Scenario Planning from Construction of Narratives to Evaluation of Options

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CLIMAS
Climate Assessment for the Southwest

ARIZONA

Scenario Planning: Strategic Thinking about Responses to Increasing VUCA

IPCC WG1

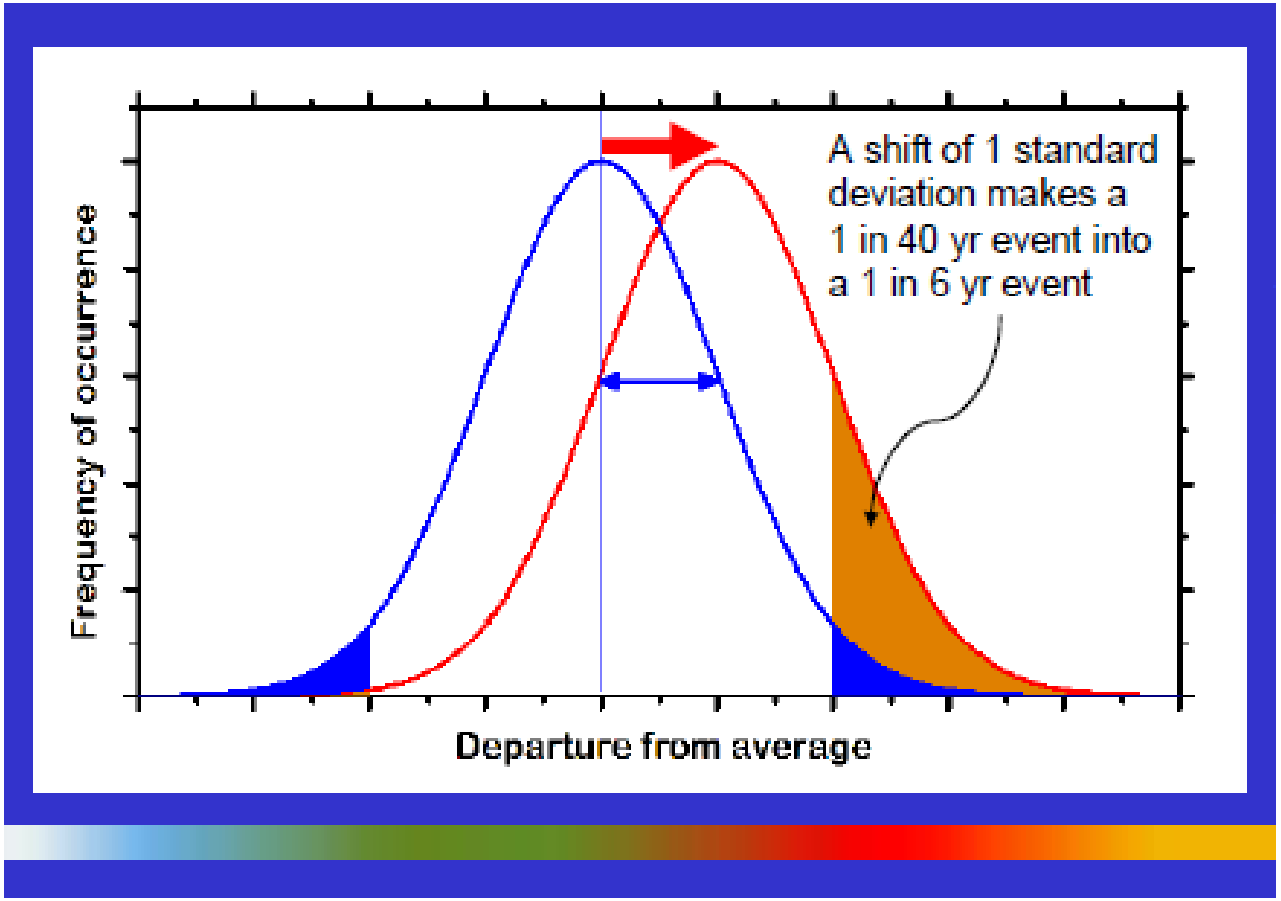
Volatility

Uncertainty

Complexity

Ambiguity

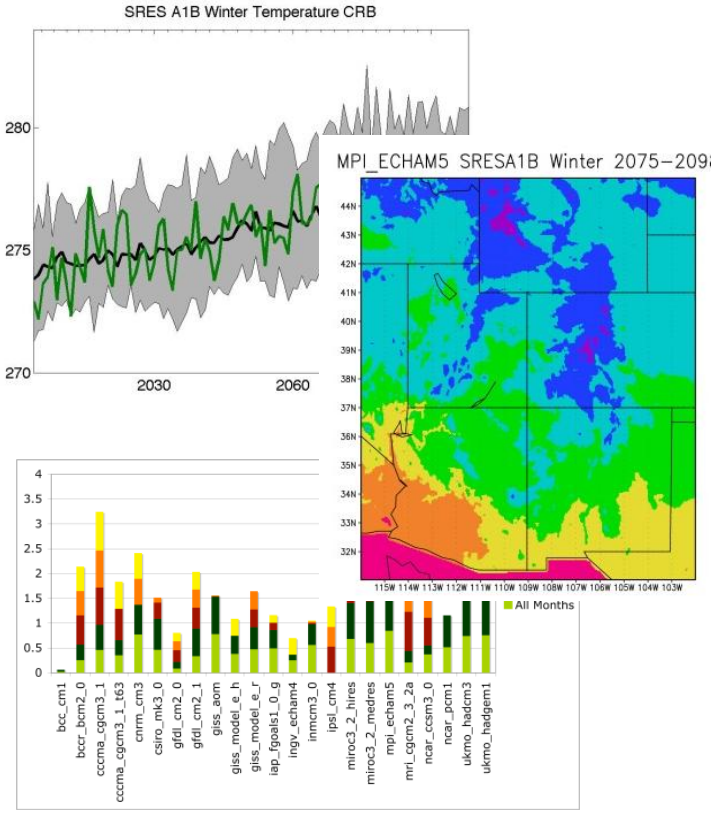
Institute for the Future



