

Water and Climate Change – Planning for Uncertainty Brandon Goshi Metropolitan Water District October 13, 2022

Overview

- Metropolitan Water District and its planning scope
- Evolution of uncertainty planning for MWD
- Moving to Scenario Planning in the 2020 IRP

Metropolitan Water District and its Planning Scope

Metropolitan Water District of Southern California

Water Wholesaler
26 Member Agencies
19+ Million People
5,200 Square Miles
~3 to 4 MAF Annual Demand
½ MWD Imported Supplies

MWD Service Area

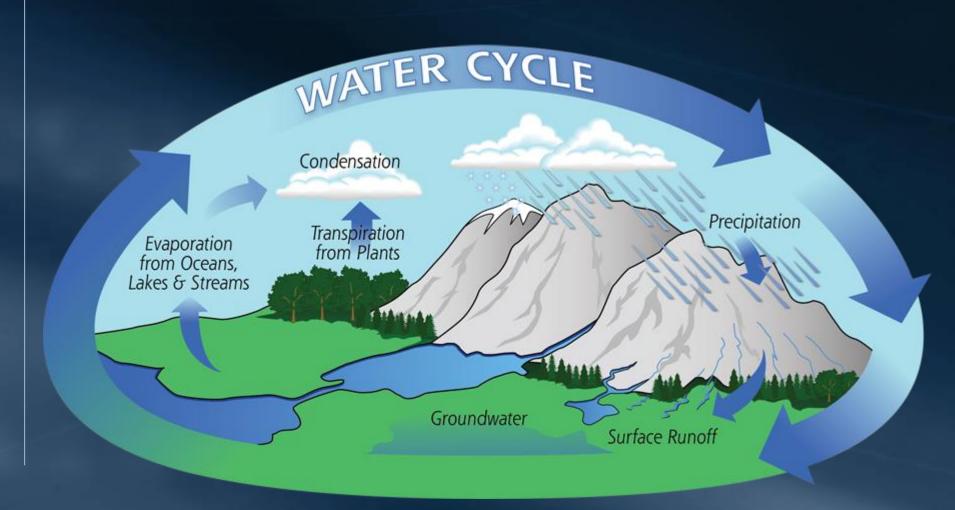
Sources of Water for Southern California



