Lower Santa Cruz River Basin Study:

Study Review and Introduction to Supply-Demand Scenario Combinations

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Stakeholder Advisors Meeting #2
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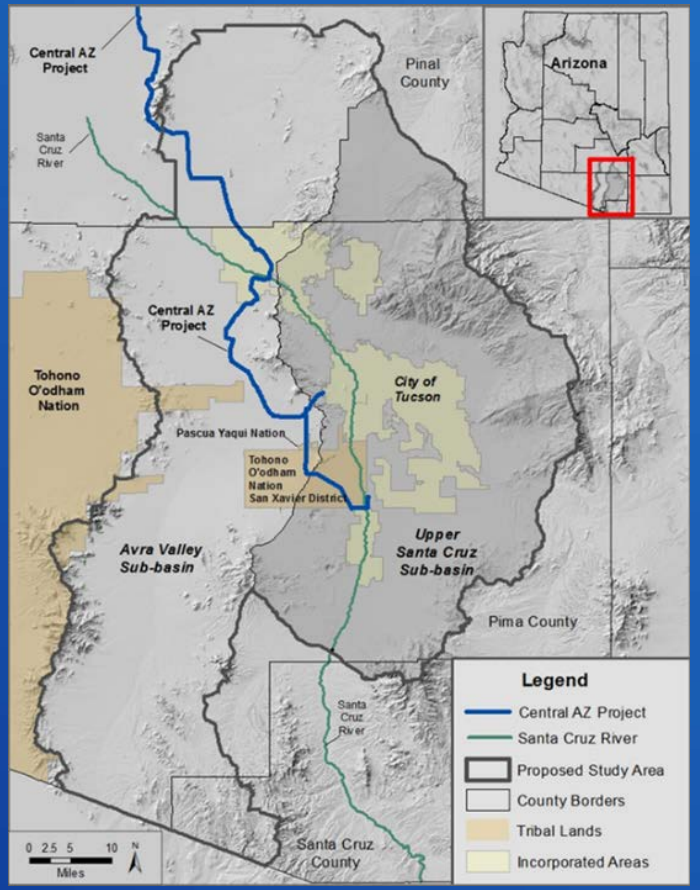

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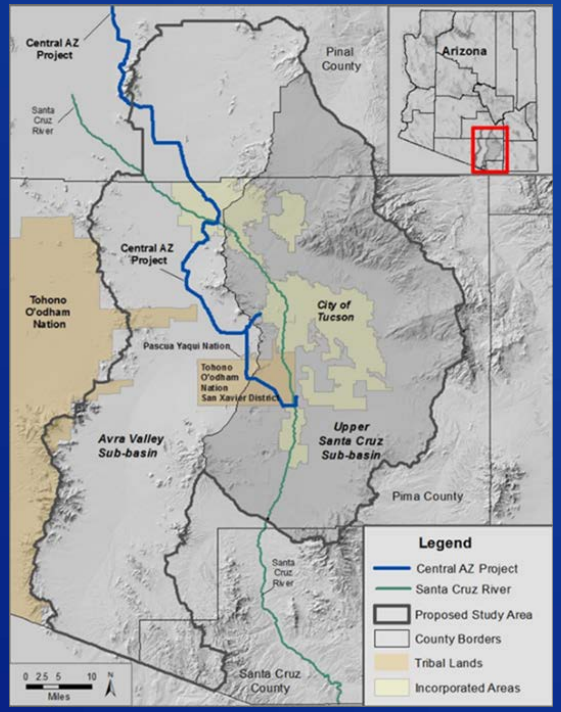
Lower Santa Cruz River (LSCR) Basin Study Summary



- Addresses the impacts of changing climate, population and other factors on water use through 2060
- Focuses on spatial distribution of water resources in the Tucson basin (Tucson Active Management Area)
- Includes analysis of environment (riparian areas)
- Employs a scenario approach to explore range of futures (with and without adaptation measures)
- Uses multiple climate projections as input to groundwater and surface water models
- ***Incorporates Input from Public and Stakeholder Advisors***