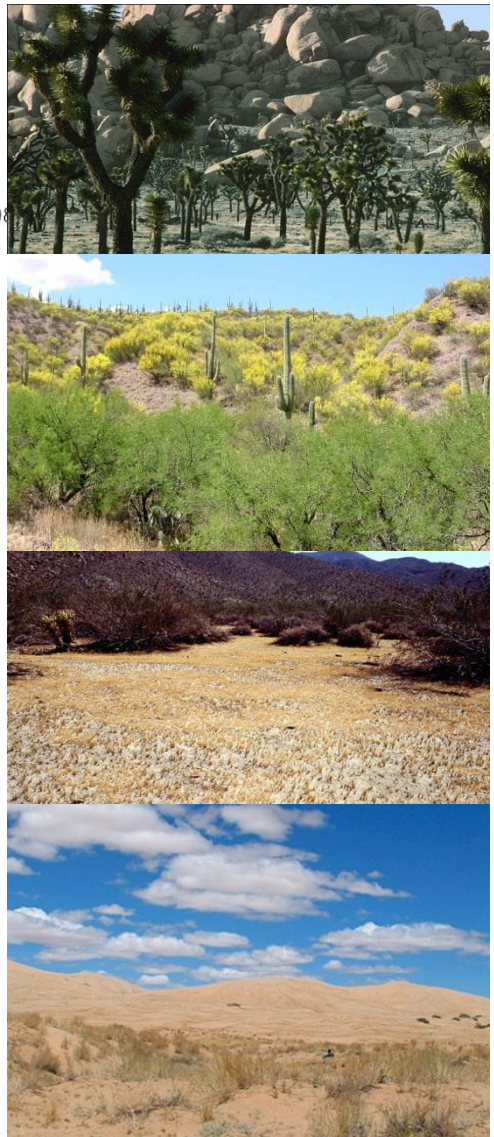
In your work, what is vulnerable to VUCA?

Different Scenario Approaches

Characterizing Uncertainty



Embracing Uncertainty

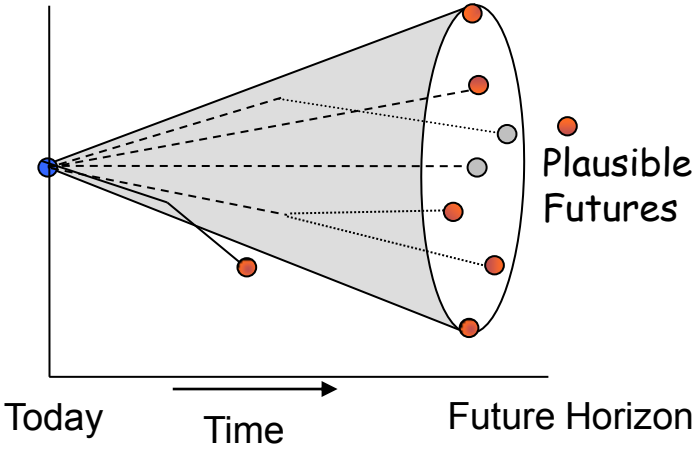


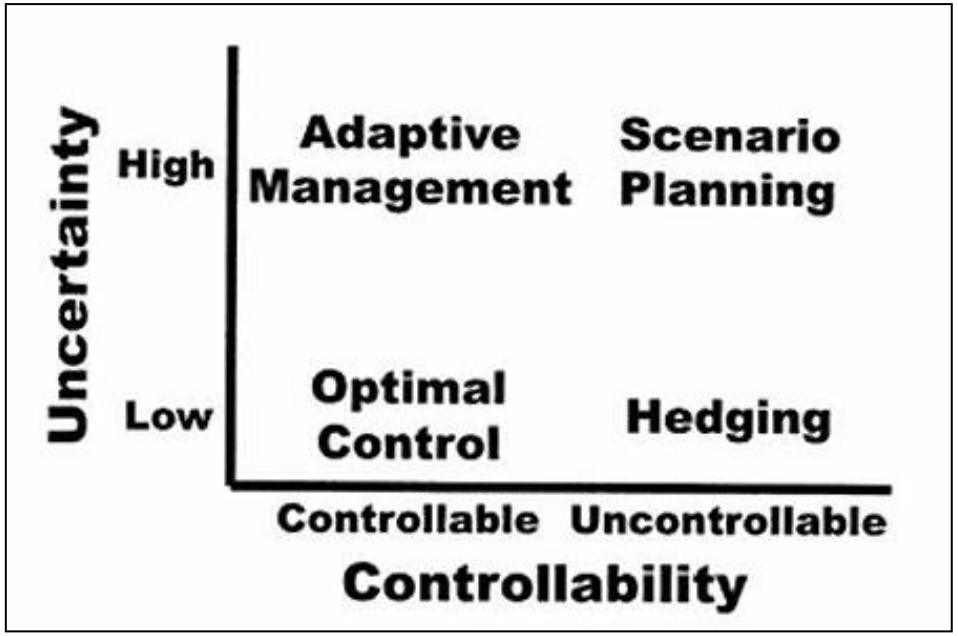
Reducing Uncertainty

Scenario Planning

Goal: **Challenge thinking** about the future. Foster **strategic thinking** about responses to different possibilities.

