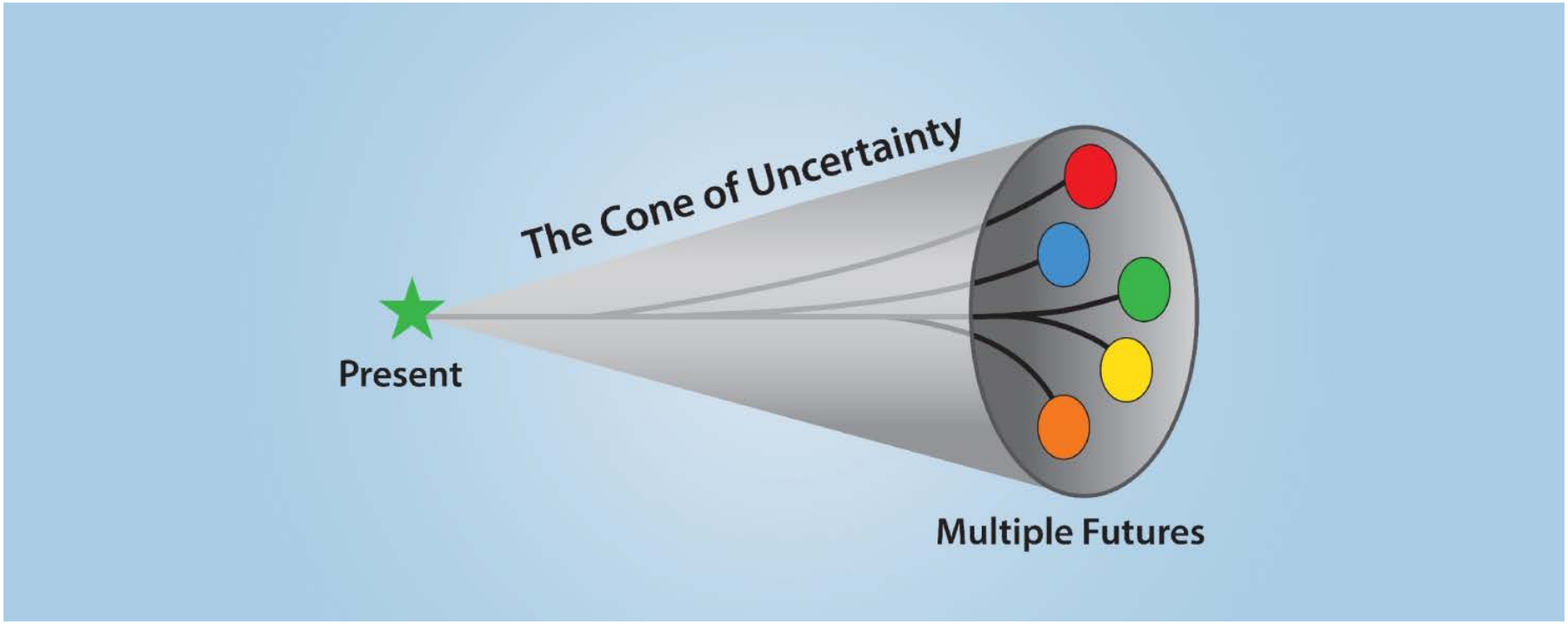
Climate Change



Climate Change

How are you going to handle the large uncertainty?

1. Can't use probabilities
2. **Build for robustness**
   - **Bottom-up analysis allows you to identify the conditions that will break the plan**
3. Wish for the best – no insurance
4. **Adaptive plan**
   - **Identify signposts and actions**