Metropolitan's Imported Water Supply

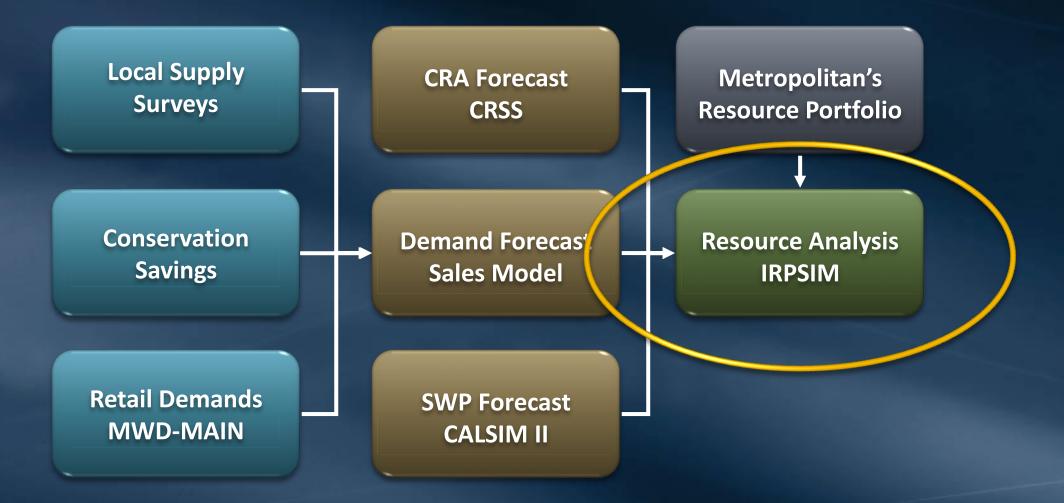


Runoff is a key measure of the health of our water supply



Evolution of Uncertainty Planning for MWD

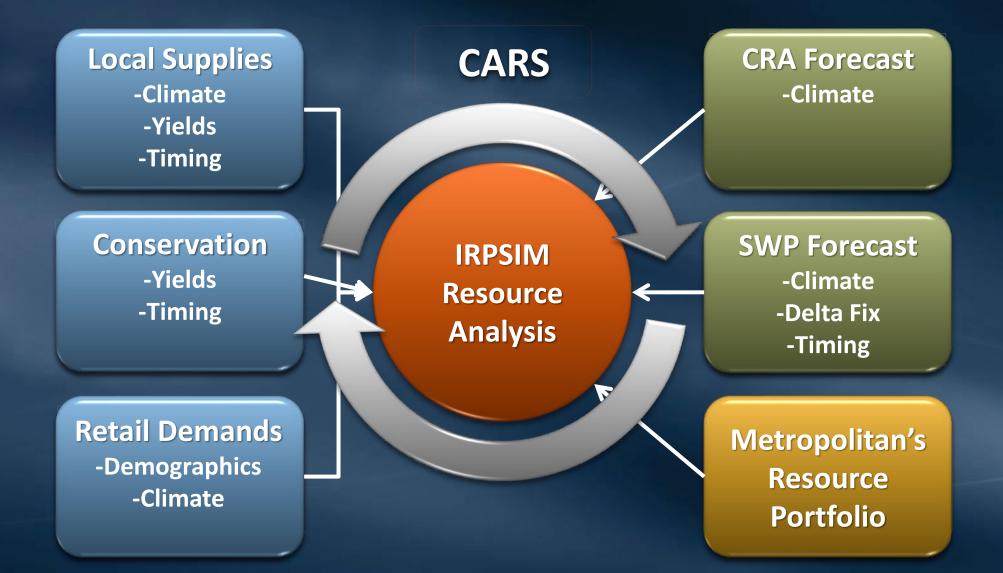
Metropolitan's Planning Models



Defining Future Uncertainties for RDM The Experimental Design

Factor	Range of Uncertainty
Demographic Changes	4 Scenarios: Balanced Growth, Baseline Growth, Periurban Growth, High Growth
Climate Conditions	12 Climate Scenarios: 6 GCMs x 2 Emissions Scenarios used by IPCC
Bay-Delta Conditions	3 Scenarios: No Delta Fix, Partial Delta Fix, Full Delta Fix
Local Resource Yields	±20% Variation in Groundwater, Recycling, Groundwater Recovery, Conservation
Project Implementation Timing	Delays: 0-10 years Desalination & Recycling, 0-20 years Conservation, 0-30 years Delta Fix

Incorporating Uncertainty In RDM Using an Existing Model Framework



RDM Analytical Approach

- Analyzed +6,900 combinations of uncertainty
- Used "scenario discovery" to identify where IRP Resource Mix failed:
 - Net Balance
 - Total Storage
- Used statistical methods to identify and determine common areas of vulnerability

Summary of RDM Conclusions

- The IRP approach is vulnerable when two or more uncertainties turn out unfavorably
 - Example: High inland growth combined with an increasingly hot/dry climate
- Key uncertainties to "signpost" and monitor
 - Future Delta conditions
 - Demographic trends
 - Groundwater yields
 - Climate Conditions

Signposts for Monitoring

Demographics

- Growth Rates
- Areas of Growth
- Housing Type Trends
- Density Trends
- Employment

Local Supplies

- GW Adjudications
- Water Quality Impacts
- Regulations
- New Projects/Timing
- Reduced Yields