Scenarios Are:
- A tool for long-term strategic planning
- Compelling narratives of alternative environments in which decisions may be played out
- Coherent, internally consistent, and plausible

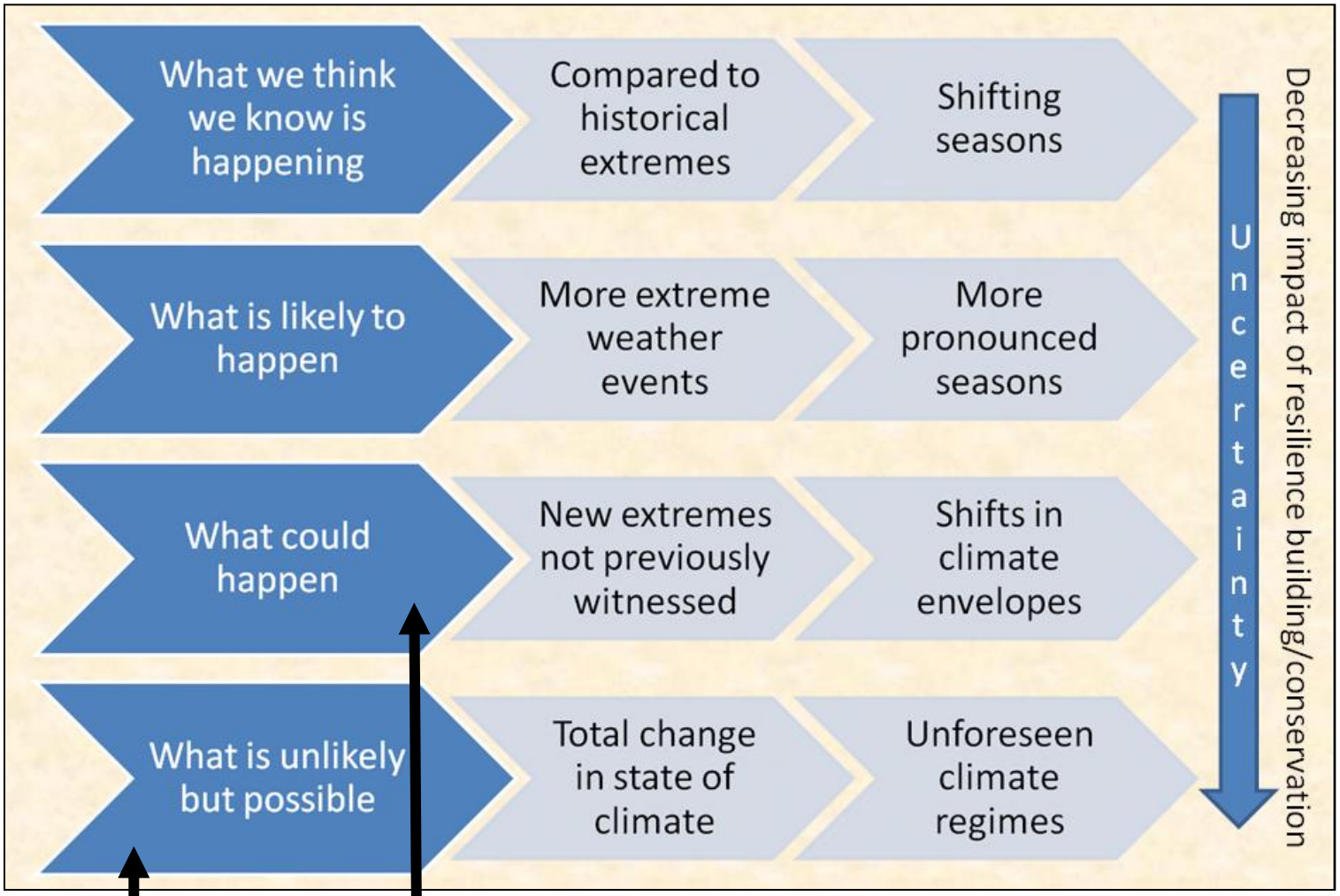




Peterson et al., 2003. Conservation Biology

Scenarios Are Not:
- Predictions or Forecasts
- A method for arriving at the "most likely" future