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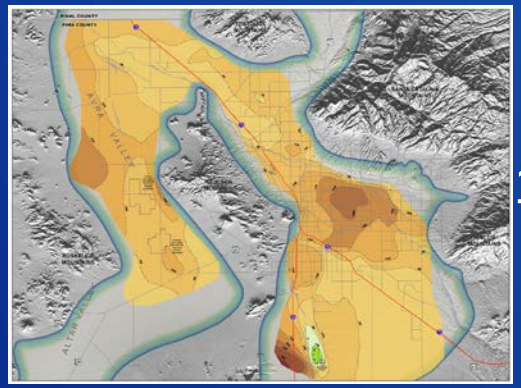
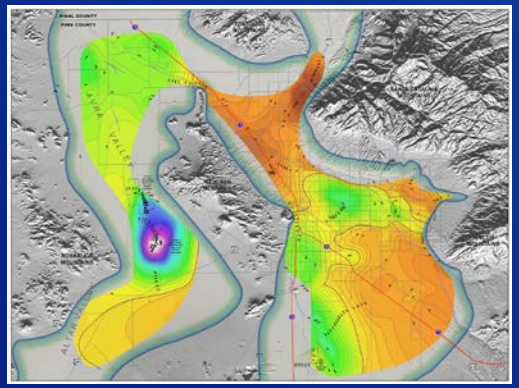
LSCR Basin Study Objectives

Tucson Basin Water Level Changes



1950 - 2000



2000 - 2014

1) Identify Where Physical Water Resources are Needed to Mitigate Supply-Demand Imbalances

2) Develop Adaptation Strategies to Improve Water Reliability for Municipal, Industrial, Agricultural and Environmental Sectors

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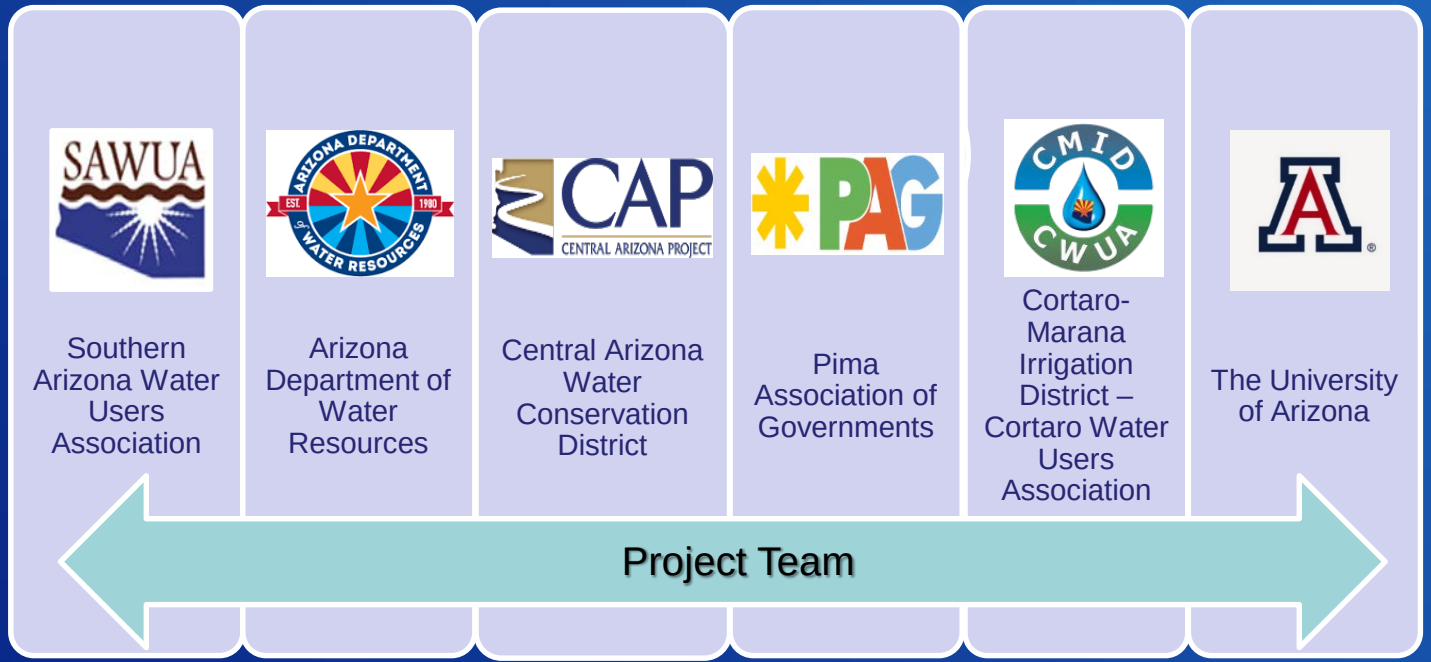
Cost-Share Partners



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SAWUA Members

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Other organizations with participating staff include:

- Tohono O'odham Nation
- Pascua Yaqui Tribe
- ASARCO
- Freeport McMoran
- Vail Water
- Tucson Electric Power
- Pima County Flood Control District
- Sonoran Institute
- AZ Land and Water Trust
- Watershed Management Group
- Community Water Coalition
- Coalition for Sonoran Desert Protection
- Sky Island Alliance
- Tucson Audubon Society
- The Nature Conservancy
- American Rivers

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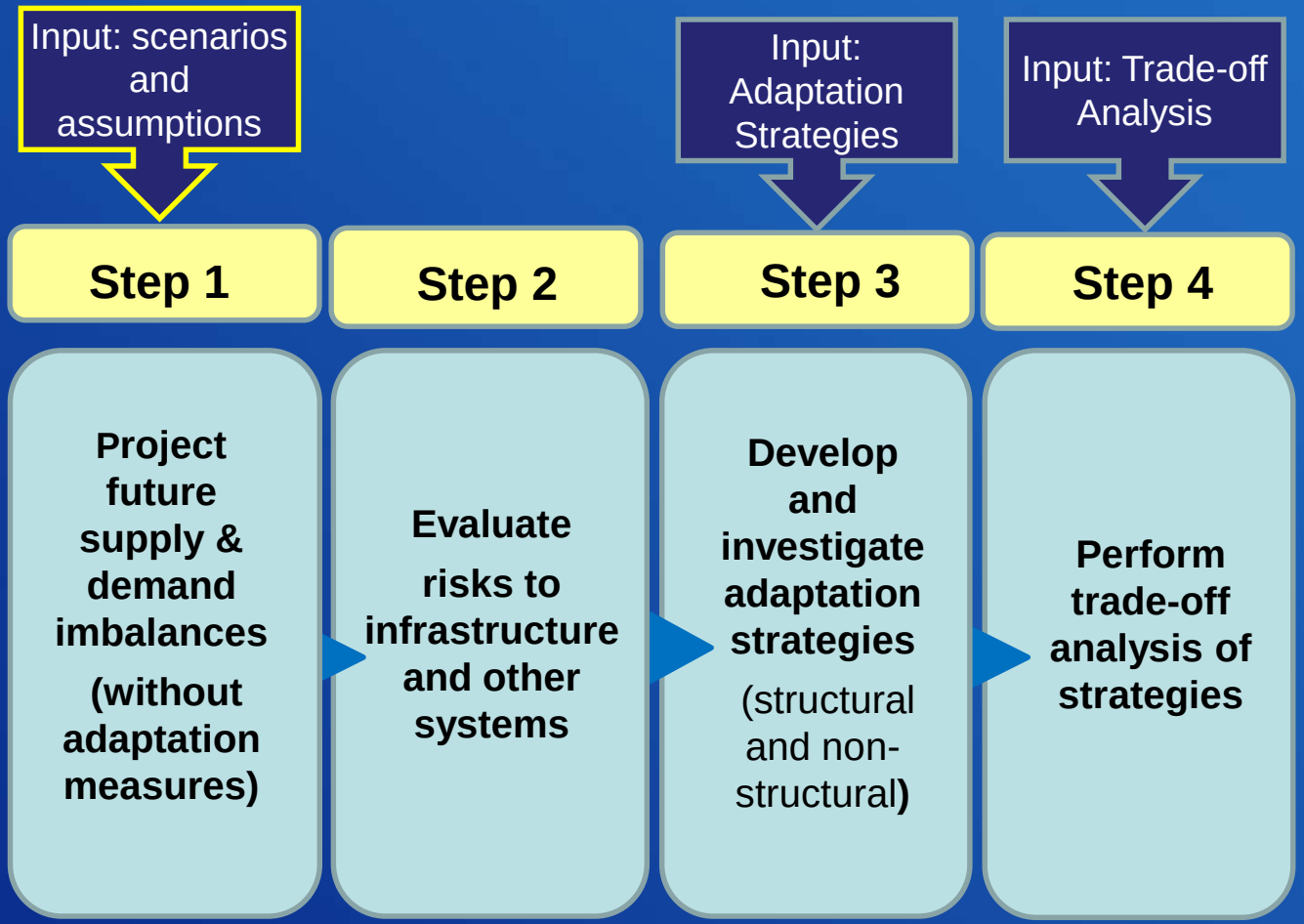
Key Terms

