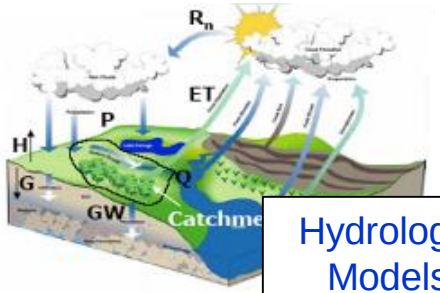


Global Climate Models

Joel

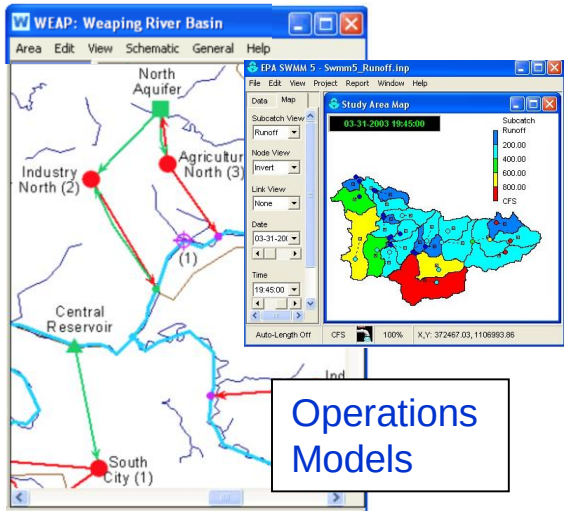


Downscaling methods



Hydrologic Models

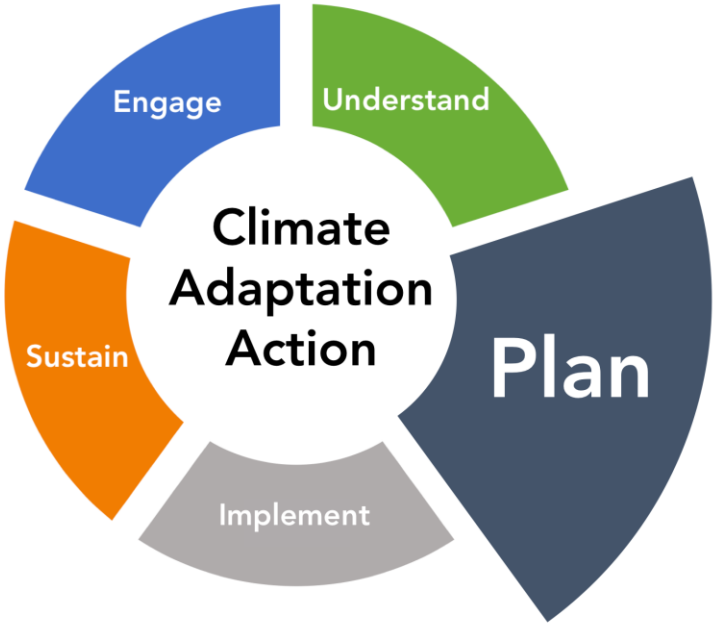
Julie



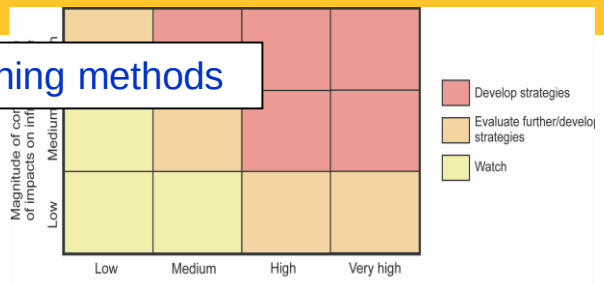
Operations Models

Decision Support Tools

Case studies

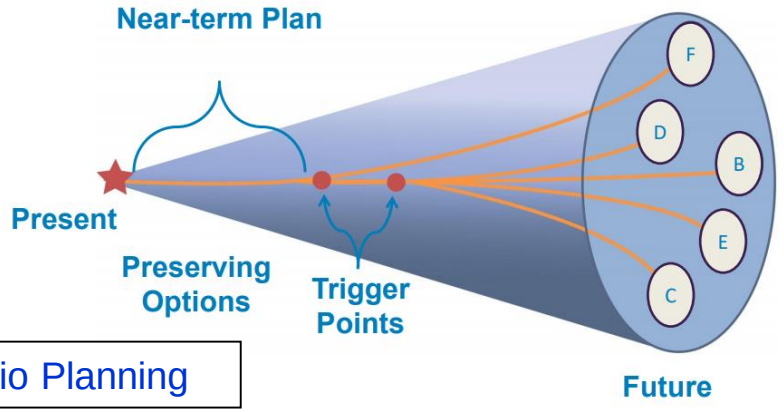


Planning methods



CREAT 3.0

Joel & Steve



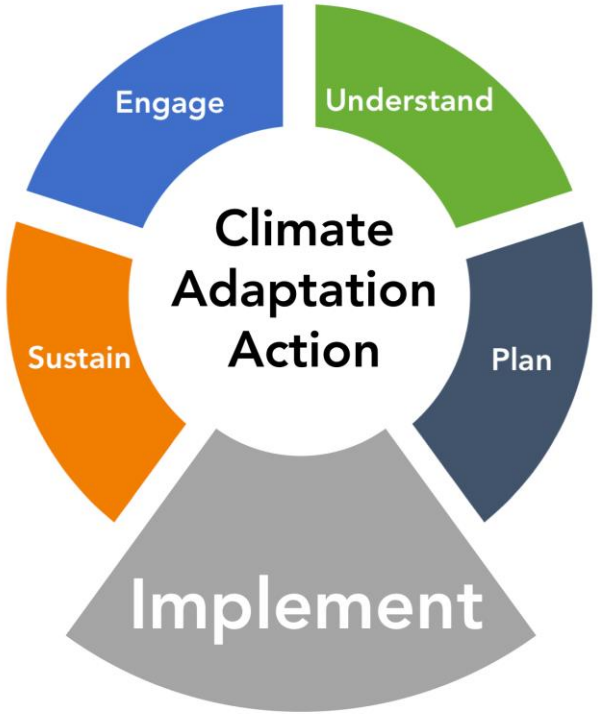
Scenario Planning

Laurna

DMDU methods

Strategy & Context → Stress Test → New & Revised Strategies

Rob



