WATER TOMORROW

2020 Integrated Resources Plan

SCENARIO PLANNING

CONSTRUCTING SCENARIOS - QUALITATIVE-QUANTITATIVE ASSESSMENT

Member Agency Technical Workgroup Meeting

July 15, 2020

Objectives for Member Agency Technical Workgroup

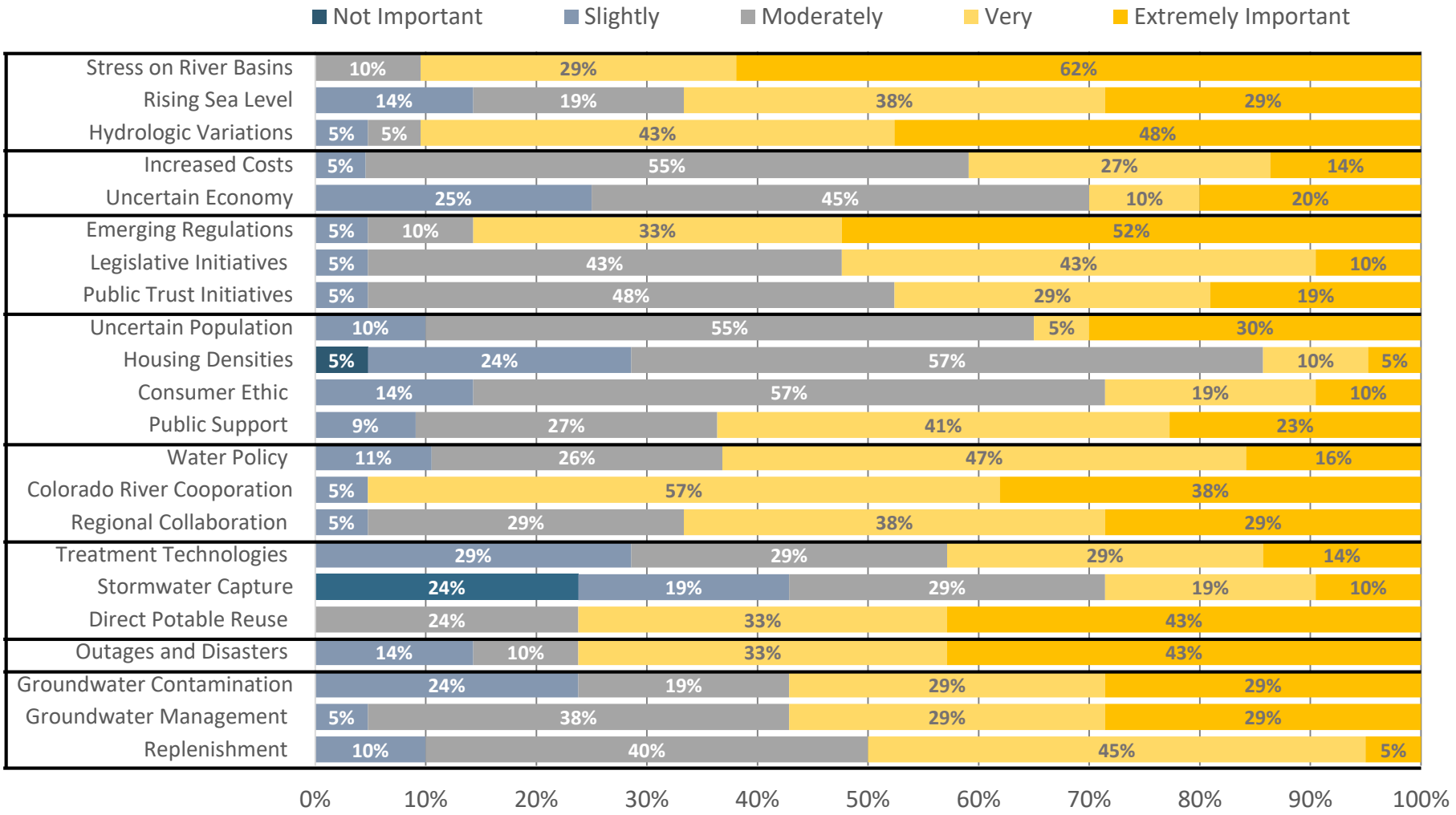
- Drivers of Change survey results and how the information will be used
- Discuss the Qualitative-Quantitative Assessment process through examples
  - Methodology used to screen and examination drivers
  - Progress update
  - Opportunities to provide feedback