- ***Scenario –*** set of assumptions used to help understand potential future conditions
- ***Risk -*** threats to life, health and safety, the environment, economic well-being, and other things of value
- ***Adaptation -*** Adjustment in natural or human systems to a new or changing environment that exploits beneficial opportunities or moderates negative effects

Source: U.S. Global Change Research Program,
Link to Global Change Glossary

Public Involvement: Key Part of Process

All Reclamation Basin Studies must have four required elements



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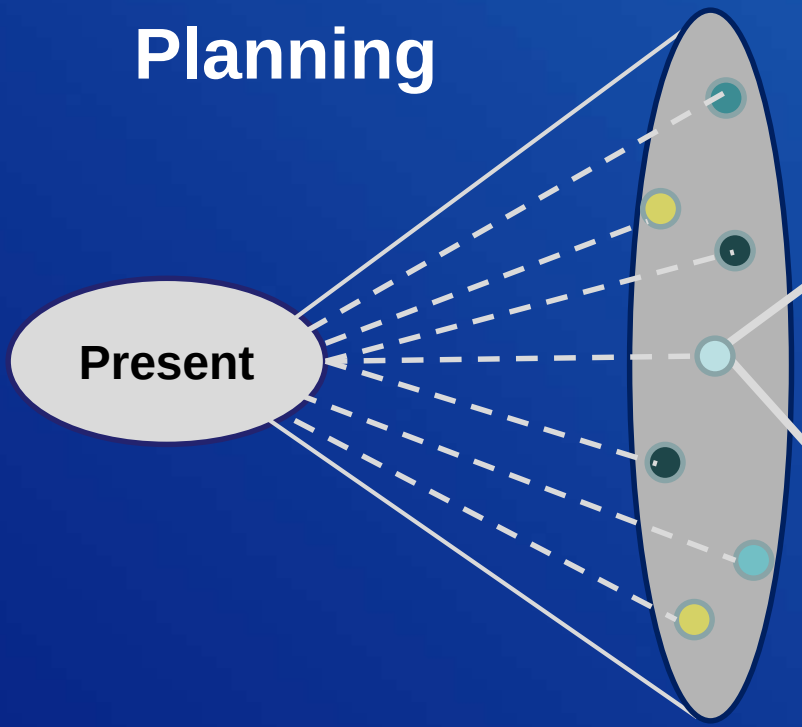
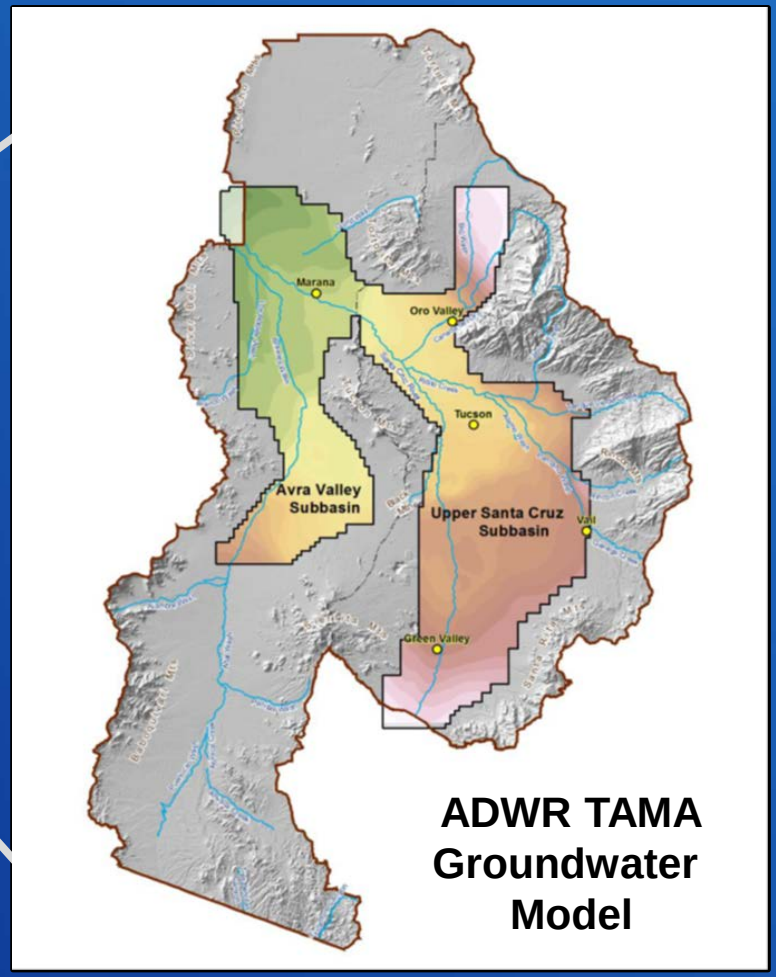
Scenario Planning