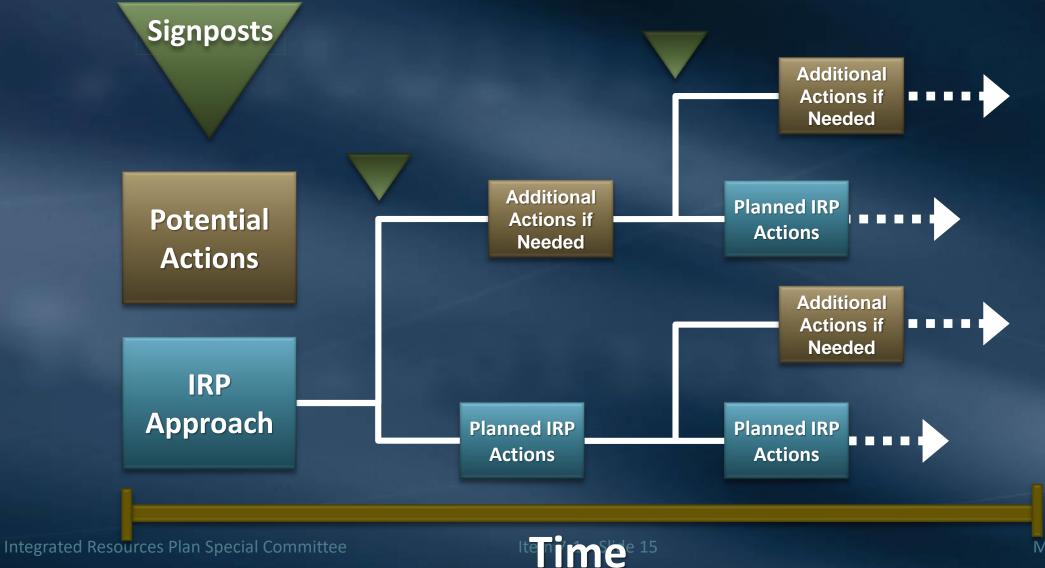
Bay-Delta

- Environmental Impacts
- Ecosystem Restoration
- New and Improved Facilities
- Operations

<u>Climate Change</u>

- Precipitation Trends
- Temperature Trends
- Global Modeling results
- Downscaling improvement

IRP Adaptive Plan Approach



March 22, 2022

Re-Defining Future Uncertainties Factors and Ranges

Factor	Range of Uncertainty
Demographic Changes	4 New Scenarios: Baseline, Balanced Growth, Peri-Urban Growth, High Growth
Climate Conditions	12 Climate Scenarios: Used to inform a range of <u>Delta Method</u> climate scenarios and map results
Bay-Delta Conditions	2 Scenarios: No California WaterFix, Full California WaterFix
Local Resource Yields	±20% Variation in Groundwater, Recycling, Groundwater Recovery, Conservation
Project Implementation Timing	Delays: 0-10 years Desalination & Recycling, 0-20 years Conservation, 0-30 years Delta Fix

Climate Thresholds and Signposting

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GCM Climate Modeled Temperatures



Temperature Threshold in 2030



GCM Climate Modeled Temperatures

Moving to Scenario Planning

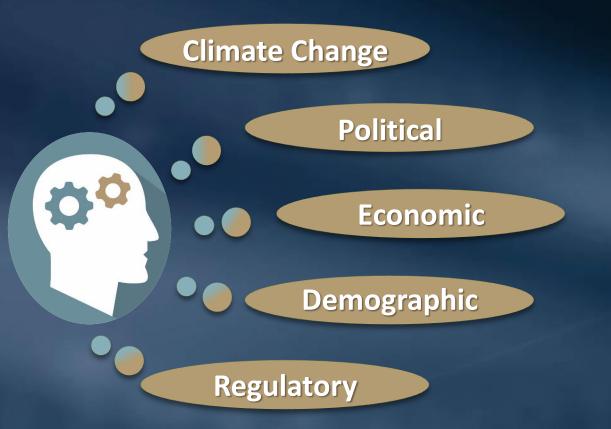
2020 IRP- Scenario Planning Approach

- While RDM is more comprehensive it is difficult to explain the multitude of "what if" outputs. Scenario Planning is clearer and more transparent
- Key potential vulnerabilities and "Drivers of Change" were identified in an extensive stakeholder/public process
- Regarding Climate Change Uncertainty, MWD engaged an expert panel to identify ranges of uncertainty used to define the scenarios included in the IRP
 - Incorporated either a moderate or severe climate change future into the modeling framework for supply and demand