DRIVERS OF CHANGE SURVEY RESULTS

Drivers of Change Survey

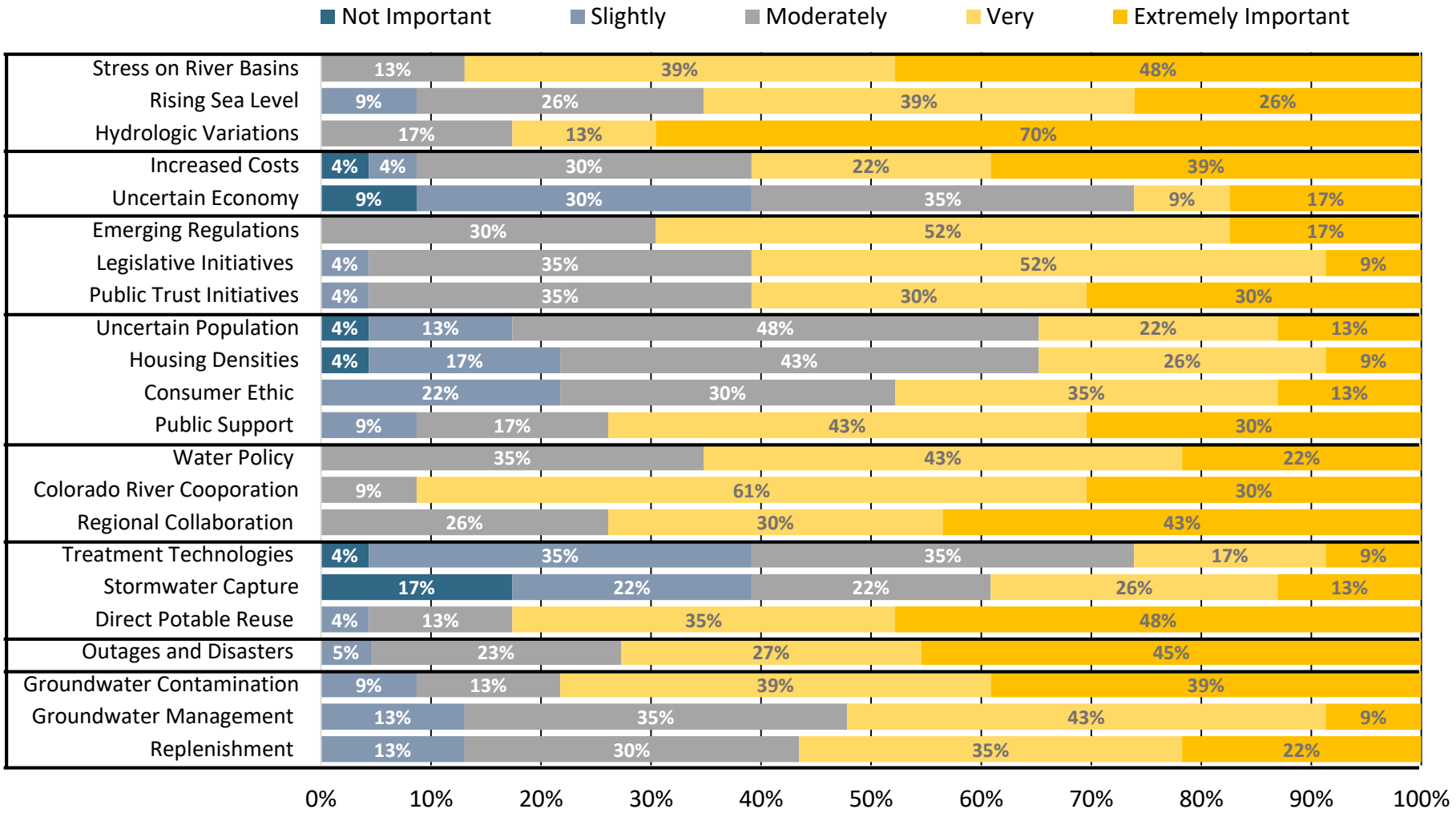
Survey Response Statistics by Driver

Board Members – 25 Responses (70%); 13% NA



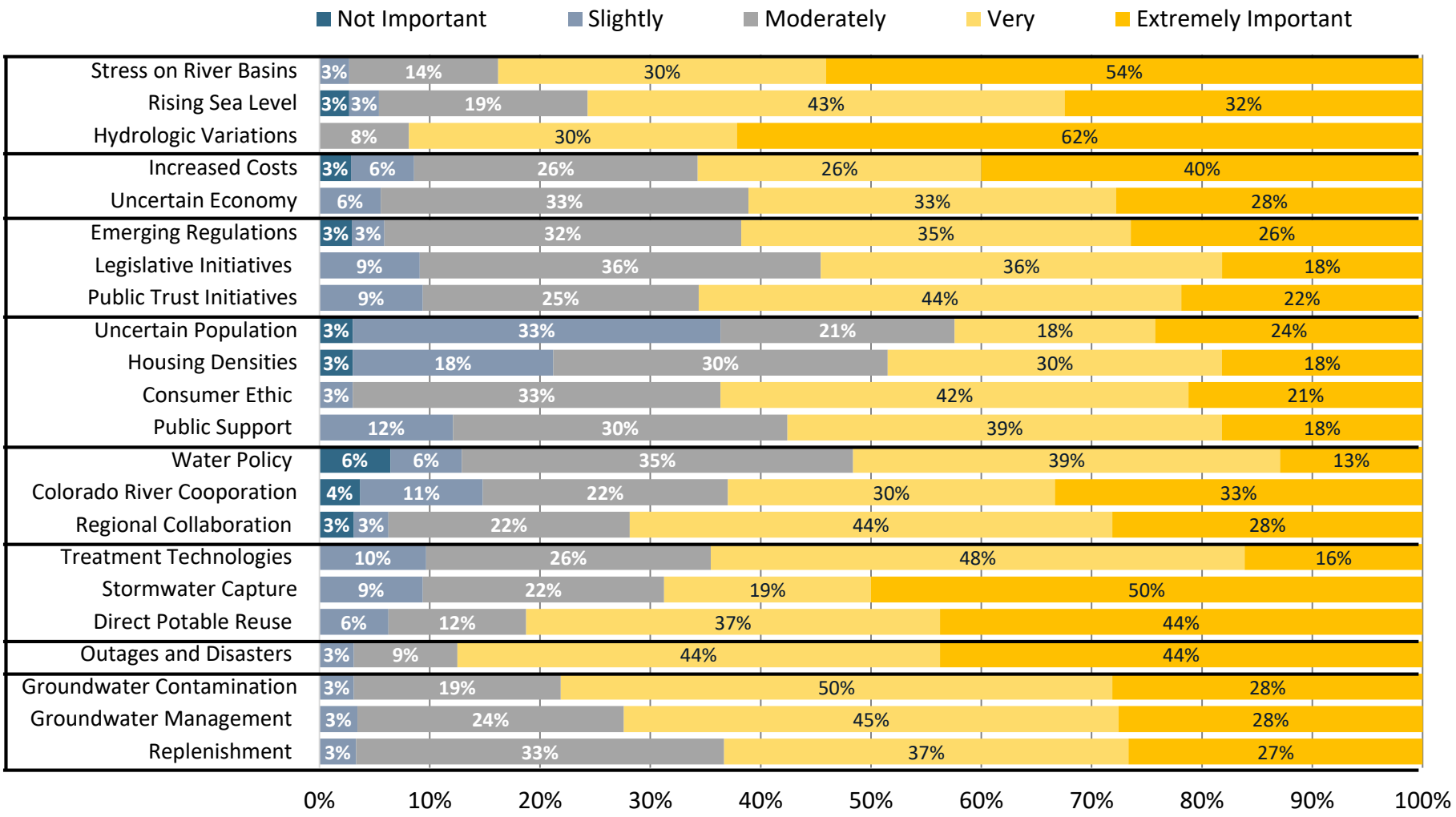
Survey Response Statistics by Driver

Member Agency– 23 Responses (89%); <1% NA



Survey Response Statistics by Driver

Stakeholders– 43 Responses (10%); 4.6% NA



Top 5 Survey Rankings by Cohort

Based on Percentage of Responses that Were Extremely or Very Important

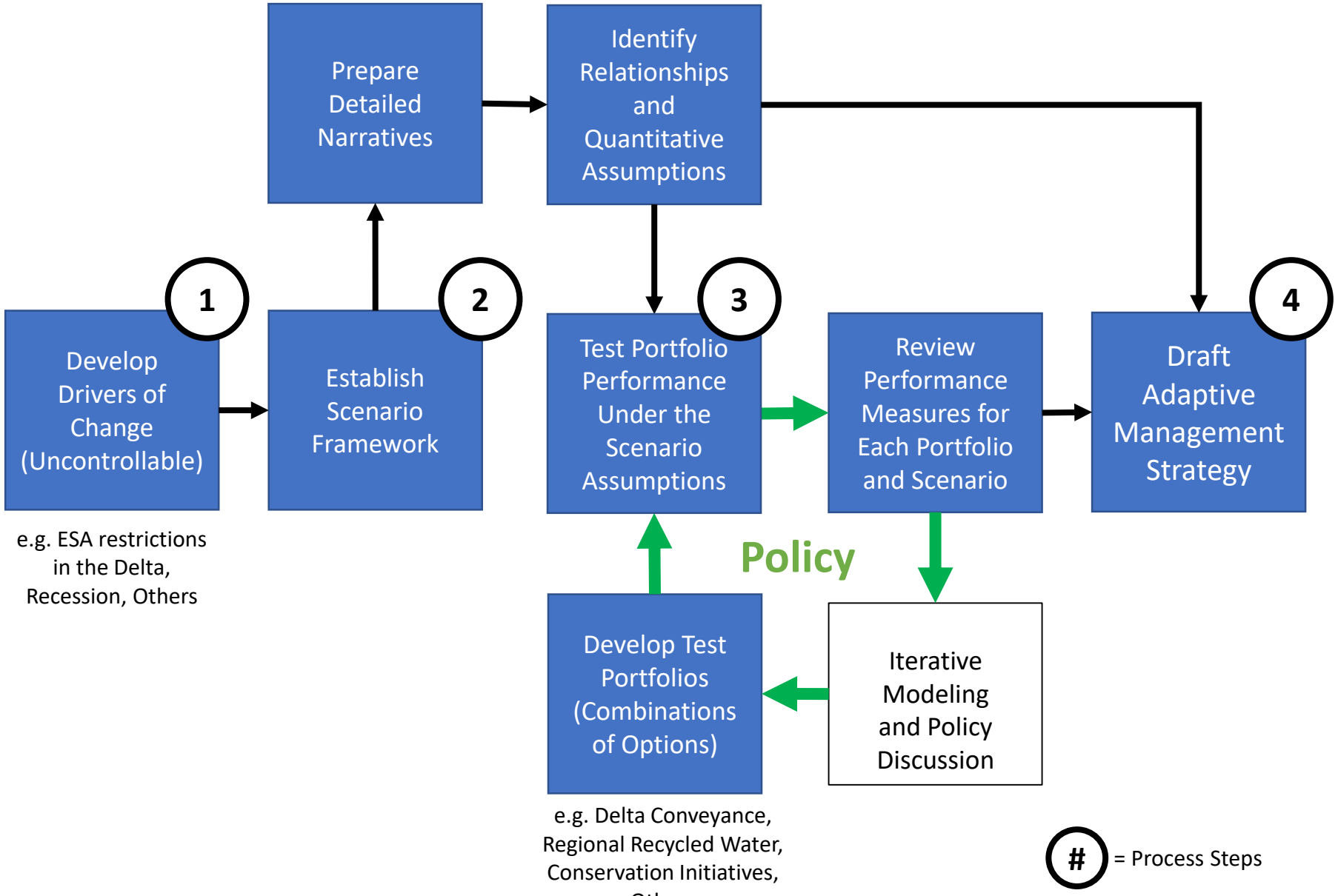
Board Members	%
Colorado River Cooperation	**95%**
Hydrologic Variations	**90%**
Stress on River Basins	**90%**
Emerging Regulations	**86%**
Direct Potable Reuse	**76%**
Outages & Disasters	**76%**

Member Agencies	%
Colorado River Cooperation	**91%**
Stress on River Basins	**87%**
Direct Potable Reuse	**83%**
Hydrologic Variations	**83%**
Groundwater Contamination	**78%**

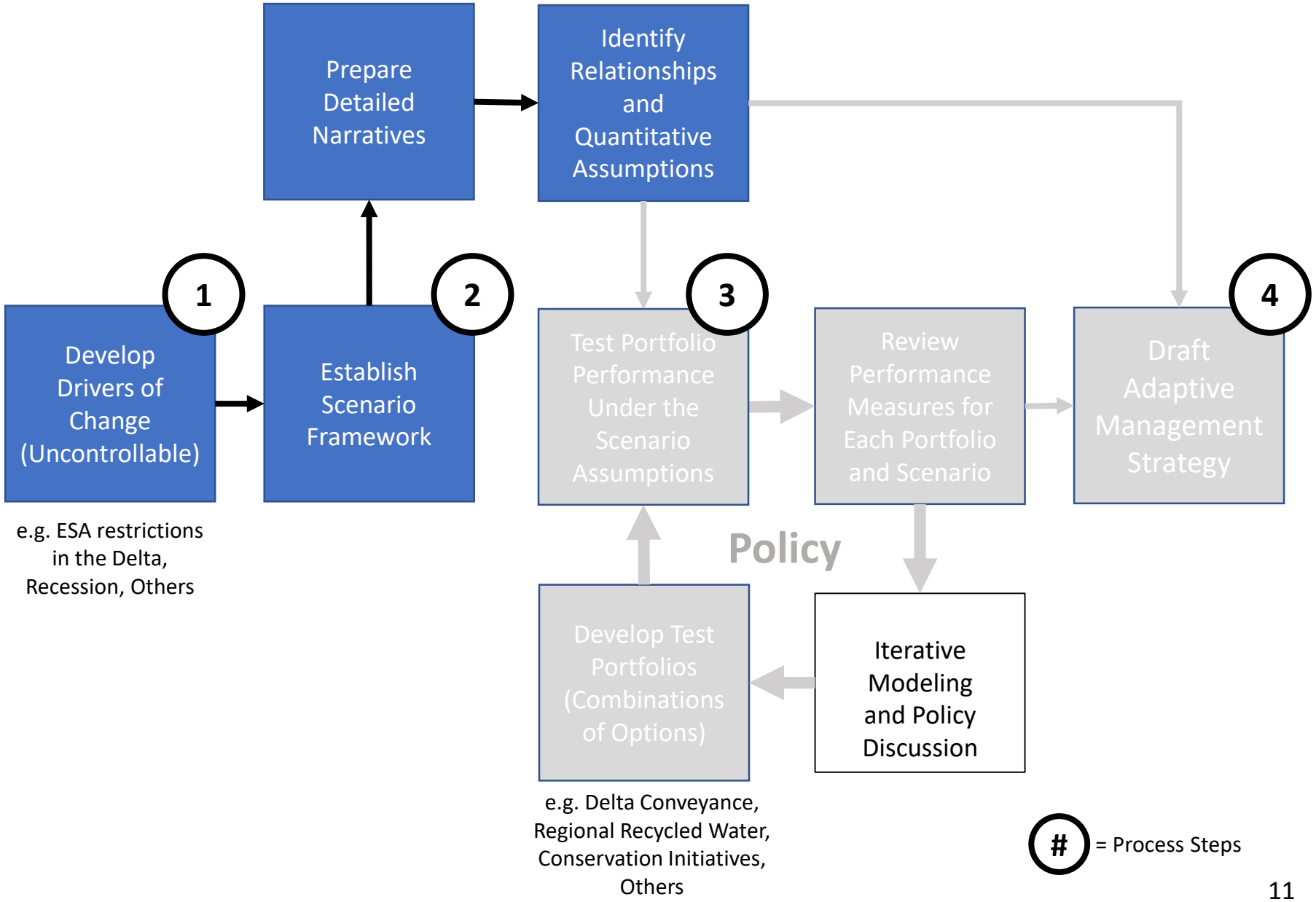
Stakeholders	%
Hydrologic Variations	**92%**
Outages and Disasters	**87%**
Stress of River Basins	**84%**
Direct Potable Reuse	**81%**
Groundwater Contamination	**78%**