Adaptive Pathway Example

Plan using existing projections

- Identify approach for handling uncertainty

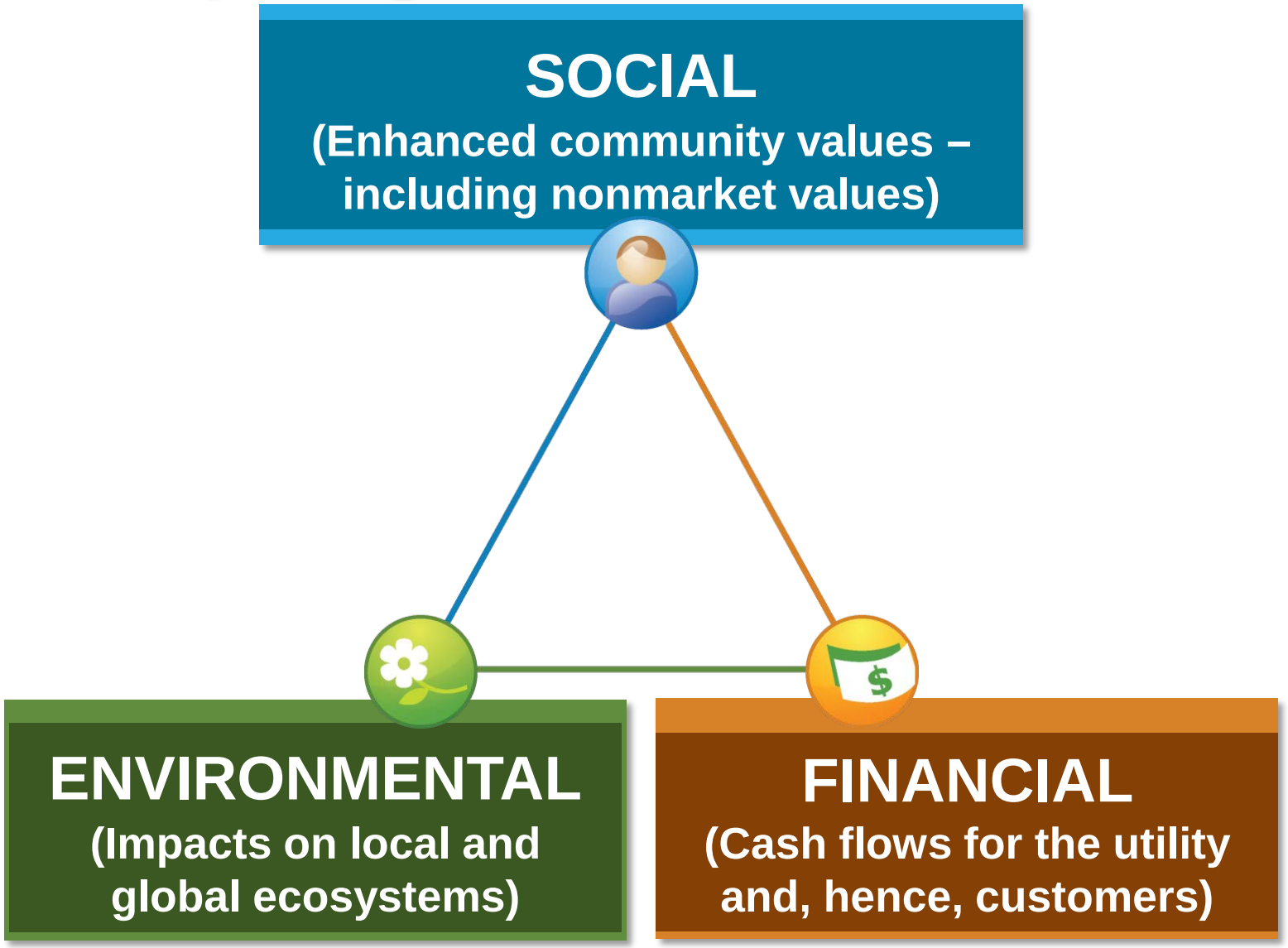
Portfolio Analysis

- Two Portfolios:

1. Compares winter flows with Recycled Water – both with storage
2. Compares two types of recycled water projects – Indirect Potable Reuse (IPR) stored in an aquifer with North Coast exchange for groundwater

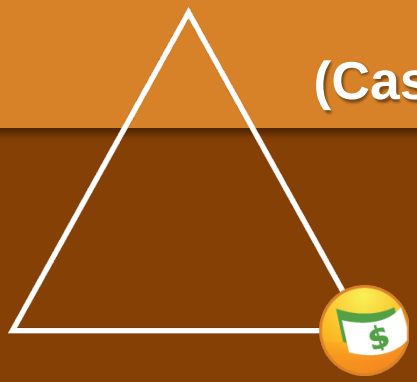
MCDS application provided in handout

TBL Illustration -- *Highly Preliminary*: Comparing IPR v. Winter Flows



TBL Illustration: Comparing IPR to Winter Flows

Highly Preliminary



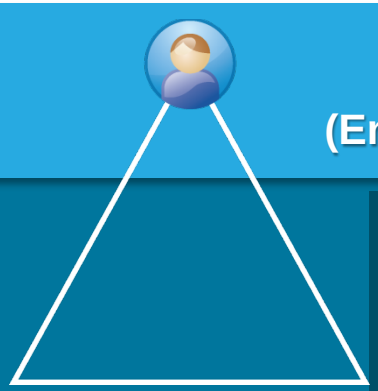
FINANCIAL

(Cash flows for the utility and, hence, customers)

- Lifecycle PV costs of reuse option higher than for winter flows: $278 ($348 M vs. $80M) (-)
- Reuse option may avoid or postpone wastewater treatment plant expansion or upgrade costs (+)
- Reuse costs may be supported by state or federal grants (+)
- Reuse option reduces size of necessary additional storage by 1.7 BG (1.3 BG vs. 3 BG), which may reduce overall costs considerably (+)

TBL Illustration: Comparing IPR to Winter Flows

Highly Preliminary



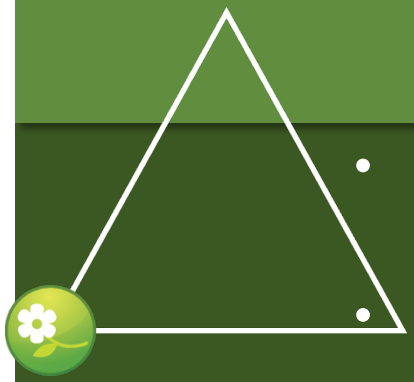
SOCIAL

(Enhanced community values – including nonmarket values)