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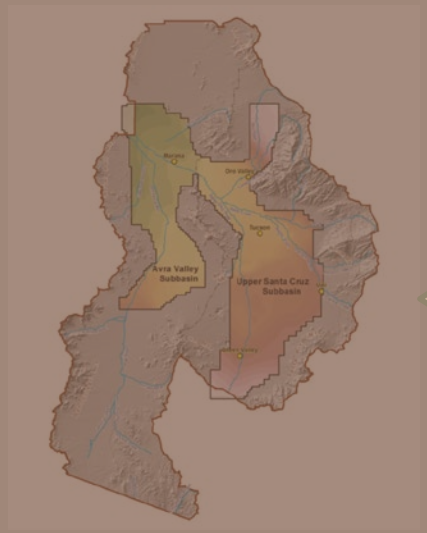
Simplified Modeling Overview

Tucson AMA Groundwater Model



Climate Driving Forces
(Precipitation, Temperature)

GLOBAL CLIMATE MODELS

SURFACE HYDROLOGY MODEL

Socio-Economic Driving Forces
(Demographics, Economics, Technological, Regulatory)

CAP SERVICE AREA MODEL

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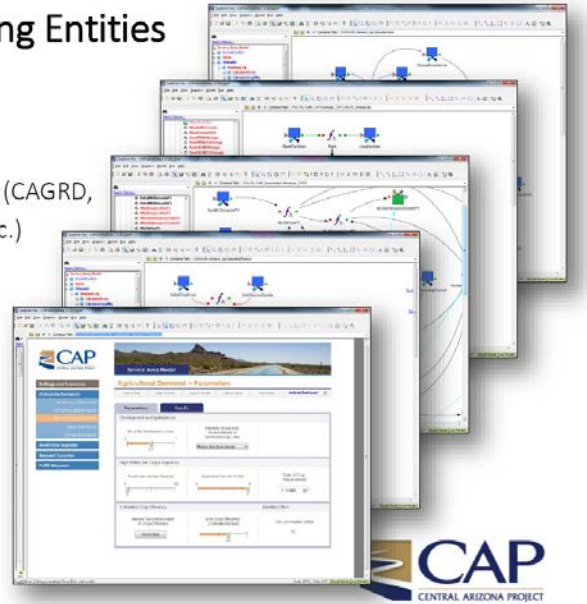
Socio-Economic Forces - CAP Service Area Model

CAP Service Area Model (CAP:SAM)

- All Major Water Using Entities
  - 80 Municipal Providers
  - 23 Irrigation Districts
  - 12 Tribes and Districts
  - 20+ other user categories (CAGRD, AWBA, Industrial users, etc.)
- 16 Water Supply Types
  - Includes Surface Water, Effluent, CAP, LTSC, Groundwater, Recovered Water, etc.
  - Incorporates shortage scenarios from Colorado River Simulation model (CRSS)



Models municipal, agricultural and industrial demands and supplies used to meet them

Projects service providers total :

- Recharge and delivery of CAP and effluent
- Groundwater pumping
- Agricultural and incidental recharge