CONSTRUCTING SCENARIOS - RECAP OF PROCESS

2020 IRP Process Flow Chart

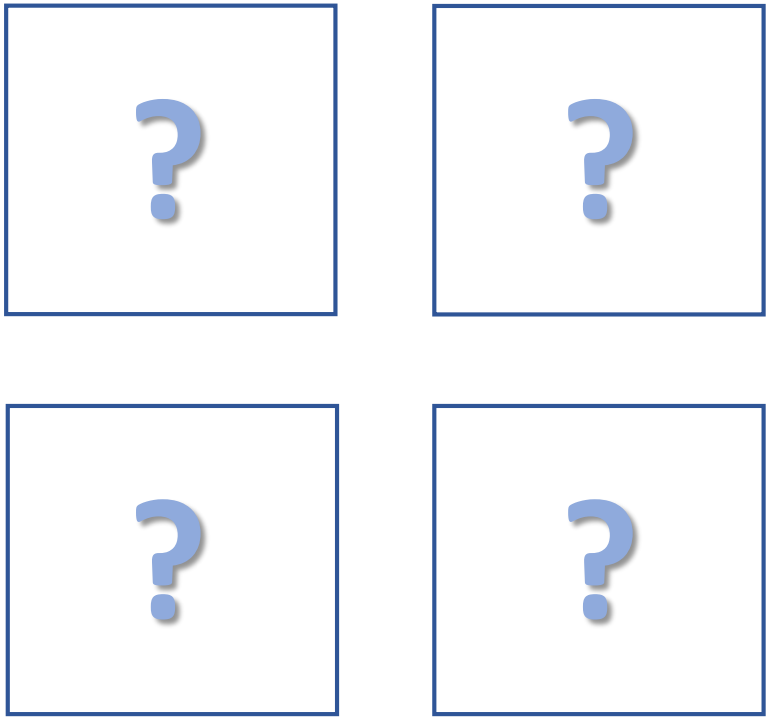


2020 IRP Process Flow Chart



Constructing Scenarios

Develop Scenario Descriptions for Plausible Futures



Metropolitan's Scenarios will have different views of the future, each with varying conditions on supply and demands

Constructing Scenarios

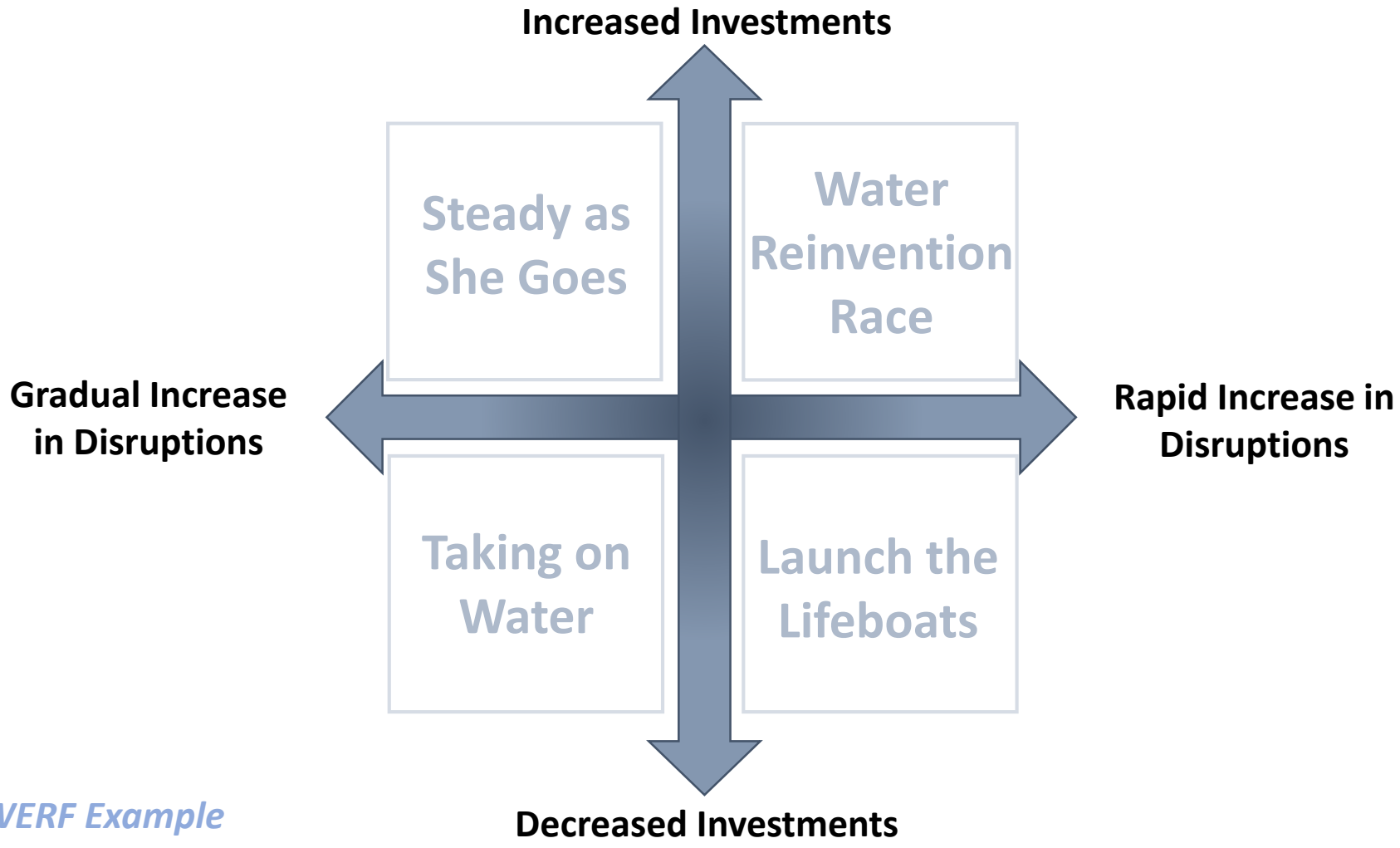
Develop Scenario Descriptions for Plausible Futures

Steady as She Goes	**Water Reinvention Race**
Taking on Water	**Launch the Lifeboats**

WERF Example

Constructing Scenarios

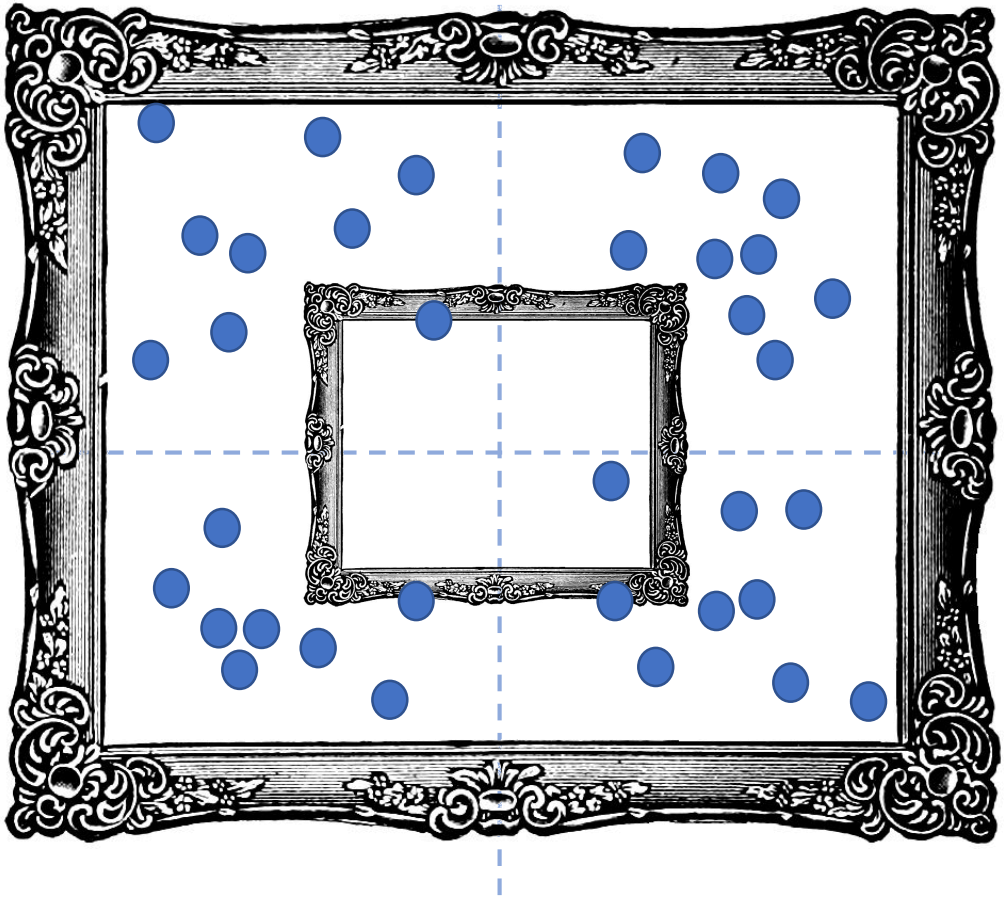
Identifying Scenario Framework to Allow for a Broad View