Daryl

Austin Water

trwd Tarrant Regional Water District

Laura & Courtney

The Metropolitan Water District of Southern California

Philadelphia Water Department

Abby

Keely

Sharon & Maureen

Houston Public Works

Brandon

Laurna

Southern Nevada Water Authority

Denver Water

Abby
&
Keely

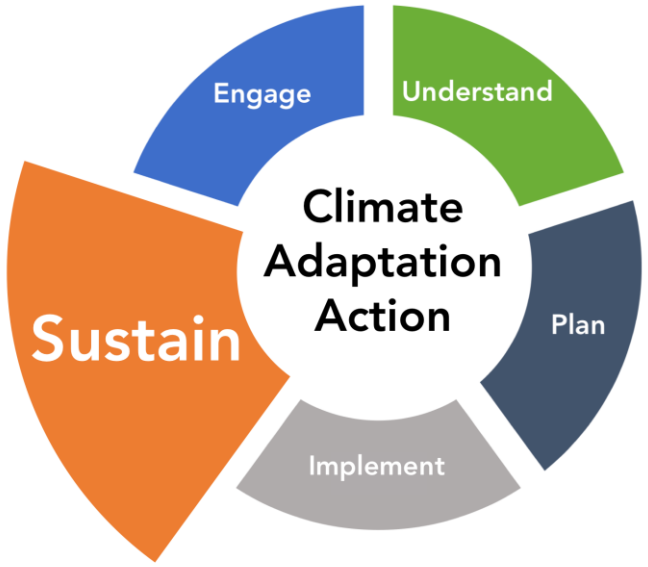
Organizational Structure

Communication

Technical Challenges

Resources & Capacity

Policies



Community building

YOU

Person on your right

Person on your left

Person behind you…

All of us

Are you ready?