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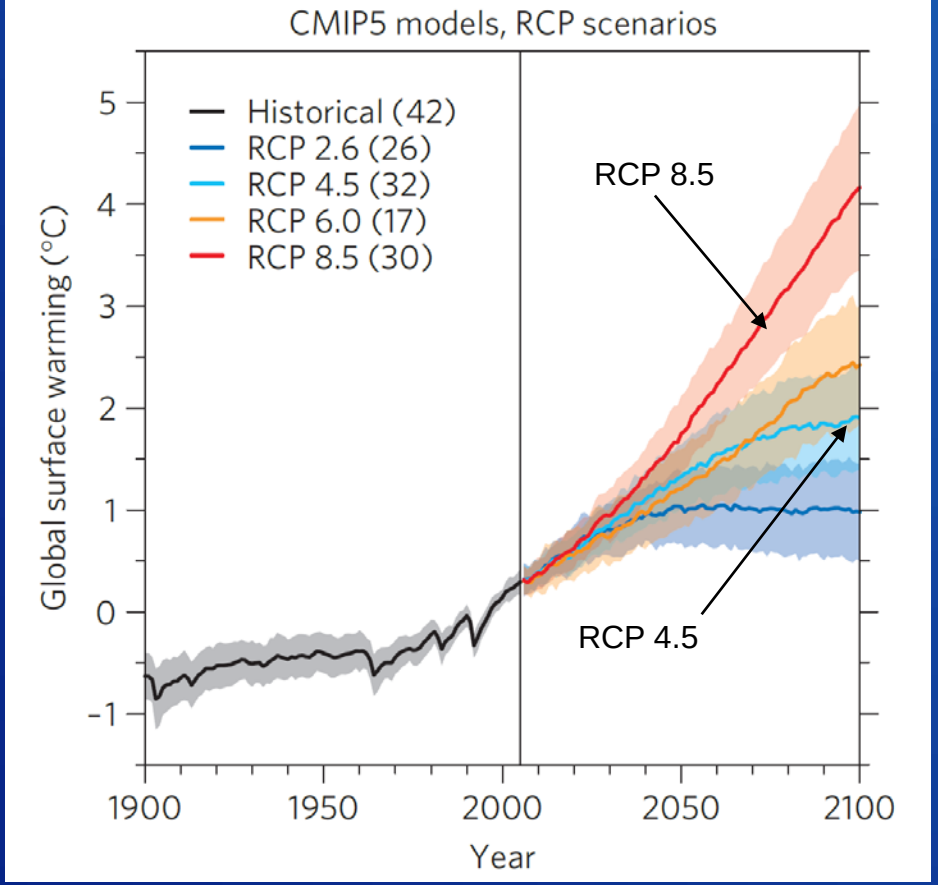
Draft Demand Matrix (for input into CAP:SAM)

Draft Demand Matrix (for input into CAP:SAM)

Driving Forces	Demand Scenario 1 Baseline	Demand Scenario 2 Slow Compact Growth	Demand Scenario 3 Slow Outward Growth	Demand Scenario 4 Rapid Outward Growth	Demand Scenario 5 Rapid Outward Growth Plus Mining and no Replenishment
Demand Scenario Summary	Medium growth series	Low growth series: condensed growth pattern, no additional mines, no overdraft in Green Valley	Medium growth series: outward growth pattern, new mine development, replenish Green Valley	High growth series: outward growth pattern, new mine development, replenish Green Valley	High growth series: outward growth pattern, mining growth, no replenishment in Green Valley
Municipal Demand: Population Growth Rate	Medium	Low Series	Medium Series	High Series	High Series
Municipal Demand: Infill vs. Outward Growth	Baseline	In-Fill/Redevelopment	Slow Outward	Rapid Outward	Rapid Outward
Municipal Demand: Gallons Per Household Unit Per Day	Decline as expected	Decline faster than expected	Decline as expected	No change in current GPHUD	No change in current GPHUD
Municipal Demand: Additional recharge	per current CAP-SAM assumptions	Year 2020	Year 2030	Year 2030	Never
Municipal Demand: Develop Ag Land or Undeveloped Land	Baseline	Low GPHUD development tends to replace high water use ag land.	CAP-SAM Baseline	Higher GPHUD development occurs on undeveloped land before replacing agriculture	Higher GPHUD development occurs on undeveloped land before replacing agriculture
Agricultural Demand: Consumptive Use (CU) Crop	Baseline	Some ag areas convert to low CU crops	No change in CU crops	Some ag areas convert to higher CU crops	Some ag areas convert to higher CU crops
Agricultural Demand: Groundwater Savings Projects	per current CAP-SAM assumptions	Highest savings start 2018	Highest savings start in 2018	Half of highest savings start in 2025	No savings
Industrial Demand: Manufacturing	Baseline	Slow economic growth and/or greatly improved water use efficiency	Moderate economic growth within existing water service areas, expected improvements in efficiency	Rapid economic growth that depends on groundwater, minimal improvements in efficiency	Rapid economic growth that depends on groundwater, minimal improvements in efficiency
Industrial Demand: Mining	Baseline	No new mines	New mine in 2020-2030	New mine in 2020-2030, Existing mines expand	New mine in 2020, Existing mines expand
Environment's Demand: Riparian Evapotranspiration	Baseline	Changes with climate and availability of surface water and shallow groundwater	Changes with climate and availability of surface water and shallow groundwater	Changes with climate and availability of surface water and shallow groundwater	Changes with climate and availability of surface water and shallow groundwater

Representative Concentration Pathways (RCPs)



- Used to compare results of global climate models
- Climate model projections available for RCP 4.5 and RCP 8.5
- RCP 4.5 – “Best Case / Lower Risk”
- RCP 8.5 – “Worse Case / Higher Risk”

Source: Knutti, R. and J. Sedlacek, 2013. “*Robustness and uncertainties in the new CMIP5 climate model projections*”, Nature Climate Change 3, pp. 369 - 373.