WERF Example

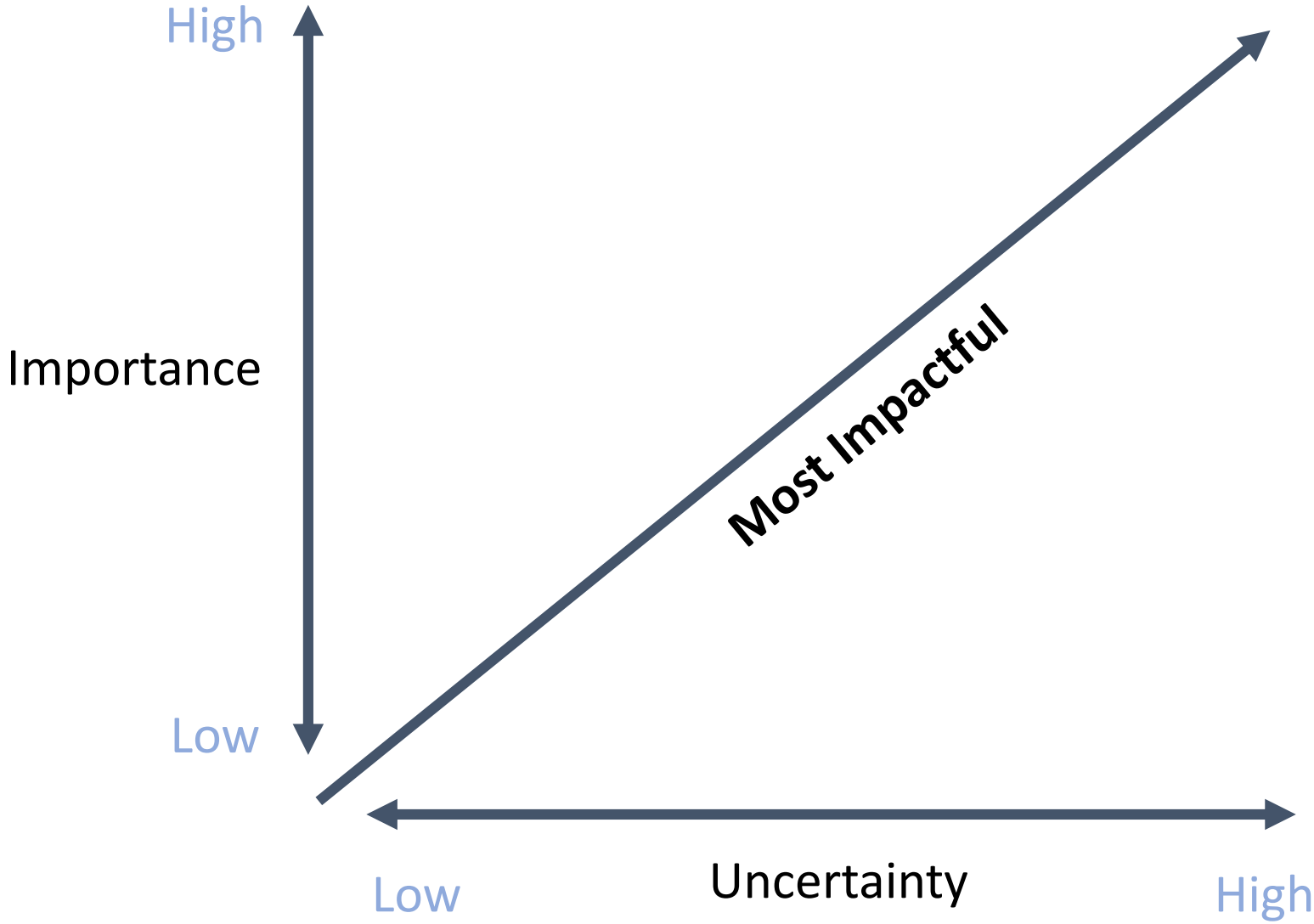
Constructing Scenarios

Why a Broad View?



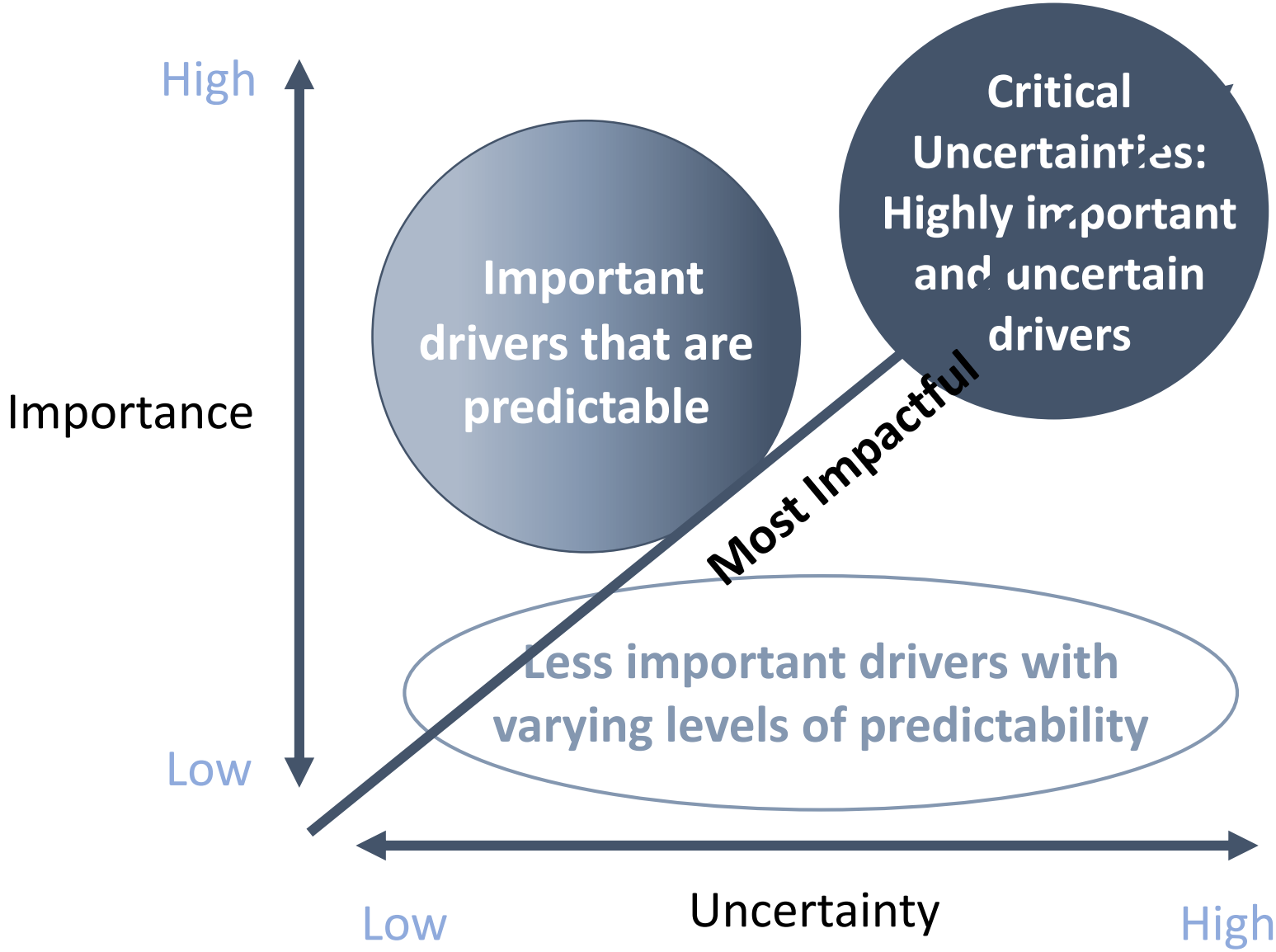
Constructing Scenarios

How Do We Get a Broad View?