The Adaptation Challenge



Scenario Planning's Focus

From Wickel et al, 2009

Phases in Scenario Planning

I. Preparing for the process

II. Building and refining scenarios

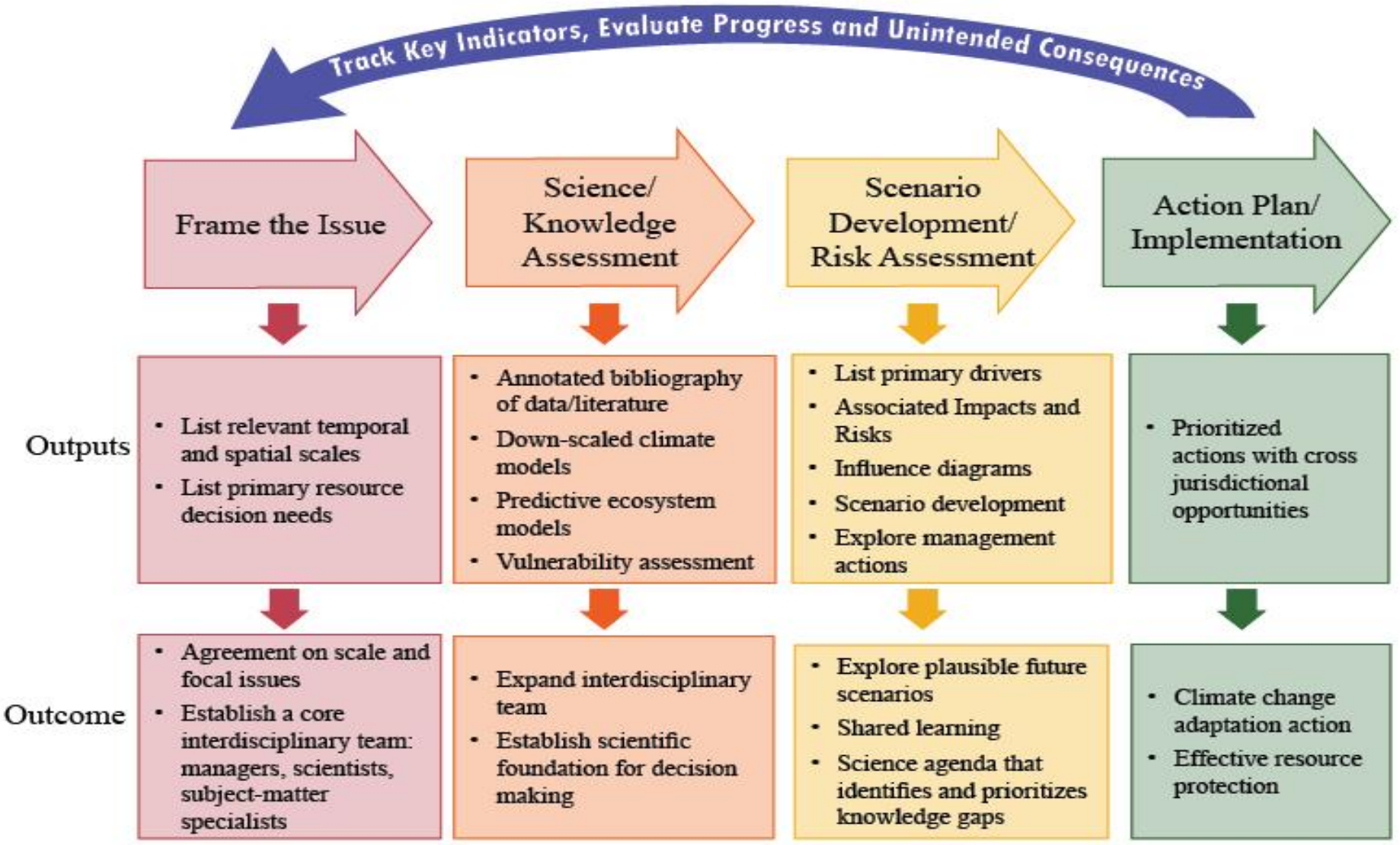
III. Using scenarios to evaluate, prioritize, and implement management actions

Part 1: Preparing for the Process

Preparing for the Process

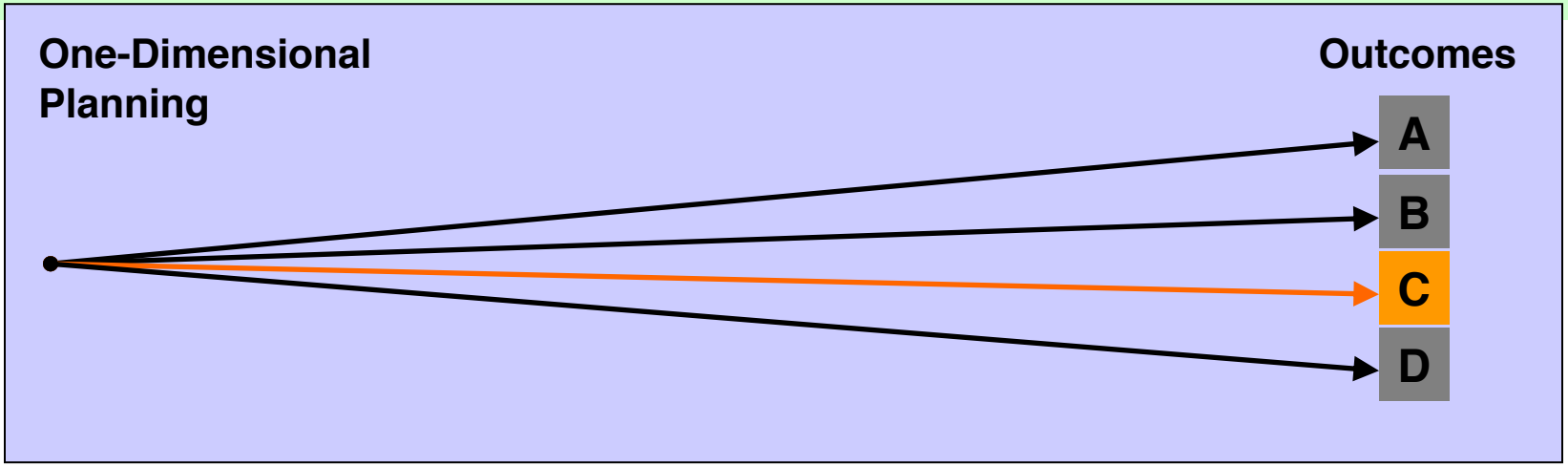
1. Clarify adaptation goals and context
2. Is scenario planning the right tool?
3. Define aims and expected outcomes
4. Select scenario planning approach
5. Identify stakeholders and define the process