- Reuse enhances water supply reliability, adding a climate independent source to the portfolio (+)
- Diversifies and thus reduces water delivery risks (as may arise due to wildfire, seismic risk, or uncertainty associated with habitat conservation plans) (+)
- Public health concerns for recycled water need to be carefully and fully addressed (-)
- Reduces scale of needed additional storage (by 57%), which may reduce community disruption and enhance implementability (+)

TBL Illustration: Comparing IPR to Winter Flows

Highly Preliminary



ENVIRONMENTAL

(Impacts on local and global ecosystems)

- Reuse option has greater energy use and carbon footprint compared to winter flow capture (-)
- Reuse option makes productive recycled use of an untapped local “waste” resource (+)
- Reuse reduces effluent discharge to coastal waters (+)
- Reuse option may enable higher instream flows (+)
- Reuse provides more water to restore groundwater levels and/or manage seawater intrusion (+)
- Potential impact on groundwater quality (?)
- Reuse reduces scale of additional storage needs by 57%, which likely reduces environmental impacts (+)

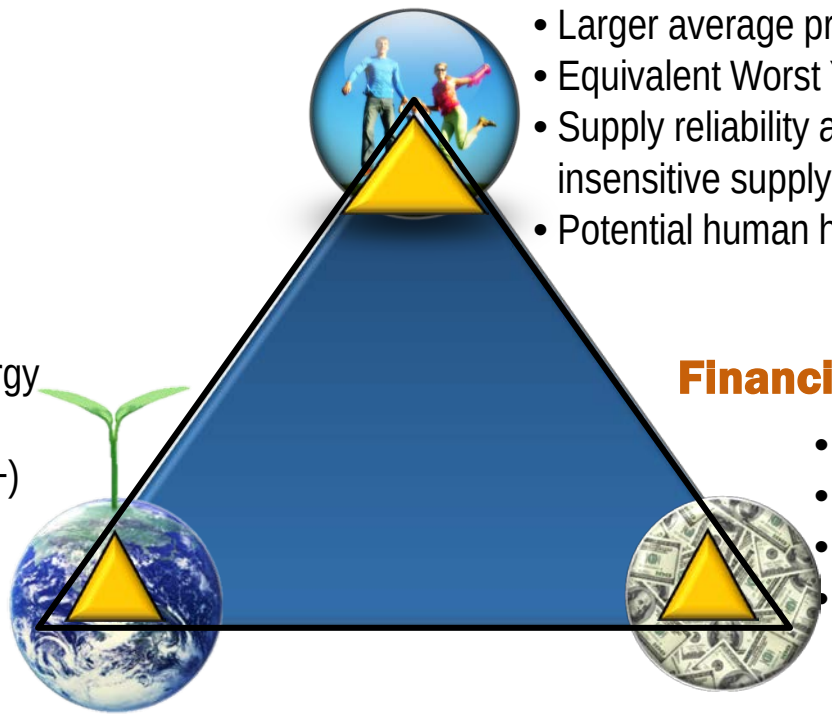
Example TBL Comparison of Reuse and Winter Flow for Storage

Social (+/-)

- Larger average production (1300 MG v. 560 MG) (+)
- Equivalent Worst Year Yields (1360 MG)
- Supply reliability and risk diversification (Climate-insensitive supply source) (+)
- Potential human health concerns (-/?)

Environmental (+/-)

- Higher GHG emissions /Energy use (-)
- Smaller storage/ disruption (+)
- Aquifer restoration (+)
- Groundwater quality (?)
- Surface water quality (+)



Financial (-$278 M PV Cost)

- Higher cost of reuse supply (-)
- Potential for cost subsidies (+)
- Possible WWTP savings (+?)
- Smaller storage = cost savings (+)

Illustrative and Highly Preliminary

Exercise Overview

- Objectives
- Questions for Consideration
- Report Out Requirements

Exercise Overview

- Objectives
  - Practice bargaining communication skills
  - Identify set of Alternatives you want to examine in more detail
  - Compare Alternatives using MCDS criteria
  - Identify how you will handle uncertainties and timings
  - Begin constructing a frame for your recommendations that includes the above

Process Suggestion

1. Identify demand-supply gap objectives
2. Identify set of Alternatives or combination of Alternatives that could be used to meet the gap
3. Narrow to set you want to consider
4. Use MCSD to discuss the pros and cons of your options
5. Select Portfolio for Report Out
6. Fill in Report Out Sheet

Report Out Sheets

Handouts

Questions for consideration

- Fish flow: scenarios or signposts?
- What other exogenous events need scenarios or signposts to make your plan adaptable?
- How will your plan fit in with the current CIP?
- How will you handle the large uncertainties?