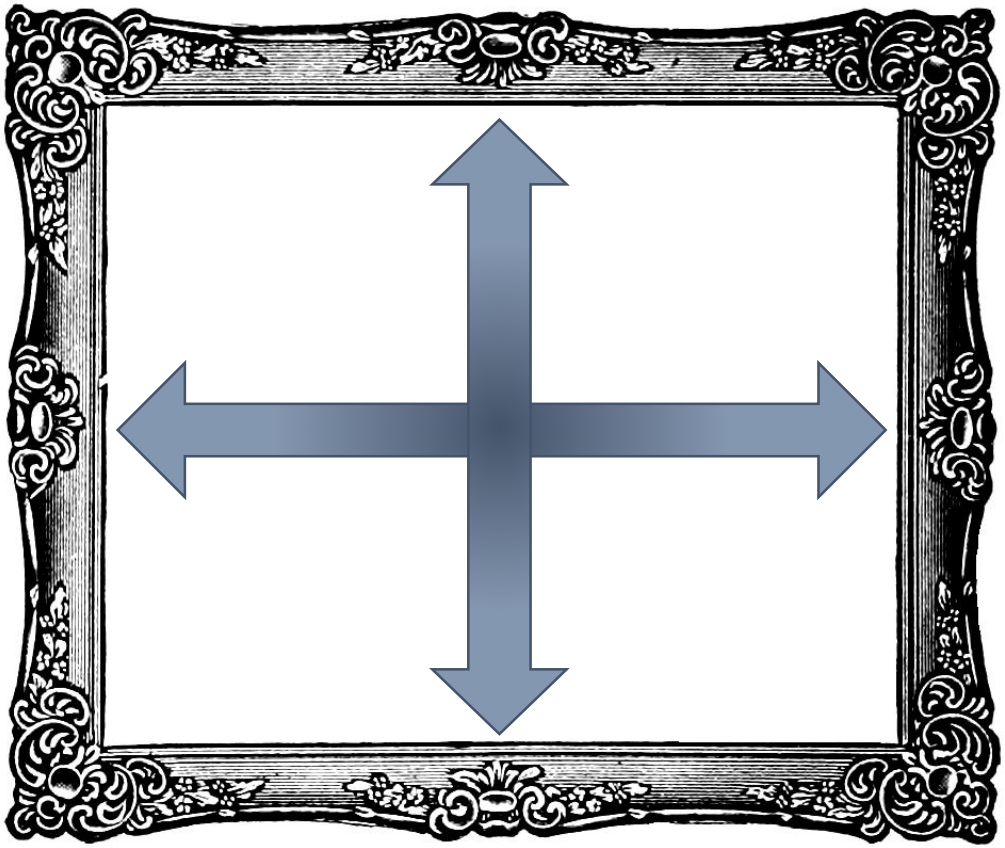
Identifying Most Impactful Drivers

Established How to Get a Broad View



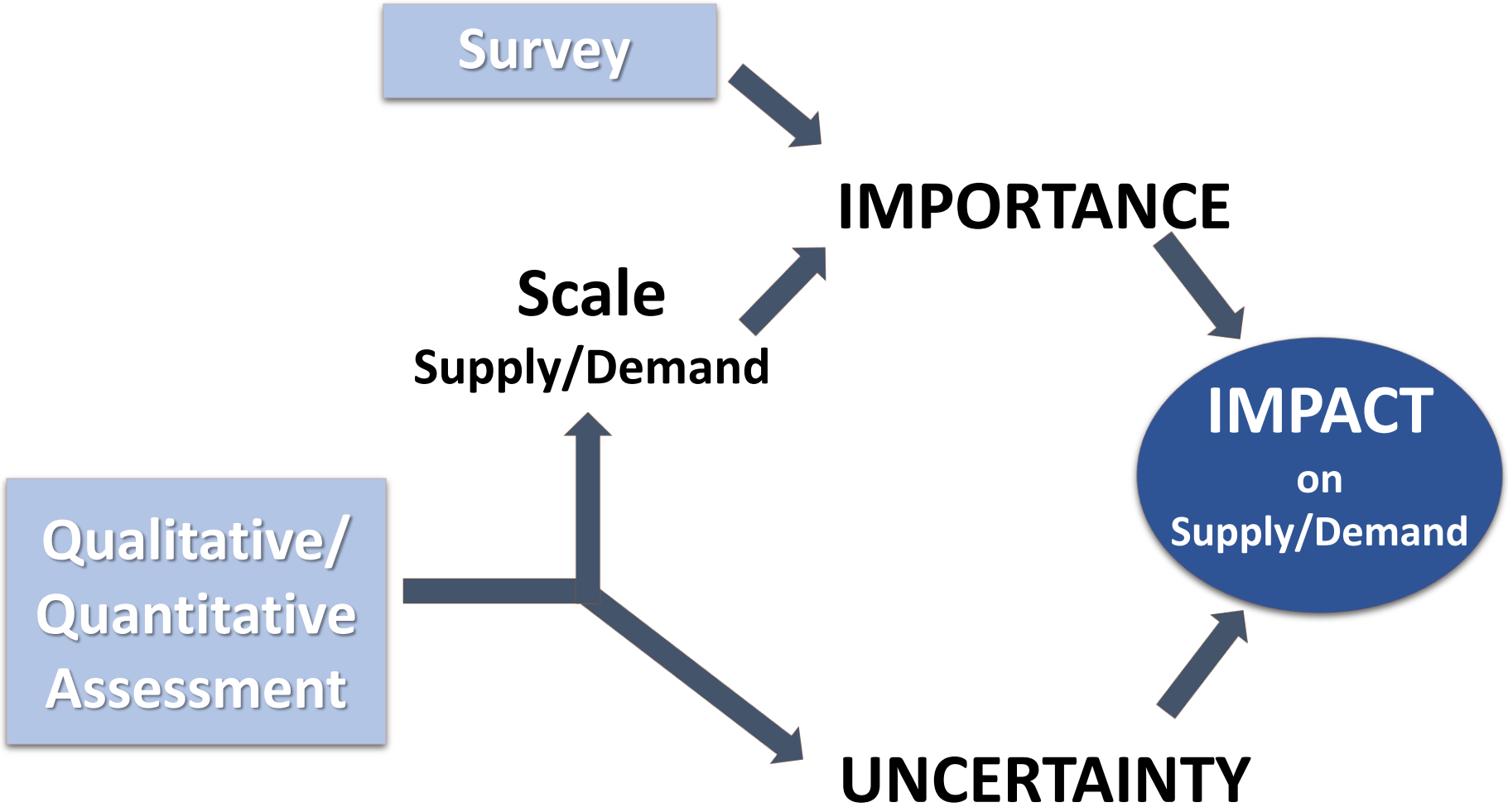
Utilizing All Drivers

Examine Other Drivers Within this Framework



Determining Most Impactful Drivers

Inclusive Process with Member Agency Feedback



CONSTRUCTING SCENARIOS - QUALITATIVE/ QUANTITATIVE ASSESSMENT

Survey Impact	Survey Impact	Survey Impact	Category	Driver	Sub Elements	Locations	Can you calculate sub-elements given the driver?	If yes, how?	Does this effect supply? (Yes or No)	Supply Effect (If yes, how?)	Scale of Effect	Can you quantify the supply effect? (Yes …	Quantification Method (If yes, how?)	Does this effect Service Area consumptive use?	Demand Effect (If yes, how?)	Scale of Effect	Can you quantify the demand effect? (Yes …	Quantification method (If yes, how?)	Does this effect Service Area replenishment?	Replenishment Demand Effect (If yes, how?)	Scale of Effect	Can you quantify the demand effect? (Yes …	Quantification method (If yes, how?)
3.81	3.83	4	[1.0] Climate Change	[1.2] Rising Sea Level	[1.2.1] Bay Delta saltwater intrusion	[1.2.1.1] State Water Project			Yes	Increased Delta outflow depending the regulatory environment.	Large	Increased Delta outflow		No	None				No	None			
			[1.0] Climate Change	[1.2] Rising Sea Level	[1.2.2] Coastal groundwater basin saltwater intrusion	[illegible] Metropolitan's			Yes	Increased demand for barrier supply	Moderate	Increased demand for …		Yes	Increased demand for recycled water	Moderate			Yes	Increased demand for recycled water	Moderate		
			[1.0] Climate Change	[1.2] Rising Sea Level	[1.2.3] Impacts on all coastal water supply infrastructure	[illegible] Metropolitan's			Yes	Loss of supplemental supply	Small	Loss of supplemental …		No	None	N/A			No	None	N/A		
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.1] changing runoff patterns	[1.3.1.1] Colorado River																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.a] Changing runoff quality	[1.3.1.1] Colorado River			Yes	Runoff quality reduced due changing runoff pattern caused by warming temperatures													
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.a] Spatial distribution snowfall	[1.3.1.1] Colorado River			Yes	Warming temperatures could alter storm tracks and send precipitation out of the basin, or lower in the basin (where it would fall as rain and not snow), thereby reducing runoff													
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.1] changing runoff patterns	[1.3.1.2] State Water Project																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.1] changing runoff patterns	[1.3.1.3] Local Projects																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.2] Alterations to ecosystems	[1.3.2.1] Colorado River																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.2] Alterations to ecosystems	[1.3.2.2] State Water Project																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.2] Alterations to ecosystems	[1.3.2.3] Local Projects																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.3] Invasive species populations	[1.3.3.1] Colorado River																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.3] Invasive species populations	[1.3.3.2] State Water Project																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.3] Invasive species populations	[1.3.3.3] Local Projects																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.4] New endangered species listings	[1.3.4.1] Colorado River																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.4] New endangered species listings	[1.3.4.2] State Water Project																	
			[1.0] Climate Change	[1.3] Warming temperatures	[1.3.4] New endangered species listings	[1.3.4.3] Local Projects																	
			[1.0] Climate Change	[1.3] Hydrologic Variations and Extremes	[1.3.5] Changes in natural replenishment patterns	[1.3.5.1] Central Valley			Yes	Reduces regional supply	Large	Reduces regional supply		Yes	Increased demand for imported replenishment supply	Large			Yes	Increased demand for imported replenishment supply	Large		
			[1.0] Climate Change	[1.3] Hydrologic Variations and Extremes	[1.3.5] Changes in natural replenishment patterns	[illegible] Metropolitan's			Yes	Reduces regional supply	Large	Reduces regional supply		Yes	Increased demand for imported replenishment supply	Large			Yes	Increased demand for imported replenishment supply	Large		
			[1.0] Climate Change	[1.4] Changing precipitation	[1.4.1] Changing runoff quality	[1.4.1.1] Colorado River																	
			[1.0] Climate Change	[1.4] Changing precipitation	[1.4.1] Changing runoff quality	[1.4.1.2] State Water Project	Yes	GCM, hydrology models.	YES	1. Reduced delta inflow. 2. Increase in regulatory needs.		1. Yes. 2. Yes	1. calsim input hydrology. 2. calsim input hydrology	N	N/A	N/A	N/A	N/A	N	N/A	N/A	N/A	N/A
			[1.0] Climate Change	[1.4] Changing precipitation	[1.4.1] Changing runoff quality	[1.4.1.3] Local Projects																	
			[1.0] Climate Change	[1.5] Atmospheric rivers	[1.5.1] changing runoff patterns	[1.5.1.1] Colorado River																	
			[1.0] Climate Change	[1.5] Atmospheric rivers	[1.5.1] changing runoff patterns	[1.5.1.2] State Water Project																	
			[1.0] Climate Change	[1.5] Atmospheric rivers	[1.5.1] changing runoff patterns	[1.5.1.3] Local Projects																	
3.50	3.87	3.94	[2.0] Economic	[2.1] Increasing Costs of Providing Water (Capacity to …	[2.1.1] Affordability concerns	[illegible] Metropolitan's			Yes	Lack of investment in water infrastructure	Moderate	Lack of investment in …		Yes	Reduced demands on MWD	Large			Yes	Reduced demands on MWD	Large		
3.25	2.96	3.83	[2.0] Economic	[2.2] Uncertain economic conditions, including lasting …	[2.2.1] Duration and frequency of recessionary periods	[illegible] Metropolitan's			No	None	N/A	None		Yes	Reduced demands	Very Large			Yes	Reduced demands	Very Large		
			[2.0] Economic	[2.2] Uncertain economic conditions, including lasting …	[2.2.2] Changing commercial and consumer consumption behavior	[illegible] Metropolitan's			No	None	N/A	None		Yes	Reduced demands	Moderate			Yes	Reduced demands	Moderate		
			[2.0] Economic	[2.2] Uncertain economic conditions, including lasting …	[2.2.3] Pressure on agency budgets and capacity to raise revenues	[illegible] Metropolitan's			Yes	Lack of investment in water infrastructure	Small	Lack of investment in …		No	None	N/A			No	None	N/A		
			[2.0] Economic	[2.2] Uncertain economic conditions, including lasting …	[2.2.4] Increasing income inequality	[illegible] Metropolitan's			No	None	N/A	None		Yes	Reduced demands on MWD	Moderate			Yes	Reduced demands on MWD	Moderate		
4.33	3.87	3.73	[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.1] Emerging contaminant regulations	[3.1.1.1] Colorado River			Yes	Higher cost of treatment	Large	Higher cost of treatment		Yes	Increased demand for imported water	Significant			Yes	Increased demand for imported water	Significant		
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.1] Emerging contaminant regulations	[3.1.1.2] State Water Project				Higher cost of treatment		Higher cost of treatment											
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.1] Emerging contaminant regulations	[3.1.1.3] Local Projects	No		Yes	Loss in gw production without additional treatment.	Large	No	N/A	No	N/A	N/A	N	N/A	Yes	????	N/A	N	N/A
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.2] Water Use Efficiency	[illegible] Metropolitan's			No	None	N/A	None		Yes	Reduced demands on MWD	Moderate			Yes	Reduced demands on MWD	Moderate		