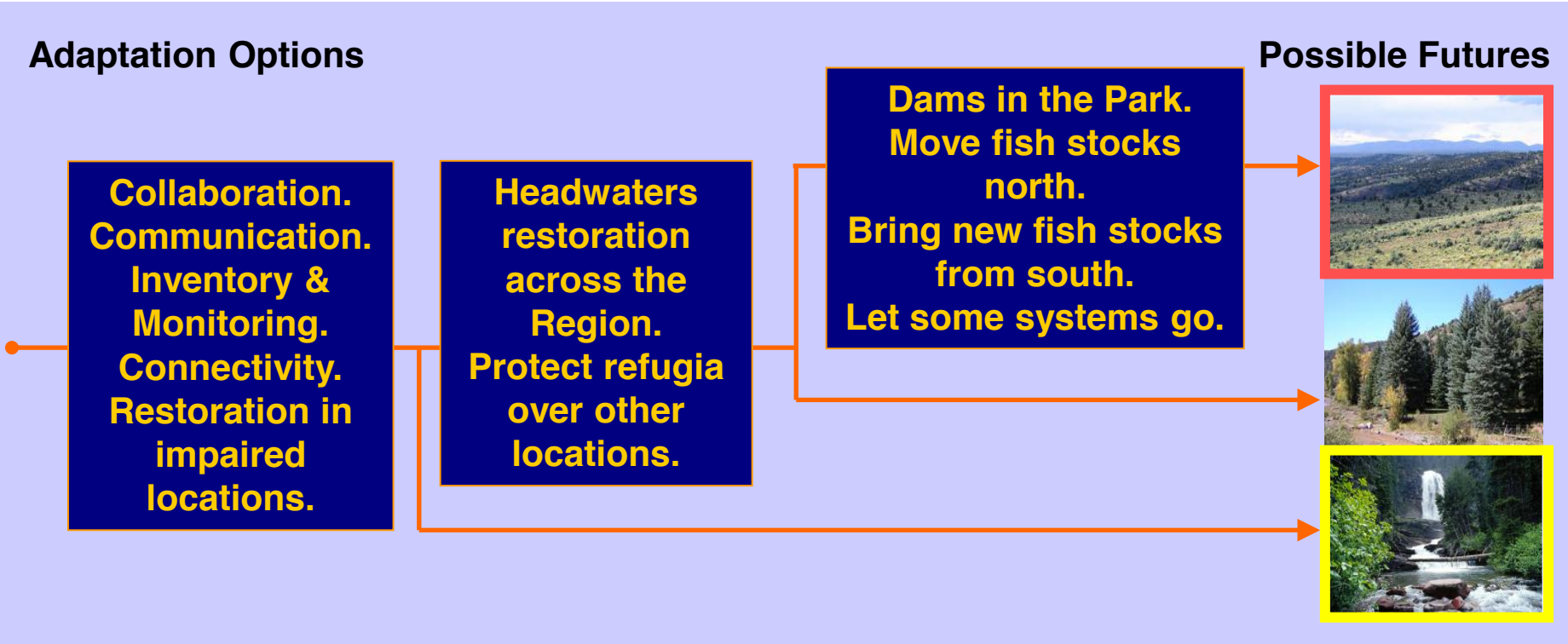
Key Elements of an Adaptation Planning Framework