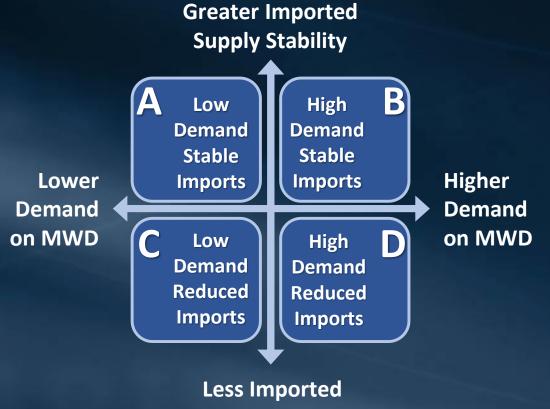
Incorporating Uncertainty in Scenario Planning

Driver	Scenario Input 1	Scenario Input 2
Climate Change	Gradual rise in temperatures and erratic precipitation	Rapidly rising temperatures and erratic precipitation
Legislative and Regulatory	Modest constraints	Severe constraint
Demographics	Sluggish economy, moderate population growth and strong water use ethic	Economy and population strong and water use ethic decreases

Uncertainties



Brainstormed Drivers of Change: Conducted surveys and workshops, and collaborated with MWD Board, member agency staff, climate and demand experts, and other interested parties

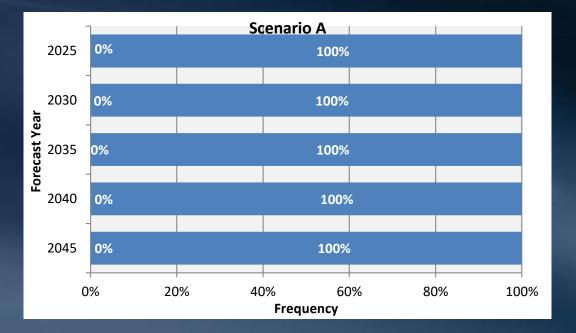


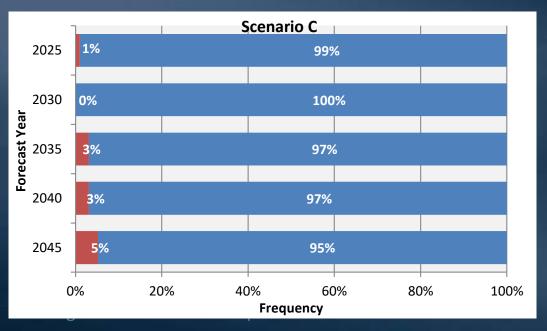
Supply Stability

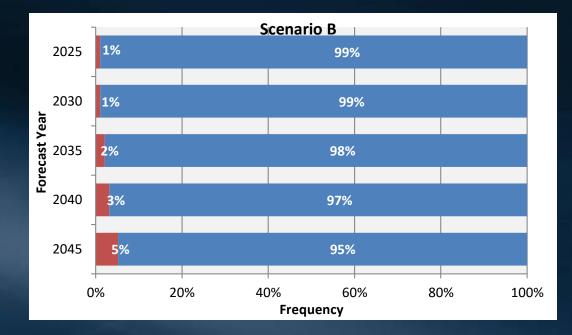
Stepping through the Analytical Framework

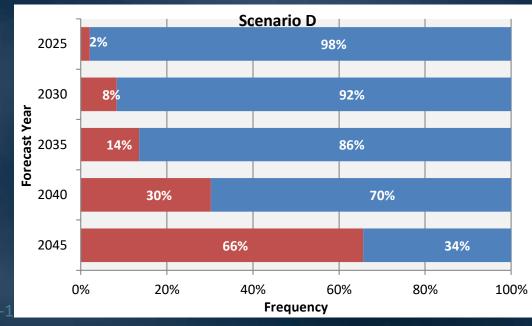
- 1. Quantify driver/uncertainty impacts on supply and demand for each scenario
- 2. Conduct "gap analysis" to show magnitude and frequency of shortages through 2045 for each scenario

3. Identify actions to minimize supply/demand gap and maintain reliability for each scenario









Lessons Learned - Moving Forward

- Balancing communication and transparency with analytic rigor is important
- Complex approaches and findings are challenging to communicate and gain understanding
- RDM vs Scenario Planning
 - RDM is more technically complex
 - Scenario Planning is more transparent and helped to increase collective understanding of uncertainties and vulnerabilities