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.3] Endangered Species listings and protections	[3.1.3.1] Colorado River			Yes	Restrictions on imported supply	Moderate	Restrictions on imported …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.3] Endangered Species listings and protections	[3.1.3.2] State Water Project			Yes	Restrictions on imported supply	Moderate	Restrictions on imported …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.3] Endangered Species listings and protections	[3.1.3.3] Local Projects			Yes	Restrictions on imported supply	Moderate	Restrictions on imported …		No	None	N/A			No	None	N/A		
			[3.0] Legislation and Regulatory	[3.1] Emerging Regulatory Requirements	[3.1.5] Disruption of current water storage and supply agreements due to mandatory groundwater management	[3.1.5.1] Local / Groundwater			Yes	Affects dry year yield from SWP and storage in the Central Valley	Large	Affects dry year yield from SWP and storage in the …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.1] Emerging Regulatory Requirements	[3.1.6] … threatening CA Aqueduct due to mandatory …	[3.1.6.1] State Water Project			Yes	Threatens to reduce capacity of CA Aqueduct	Large	Threatens to reduce …		No	None	N/A			No	None	N/A		
3.57	3.65	3.64	[3.0] Legislation …	[3.2] Legislative Initiatives	[3.2.1] Statewide per capita and outdoor water use mandates	[illegible] Metropolitan's			No	None	N/A	None		Yes	Mandates demand reductions	Large			Yes	Mandates demand reductions	Large		
			[3.0] Legislation …	[3.2] Legislative Initiatives	[3.2.2] Increased state financial support	[3.2.2.1] Colorado River			Yes	Increased spending on water supply infrastructure	Large	Increased spending on …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.2] Legislative Initiatives	[3.2.2] Increased state financial support	[3.2.2.2] State Water Project			Yes	Increased spending on water supply infrastructure	Large	Increased spending on …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.2] Legislative Initiatives	[3.2.2] Increased state financial support	[3.2.2.3] Local Projects			Yes	Increased spending on water supply infrastructure	Large	Increased spending on …		No	None	N/A			No	None	N/A		
3.62	3.87	3.78	[3.0] Legislation …	[3.3] Public … to Protect Environmental …	[3.3.1] Rebalancing of beneficial uses to protect natural resources	[3.3.1.1] Colorado River			Yes	Reduction of supply available for consumptive uses	Large	Reduction of supply …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.3] Public … to Protect Environmental …	[3.3.1] Rebalancing of beneficial uses to protect natural resources	[3.3.1.2] State Water Project			Yes	Reduction of supply available for consumptive uses	Large	Reduction of supply …		No	None	N/A			No	None	N/A		
			[3.0] Legislation …	[3.3] Public … to Protect Environmental …	[3.3.1] Rebalancing of beneficial uses to protect natural resources	[3.3.1.3] Local Projects			Yes	Reduction of supply available for consumptive uses	Large	Reduction of supply …		No	None	N/A			No	None	N/A		
3.55	3.26	3.27	[4.0] Demographic …	[4.1] Uncertainty Regarding Population Projections	[4.1.1] Growth rate of the population	[illegible] Metropolitan's	Yes	expert demographer input	No	n/a	N/A	N/A	N/A	Yes	1. Increase in … demand. 2. Change in HH size. 3. Change in …	Large	Y	1. … population input. 2. MWD-EDM … 3. MWD …	no	None	N/A	N	N/A
			[4.0] Demographic …	[4.1] Uncertainty Regarding Population Projections	[4.1.2] Spatial distribution of growth	[illegible] Metropolitan's			No	None	N/A	None		Yes	Affects ability to forecast future demands	Moderate			Yes	Affects ability to forecast future demands	Moderate		
2.86	3.17	3.42	[4.0] Demographic …	[4.2] Changing Housing Densities and Land Uses	[4.2.1] Densification of suburban areas, including accessory dwelling units	[illegible] Metropolitan's			No	None	N/A	None		Yes	Affects ability to forecast future demands	Moderate			Yes	Affects ability to forecast future demands	Moderate		
			[4.0] Demographic …	[4.2] Changing Housing Densities and Land Uses	[4.2.2] Densification of urban areas	[illegible] Metropolitan's			No	None	N/A	None		Yes	Affects ability to forecast future demands	Moderate			Yes	Affects ability to forecast future demands	Moderate		
3.24	3.33	3.82	[4.0] Demographic …	[4.3] Changes in Water Use Behavior	[4.3.1] Unmandated and unfunded reduced water use / Reduced waste water flows	[illegible] Metropolitan's			Yes	None	N/A	None		Yes	Lower demand due to … change. Limits water uses ability to …	Large			Yes	Lower demand due to … change. Limits water uses ability to …	Large		
3.77	3.35	3.64	[4.0] Demographic …	[4.4] Public Support	[4.4.1] Acceptance of new forms of potable reuse	[illegible] Metropolitan's			Yes	Affects the implementation of DPR supply	Large	Affects the implementation …		No	None	N/A			No	None	N/A		
			[4.0] Demographic …	[4.4] Public Support	[4.4.2] Support for public investment in water infrastructure	[illegible] Metropolitan's			Yes	Affects ability to invest in regional water infrastructure	Very Large	Affects ability to invest in …		No	None	N/A			No	None	N/A		
3.60	3.87	3.45	[5.0] Federal, State and …	[5.1] Cooperation in State and Federal Water Policy	[5.1.1] Disagreements regarding SWP-CVP operations	[5.1.1.1] State Water Project			Yes	Loss of imported supply due to operational inefficiency	Large	Loss of imported …		No	None	N/A			No	None	N/A		
			[5.0] Federal, State and …	[5.1] Cooperation in State and Federal Water Policy	[5.1.2] Willingness of parties to invest in Delta improvements	[5.1.2.1] State Water Project			Yes	Loss of financing partners in Delta improvements implementation	Very Large	Loss of financing …		No	None	N/A			No	None	N/A		
4.2	4.22	3.78	[5.0] Federal, State and …	[5.2] Cooperation Among Colorado River Agencies	[5.2.1] Impact on 2026 guidelines	[5.2.1.1] Colorado River			Yes	Loss of CR supply and salinity impacts (more specific)	Large	Loss of CR supply and …		No	None	N/A			No	None	N/A		
3.38	4.17	3.31	[5.0] Federal, State and …	[5.3] Changes in Regional Collaboration	[5.3.1] Willingness to invest in local projects with regional benefits	[illegible] Metropolitan's			Yes	Increases MWD costs and reduces water sales revenue	Large	Increases MWD costs and …		Yes	Reduced demands on MWD	Moderate			Yes	Reduced demands on MWD	Moderate		
			[5.0] Federal, State and …	[5.3] Changes in Regional Collaboration	[5.3.2] Willingness to invest in stabilization of imported supplies	[illegible] Metropolitan's			Yes	Preserves imported supply reliability	Large	Preserves imported …		No	None	N/A			No	None	N/A		
			[5.0] Federal, State and …	[5.3] Changes in Regional Collaboration	[5.3.3] Reduced reliance on regional systems	[illegible] Metropolitan's			No	None	N/A	None		Yes	Reduced demands on MWD	Moderate			Yes	Reduced demands on MWD	Moderate		
2.71	2.36	4.03	[6.0] Technological	[6.1] Adoption of Innovative Stormwater Capture	[6.1.1] Increased investment in stormwater capture improvements	[illegible] Metropolitan's			Yes	Adds additional source of supply - multi dry year would impact supply	Small	More additional …		Yes	Reduced Outdoor water demands	N/A			Yes	Reduced Outdoor water demands	N/A		
4.05	4.14	4.20	[7.0] Aging Infrastructure	[7.1] Increased Vulnerability to System Outages	[7.1.1] Increasing budget for renewal and replacement	[7.1.1.1] Colorado River			Yes	Increased likelihood of outages	Small	Increased likelihood of …		No	None	N/A			No	None	N/A		
			[7.0] Aging Infrastructure	[7.1] Increased Vulnerability to System Outages	[7.1.1] Increasing budget for renewal and replacement	[7.1.1.2] State Water Project			Yes	Increased likelihood of outages	Small	Increased likelihood of …		No	None	N/A			No	None	N/A		
			[7.0] Aging Infrastructure	[7.1] Increased Vulnerability to System Outages	[7.1.1] Increasing budget for renewal and replacement	[illegible] Metropolitan's			Yes	Increased likelihood of outages	Small	Increased likelihood of …		No	None	N/A			No	None	N/A		