National Park Service, 2010. Climate Change Response Plan

Traditional Planning vs. Scenario Planning





Part 2: Building Scenarios

Building Scenarios

6. Refine scope and aims

7. Create space for novel thinking

8. Identify key drivers and variables

9. Prioritize drivers

10. Explore and select scenario logics

11. Develop time-evolving outlines

12. Develop scenario narratives

Building Scenarios

8. Identify key drivers and variables

***8A.* exogenous drivers: STEEP**

***8B.* potential impacts**

8C. linkages, feedbacks, thresholds

9. Prioritize drivers

10. Explore and select scenario logics

11. Develop time-evolving outlines

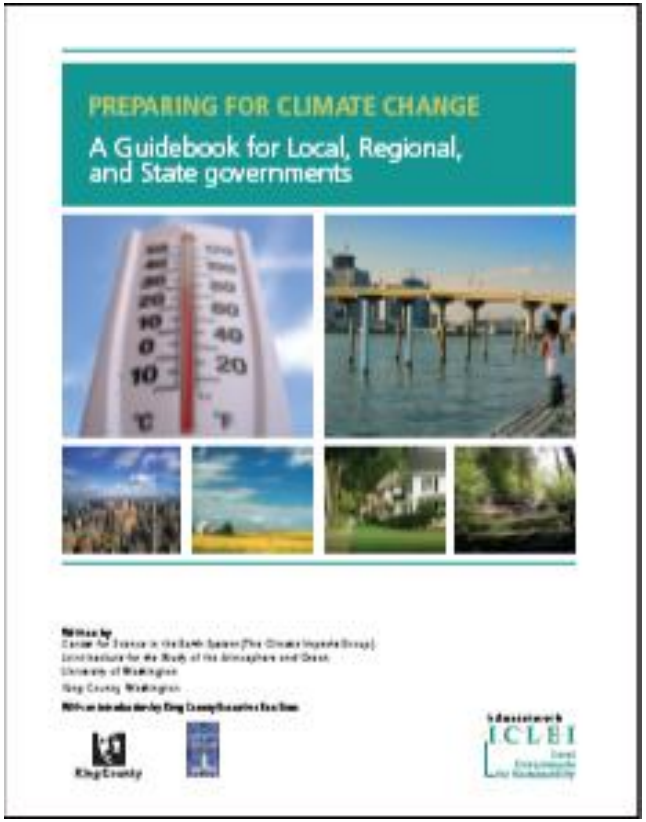
12. Develop scenario narratives

Drivers Tables

University of Washington Climate Impacts Group's Climate Change Adaptation Guidebook

SUMMARY OF PROJECTED CLIMATE CHANGES FOR THE U.S. PACIFIC NORTHWEST						
Climate Variable	General Change Expected	Specific Change Expected and Reference Period	Size of Projected Change Compared to Recent Changes	Information About Seasonal Patterns of Change	Confidence	Source(s) & Context
Temperature	Increase	+0.7 to 3.2°F (2020s) +1.4 to 4.6°F (2040s) compared to 1970-1999 average	- Projected warming much larger than the regional warming observed during the 20th century. - By the 2020s, average temperatures could be higher than most of those experienced during the 20th century.	Slightly more warming in summer than winter.	High confidence that the Pacific Northwest will warm (all models project warming).	- Publication: Mote et al. 2005b - Projections derived from ten climate models from IPCC 2007 simulating climate changes associated with high and low greenhouse gas emission scenarios. - Geographical region is the PNW, defined as Washington, Oregon, Idaho, and western Montana.
Precipitation	Very small increase	-4 to +7% (2020s) -4 to +9% (2040s) compared to 1970-1999 average	- Projected change is very small relative to the range of precipitation observed during the 20th century.	Slight decreases in summer and slight increases in winter.	- Changes in precipitation are less certain than changes in temperature. - Changes in summer precipitation are less certain than changes in winter precipitation. - Future years projected to continue to swing between relatively wet and dry conditions, making it likely that the change due to climate change will be hard to see	
Sea level	Increase	+7-23 inches globally at 2090-2099 (compared to 1980-1999 avg). Regional variation in land movement could affect sea level rise in specific locations	- Projected changes are in the ballpark of those observed recently (7"/century globally during 1961-2003 and 12"/century globally during 1993-2003).	n/a	- High confidence that sea level will increase globally, but much uncertainty in the specific amount of increase and how it will vary by location. - Some uncertainty about data indicating subsidence in South Puget Sound.	- Publication: IPCC 2007a, Snover et al. 2005 - Projections derived from multiple climate models simulating climate changes associated with high and low greenhouse gas emission scenarios.

Table 4.1 Summary table for regional climate change.



Impacts Tables

INITIAL SCOPING: A SAMPLE OF SECTORS AND POTENTIAL CLIMATE CHANGE IMPACTS	
Sector	**Impacts in some regions could include...**
Hydrology and water resources	• Shift in the timing of spring snowmelt to earlier in the spring • Lower summer streamflows, particularly in snowmelt-dependent water systems in the western U.S. • Increased risk of drought • Increased risk of flooding • Increased competition for water • Warmer water temperature in lakes and rivers • Changes in water quality (varies by water quality parameter)
Agriculture	• Changes in crop yields (varies by crop) • Potential ability to "double crop" • Increased risk of heat stress, particularly in the South • Increased demand for irrigation water due to longer and warmer growing season • Increased risk of pest outbreaks and weeds
Biodiversity	• Shift in the distribution and range of species • Loss of species not able to adapt to changes • Increased competition from invasive species • Loss of habitat
Forests (including parks and urban forests)	• Increase in growth and productivity in the near-term where soil moisture is adequate and fire risk is low • Shift in the distribution and range of species • Increased risk of insect outbreaks • Increased risk of forest fire • Increased competition from invasive species
Recreation	• Increased opportunities for warm season activities in milder regions of the U.S. • Decreased opportunities for warm season activities during the hottest part of the year, particularly in the southern U.S. (e.g., from heat, forest fires, low water levels, reduced urban air quality) • Reduced opportunities for cold season recreation due to decreased snowpack and/or reduced snow or ice quality • Increased reliance on snow-making at ski areas • Shifts in tourism dollars within a community from one recreation sector to another, or from communities losing recreational opportunities to communities gaining opportunities
Energy	• Reduced heating demand during winter months • Increased cooling demand during summer months • Increased or decreased hydroelectric generating capacity due to potential for higher or lower streamflows