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Scenarios Focus on Risk

“Best Case”
Lower Emissions Future
(RCP 4.5)

“Worse Case”
Higher Emissions Future
(RCP 8.5)

Lower Risk  **Higher Risk**

“Base Case”
Without Climate Change
(For Comparison Purposes)

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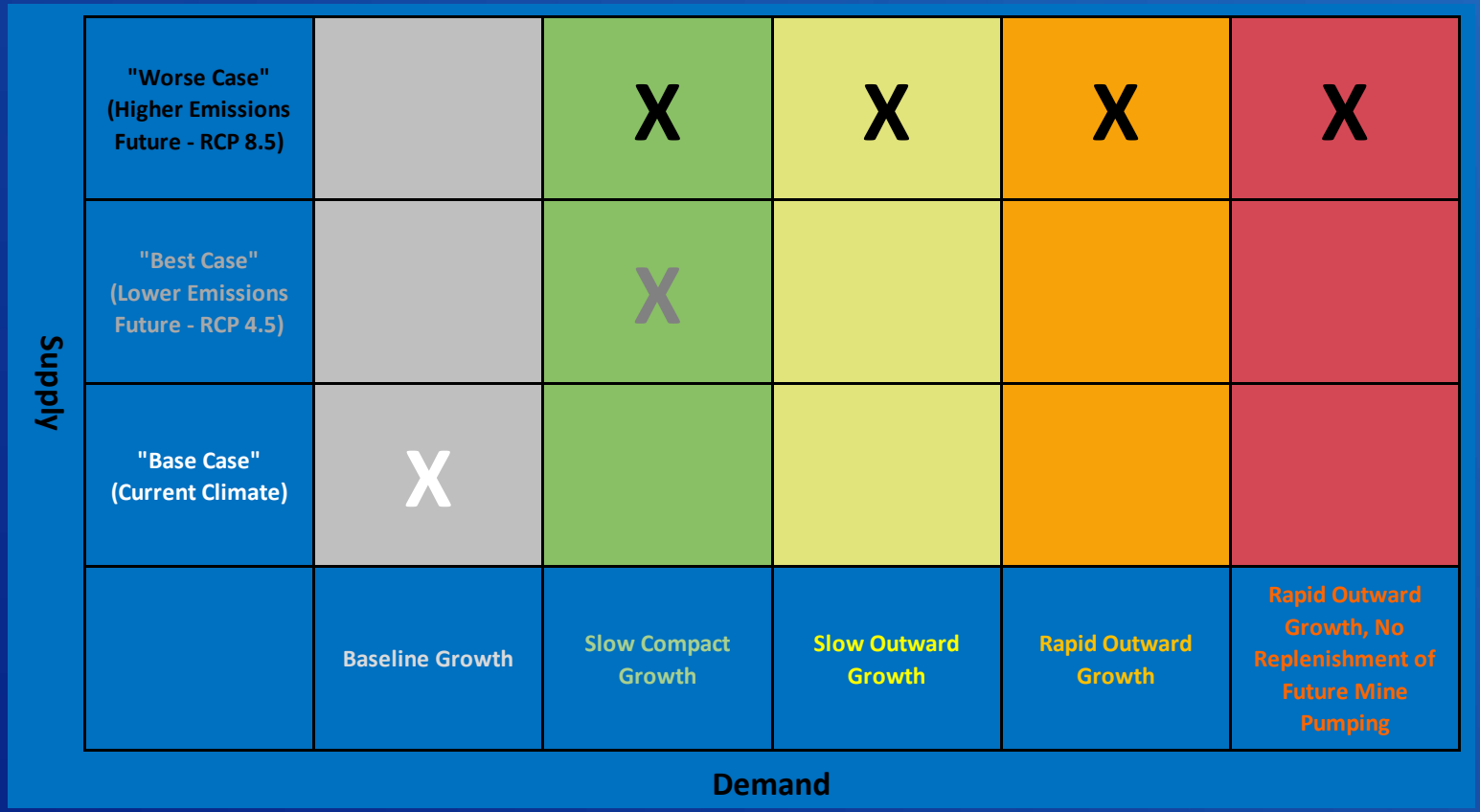
Proposed Supply- Demand Scenario Combinations



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What we are going to discuss today?