Qualitative-Quantitative Assessment Objectives

- Examine and organize the drivers
- Determine supply and demand links to the drivers
- Identify quantification methods and tools – available and/or needed
- Identify data and input needs
- Open and iterative process

Connecting Drivers to the Analysis: *Supply – Demand Links*

- Makes explicit how the drivers affect supply/demand
- Identifies what needs to be quantified
- Identifies how we will quantify
  - Calculate using existing model approaches
  - Approximate where models do not exist or are not flexible
- Relates with geographic location

Single-Family Residential Pre-Conservation Retail Demand

Inputs

- Population
- Median Income
- Median Lot Size
- Retail Price
- Temperature
- Rainfall
- Occupied Households

Change to Reflect:

- Economic Outlook
- Demographic Change
- Average Climate Outcomes
- Outdoor Water Use

Change to Reflect:

- Behavioral Change
- Response to Price

Model Parameters

- How much water use per each unit of input

Outcomes Reflect:

- Demands given changes to Inputs and Model Parameters

Result

SFR Retail Demand

Commercial/Industrial Pre-Conservation Retail Demand

Inputs

- Retail Price
- Cooling Degree Days
- Average Max Temp
- Manufacturing Job Share
- Total Jobs

Change to Reflect:

- Economic Outlook
- Demographic Change
- Average Climate Outcomes

Change to Reflect:

- Behavioral Change

Model Parameters

- How much water use per each unit of input

Outcomes Reflect:

- Demands given changes to Inputs and Model Parameters

Result

- CII Retail Demand

CALSIM
State Water Project Model

Inputs
- Land Use
- River flow Hydrology

Change to Reflect:
- Economic Outlook
- Climate Change

Change to Reflect:
- Regulatory Outlook
- Operational Requirements
- System Changes

Model Parameters
- System Facilities and Capacities
- Operational Rules
- Regulatory Rules

Outcomes Reflect:
- Supply given changes to Inputs and Model Parameter

Result
- SWP Allocation

Demand & Conservation Models

Single Family Residential (Pre-Conservation)

- ***MWD-EDM SFR***

Multi-Family Residential (Pre-Conservation)

- ***MWD-EDM MFR***

Commercial/Industrial/Institutional (Pre-Conservation)

- ***MWD-EDM CII***

Agricultural (Retail Level)
Replenishment for Groundwater
Seawater Barrier

- ***Member Agency Survey***

Active Conservation

- ***MWD Conservation Model (for accounting)***
- ***Alliance for Water Use Efficiency Model (for planning)***

Code-Based Conservation

- ***MWD Conservation Model***

Price-Based Conservation

- ***MWD-EDM***

System Loss

- ***Member Agency Survey***

Retail Demand Response to Weather

- ***MWD-Fore***

Resource (Supply) Models

State Water Project & Colorado River

- ***CRSS/IRPSIM***

Los Angeles Aqueduct

- ***LAASM (from LADWP)***

Groundwater

- ***Member Agency Survey + Groundwater Agency Input + Safe/Adjudicated Yield***

Surface Water

- ***Member Agency Survey + MWD regression model***

Recycled Water & Groundwater Recovery

- ***Member Agency Survey + MWD regression model (for growth to ultimate yield)***

Seawater Desalination

- ***Member Agency Survey***

Regional Storage Portfolio Use and Operation & Water Transfers

- ***IRPSIM***

Qualitative–Quantitative Assessment Process

- Initial Screening:
  - Can you calculate **Supply–Demand Links** of the driver?
- Does it impact supply?
  - How does it affect supply?
  - What is the scale of supply effect?
  - Can you quantify the supply effect?
- Does it impact demands (Consumptive and Replenishment)?
  - How does it affect demands?
  - What is the scale of demand effect?
  - Can you quantify the demand effect?

Example 1:

Category:
Demographic Changes

Driver:
Uncertainty Regarding Population Projections

SCREENING

Can you calculate Supply-Demand Links given the driver?
YES, utilizing expert demographer input

Example 1: Summary of Changes

BEFORE:

Category	Driver
Demographic Changes	Uncertainty Regarding Population Projections

AFTER: Identified Supply-Demand Link:
Growth rate of population - MWD Service Area

Example 1:

Category:
Demographic Changes

Driver:
Uncertainty Regarding Population Projections

Supply – Demand Link:
Growth Rate of Population

Location:
MWD Service Area

Example 1:

Demographic Changes

Uncertainty Regarding Population Projections

Growth Rate of Population

MWD Service Area

SUPPLY

- Does this driver affect supply? **NO**
- What is the scale of effect? **N/A**
- Can you quantify the supply effect? **N/A**

Example 1:

Demographic Changes

Uncertainty Regarding Population Projections

Growth Rate of Population

MWD Service Area

CONSUMPTIVE DEMAND

- Does this driver affect demand? **YES**
- Can you quantify the demand effect? **YES**

How does it affect demand?	What is the Scale Effect?	How can you quantify the demand effect?
Increase in retail demand	Large	MWD-EDM - population Input
Changes in household size	Large	MWD-EDM - population Input
Changes in employment	Large	MWD-EDM - employment Input

Example 1:

Demographic Changes

Uncertainty Regarding Population Projections

Growth Rate of Population

MWD Service Area

REPLENISHMENT DEMAND

- Does this driver affect demand? **NO**
- What is the scale of effect? **N/A**
- Can you quantify the demand effect? **N/A**

Example 2:

Category:
Climate Change

Driver:
Hydrologic Variations and Extremes

SCREENING

Can you calculate Supply-Demand Links given the driver?
YES, using Global Climate Model and hydrology models

Example 2: Summary of Changes

BEFORE:

Category	Driver
Climate Change	Hydrologic Variations and Extremes

Expanded

AFTER:

Category	Driver
Climate Change	Warming Temperatures
Climate Change	Changing Precipitation
Climate Change	Atmospheric River

- Identified several Supply-Demand Links
  - i.e., Changing Runoff Quantity - SWP Watershed

Example 2:

Category:
Climate Change

Driver:
Changing Precipitation

Supply–Demand Link:
Changing Runoff Quantity

Location:
SWP Watershed

Example 2:

Climate Change

Changing Precipitation

Changing Runoff Quantity

SWP Watershed

SUPPLY

- Does this driver affect supply? **YES**
- Can you quantify the supply effect? **YES**

How does it affect supply?	What is the Scale Effect?	How can you quantify the supply effect?
Changes in Delta inflow	Large	CalSIM input hydrology
Changes in regulatory needs	Small	CalSIM input hydrology

Example 2:

Climate Change

Changing Precipitation

Changing Runoff Quantity

SWP Watershed

CONSUMPTIVE DEMAND

- Does this driver affect demand? **NO**
- What is the scale of effect? **N/A**
- Can you quantify the demand effect? **N/A**

REPLENISHMENT DEMAND

- Does this driver affect demand? **NO**
- What is the scale of effect? **N/A**
- Can you quantify the demand effect? **N/A**

Example 3:

Category:
Groundwater Impacts

Drivers:
Groundwater Availability Due to Contaminations, Impacts of Mandatory Groundwater Management, Impacts on Replenishment

SCREENING

Can you calculate Supply-Demand Links given the drivers?
NO

Example 3: Summary of Changes

BEFORE:

Category	Driver
Groundwater Impacts	Impacts on Replenishment
Groundwater Impacts	Impacts of Mandatory Groundwater Management
Groundwater Impacts	Groundwater Availability Due to Contaminants

Output

Merged

AFTER:

Category	Driver
Legislative and Regulatory	Emerging Regulatory Requirements

Category	Driver
Groundwater Impacts	

Category Removed

- Identified several Supply-Demand Links
  - i.e., Emerging Contaminant Regulations in MWD Service area