CLIMATE IMPACTS GROUP

Climate Science in the Public Interest

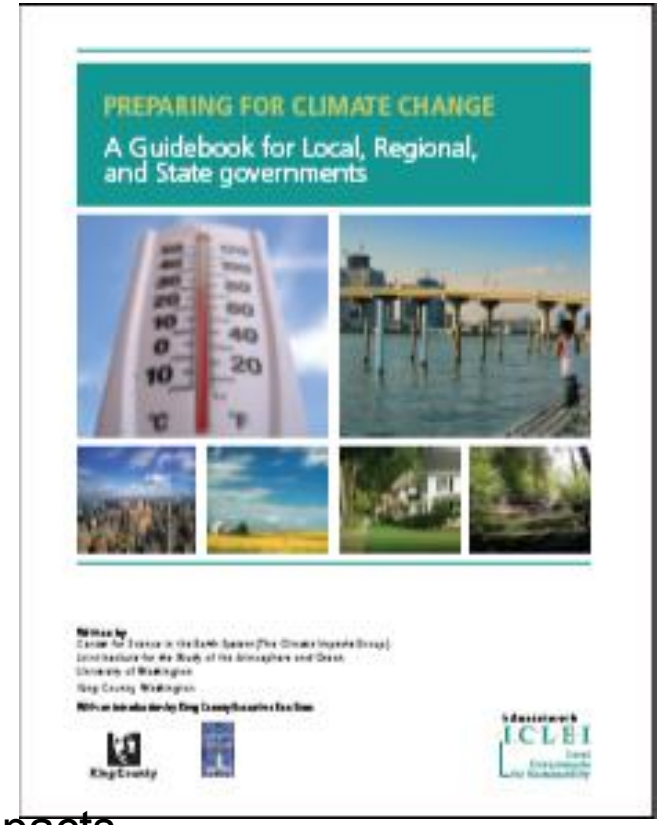


Table 4.2 Summary table for regional climate change impacts.

Building Scenarios

8. Identify key drivers and variables
- ***8A.*** exogenous drivers
- ***8B.*** potential impacts
- ***8C.*** **linkages, feedbacks, thresholds**

9. Prioritize drivers
10. Explore and select scenario logics
11. Develop time-evolving outlines
12. Develop scenario narratives