1. Do the scenario combinations selected do a good job of describing the range of risk?
2. Should any scenario combinations be deleted?
3. Should any scenario combinations be added?

GUIDED DISCUSSION OF CLIMATE – CAP:SAM DEMAND MATRIX

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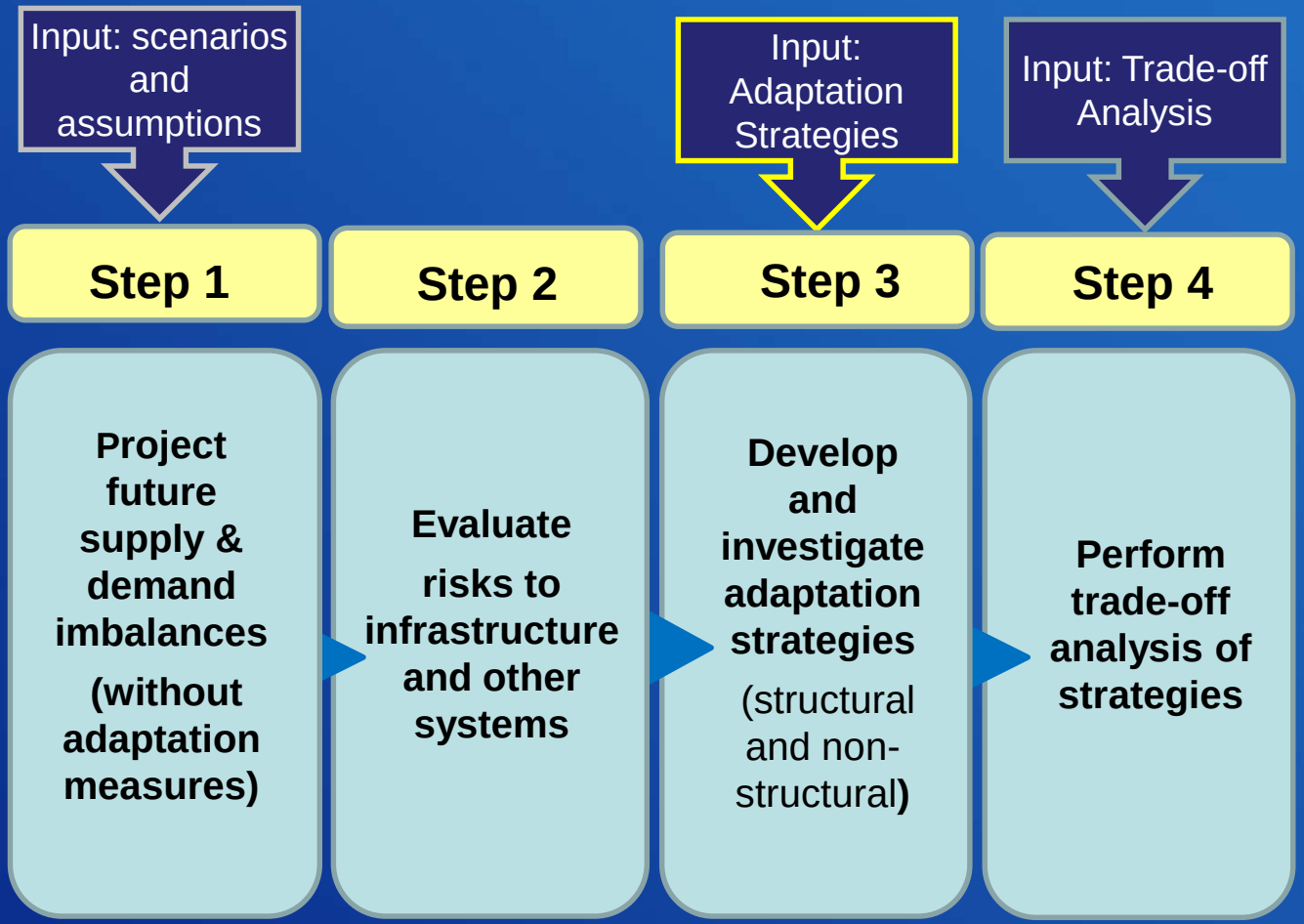
Next Steps:



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GUIDED DISCUSSION OF OBJECTIVES FOR ADAPTATION STRATEGIES

(IF TIME ALLOWS)

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Thank you for participating!

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