Example 3:

Category:
Legislative and Regulatory

Driver:
Emerging Regulatory Requirements

Supply–Demand Link:
Emerging Contaminants Regulations

Location:
MWD Service Area

Example 3:

Legislative and Regulatory

Emerging Regulatory Requirements

Emerging Contaminant Regulations

MWD Service Area

SUPPLY

- Does this driver affect supply? **YES**
- Can you quantify the supply effect? **YES**

How does it affect supply?	What is the Scale Effect?	How can you quantify the supply effect?
Loss of groundwater production without additional treatment	Large	Estimate by monitoring data

Example 3:

Legislative and Regulatory

Emerging Regulatory Requirements

Emerging Contaminant Regulations

MWD Service Area

CONSUMPTIVE DEMAND

- Does this driver affect demand? **NO**
- What is the scale of effect? **N/A**
- Can you quantify the demand effect? **N/A**

Example 3:

Legislative and Regulatory

Emerging Regulatory Requirements

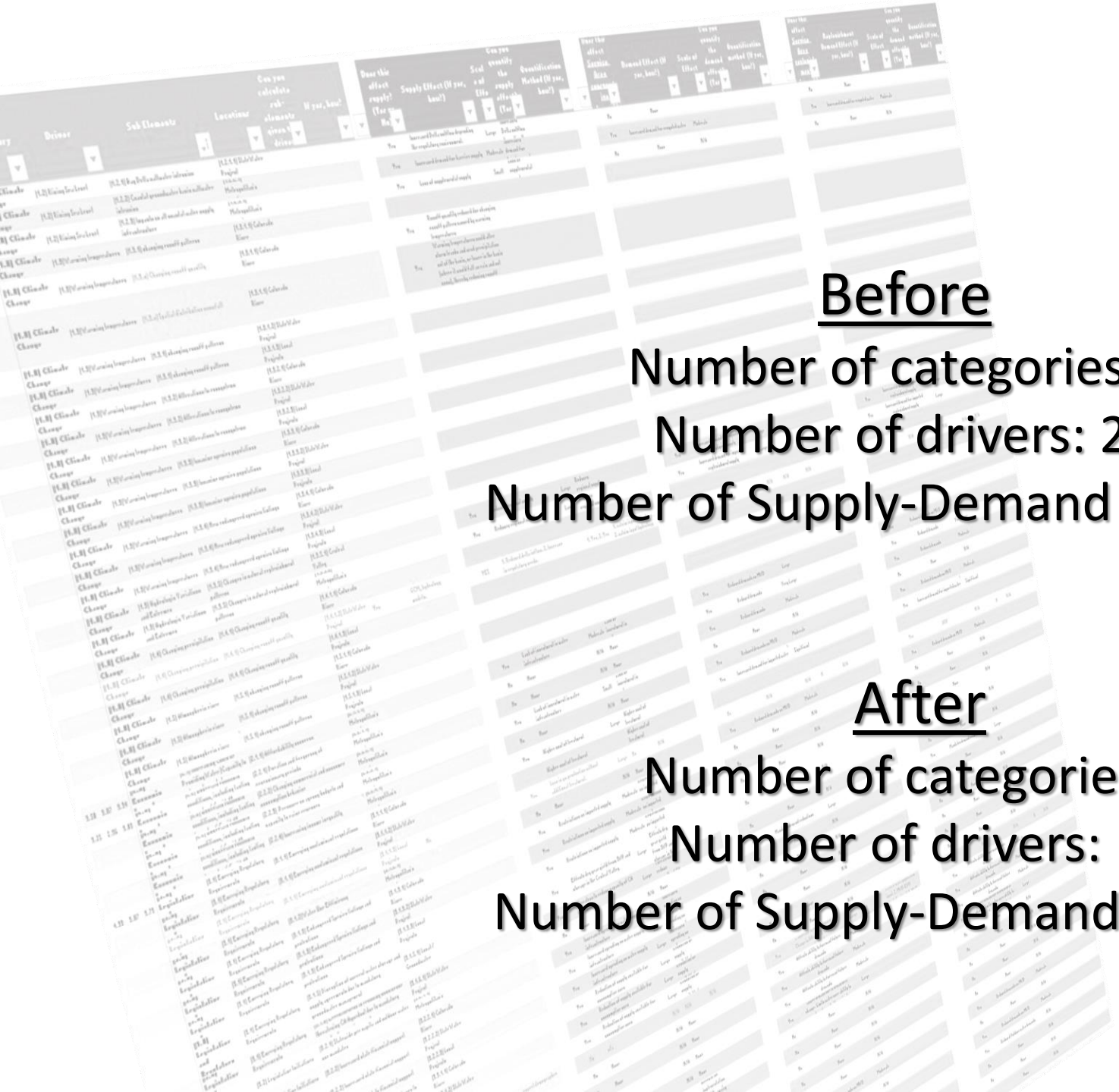
Emerging Contaminant Regulations

MWD Service Area

REPLENISHMENT DEMAND

- Does this driver affect demand? **YES**
- Can you quantify the demand effect? **NO**

How does it affect demand?	What is the Scale Effect?	How can you quantify the demand effect?
Changes in replenishment needs/quantity	Small	N/A



Before

Number of categories: 8

Number of drivers: 22

Number of Supply-Demand Links: 50

After

Number of categories: 7

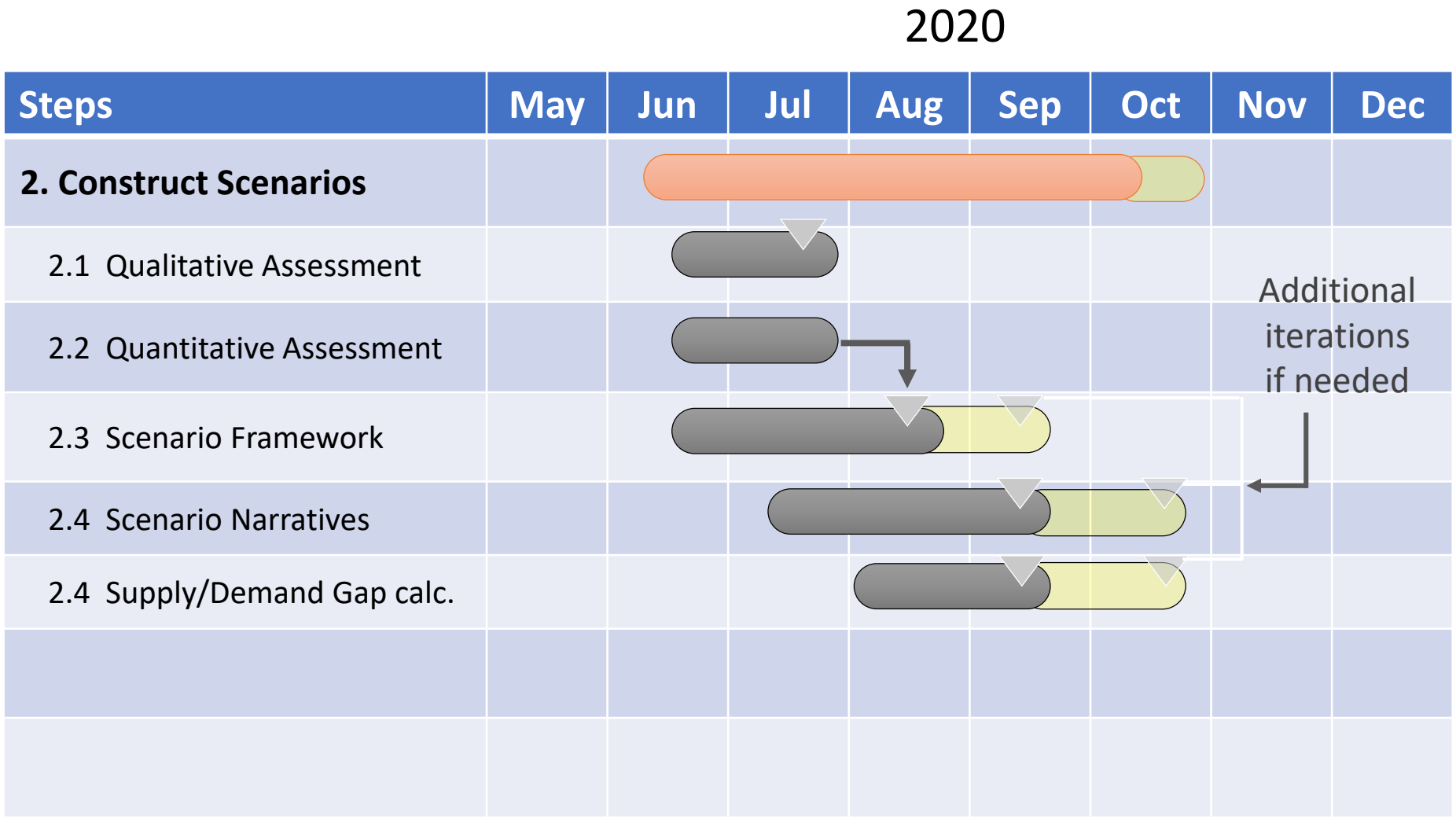
Number of drivers: 19

Number of Supply-Demand Links : 63

Technical Workgroup Partnering

- Review and provide comments on draft qualitative assessment spreadsheet
- Help identify quantification tools
- Help with approximations
- Identify and provide data
- Ensure internal consistency

IRP Process Schedule



= Metropolitan Board, Member Agency Input and Review Throughout the Process (examples only)

WHAT'S NEXT

- Continue Qualitative-Quantitative Assessment of Drivers
- Construct Scenarios