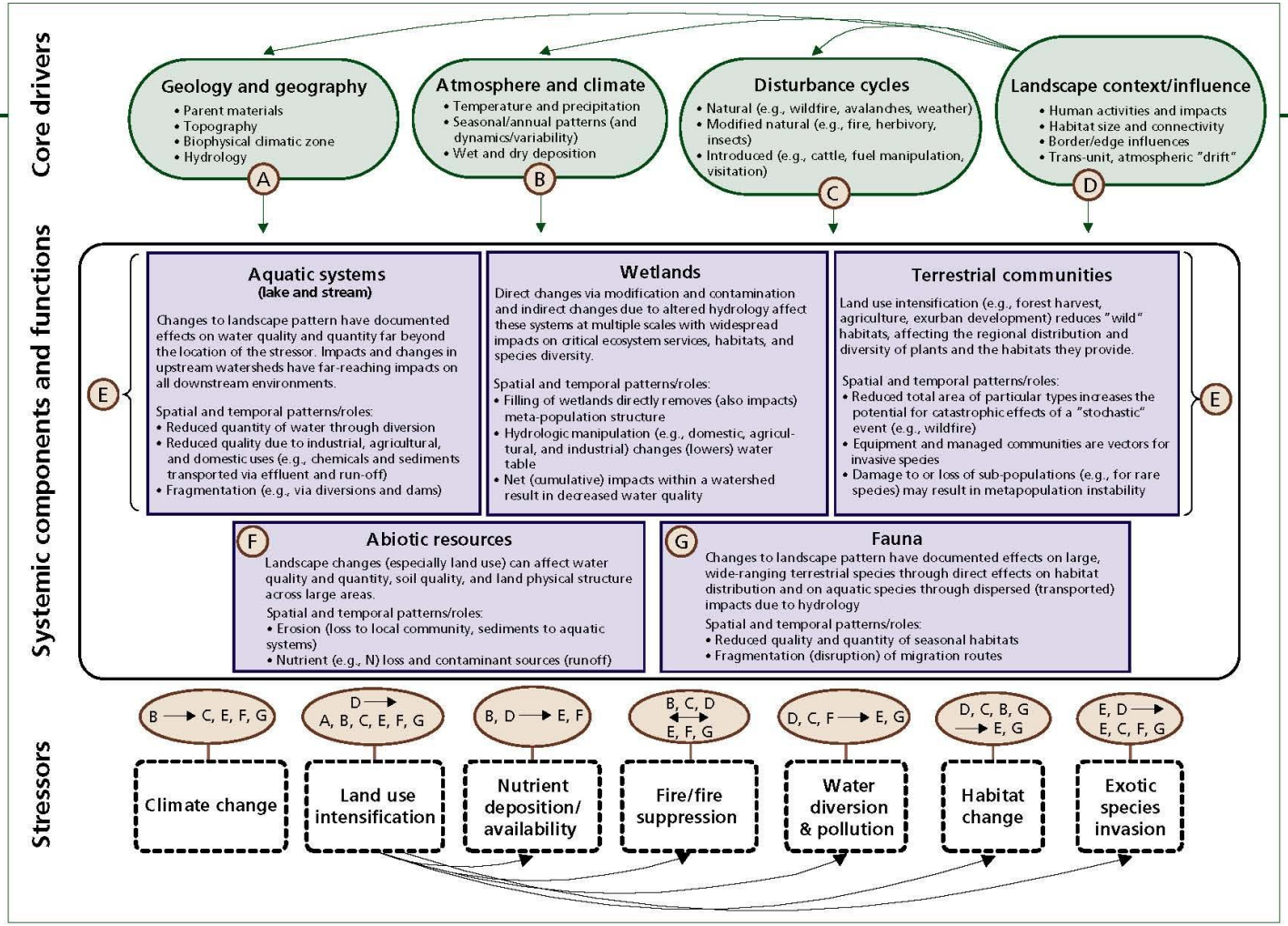
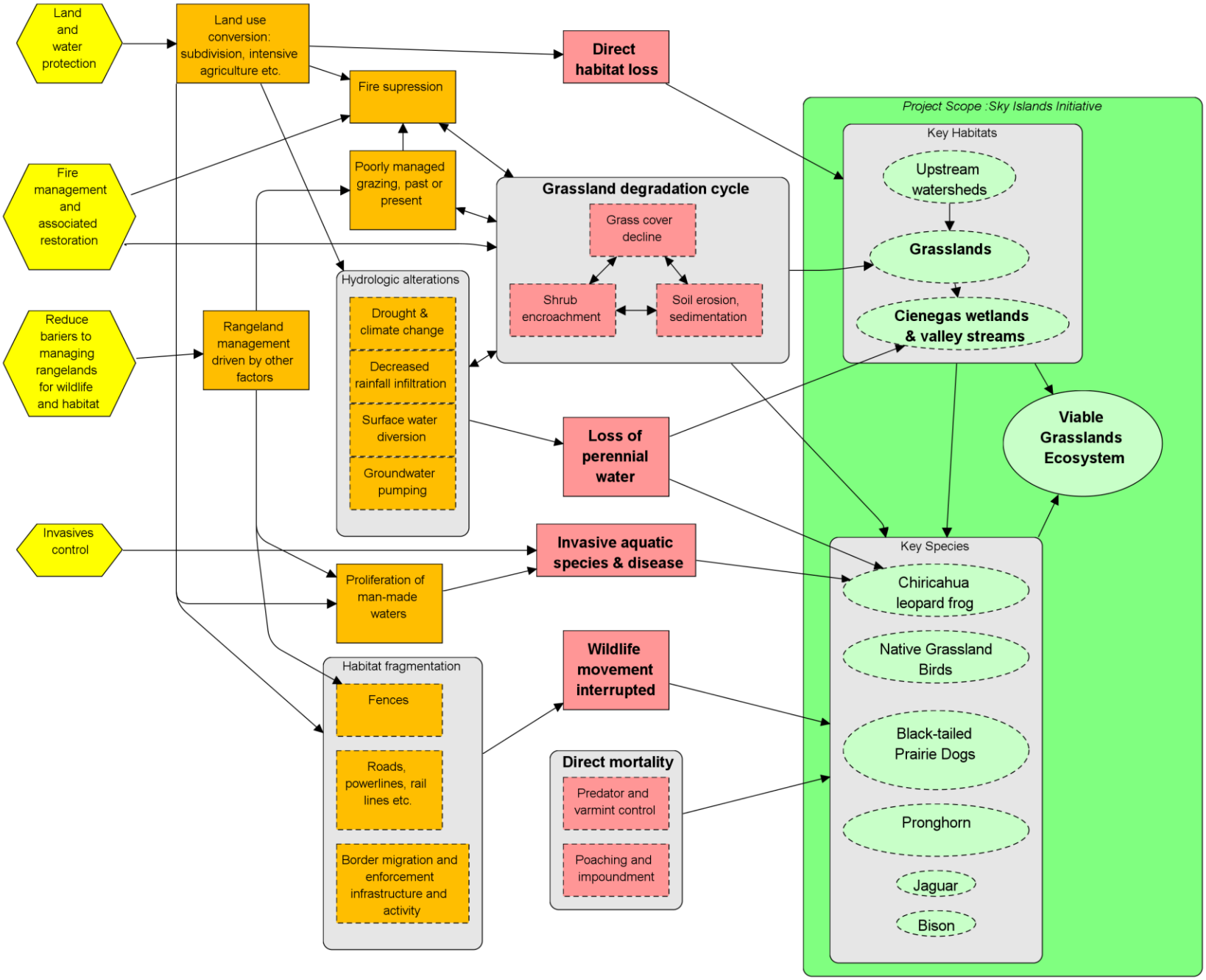


Figure 2.2.1. Landscape characterization model.

Information on how this model functions can be found in Section 2.2. More detailed information on this model can be found in Section 2.2.1 and Appendix A.


Land and water protection
Land use conversion: subdivision, intensive agriculture etc.
Direct habitat loss
Fire supression
Project Scope :Sky Islands Initiative
Key Habitats
Upstream watersheds
Fire management and associated restoration
Poorly managed grazing, past or present
Grassland degradation cycle
Grass cover decline
Shrub encroachment
Soil erosion, sedimentation
Grasslands
Cienegas wetlands & valley streams
Hydrologic alterations
Drought & climate change
Decreased rainfall infiltration
Surface water diversion
Groundwater pumping
Reduce bariers to managing rangelands for wildlife and habitat
Rangeland management driven by other factors
Loss of perennial water
Viable Grasslands Ecosystem
Invasives control
Invasive aquatic species & disease
Key Species
Proliferation of man-made waters
Chiricahua leopard frog
Native Grassland Birds
Habitat fragmentation
Fences
Wildlife movement interrupted
Black-tailed Prairie Dogs
Roads, powerlines, rail lines etc.
Direct mortality
Pronghorn
Predator and varmint control
Border migration and enforcement infrastructure and activity
Poaching and impoundment
Jaguar
Bison

Building Scenarios

8. Identify key drivers and variables
  8A. exogenous drivers
  8B. potential impacts
  8C. linkages, feedbacks, thresholds
9. Prioritize drivers
10. Explore and select scenario logics
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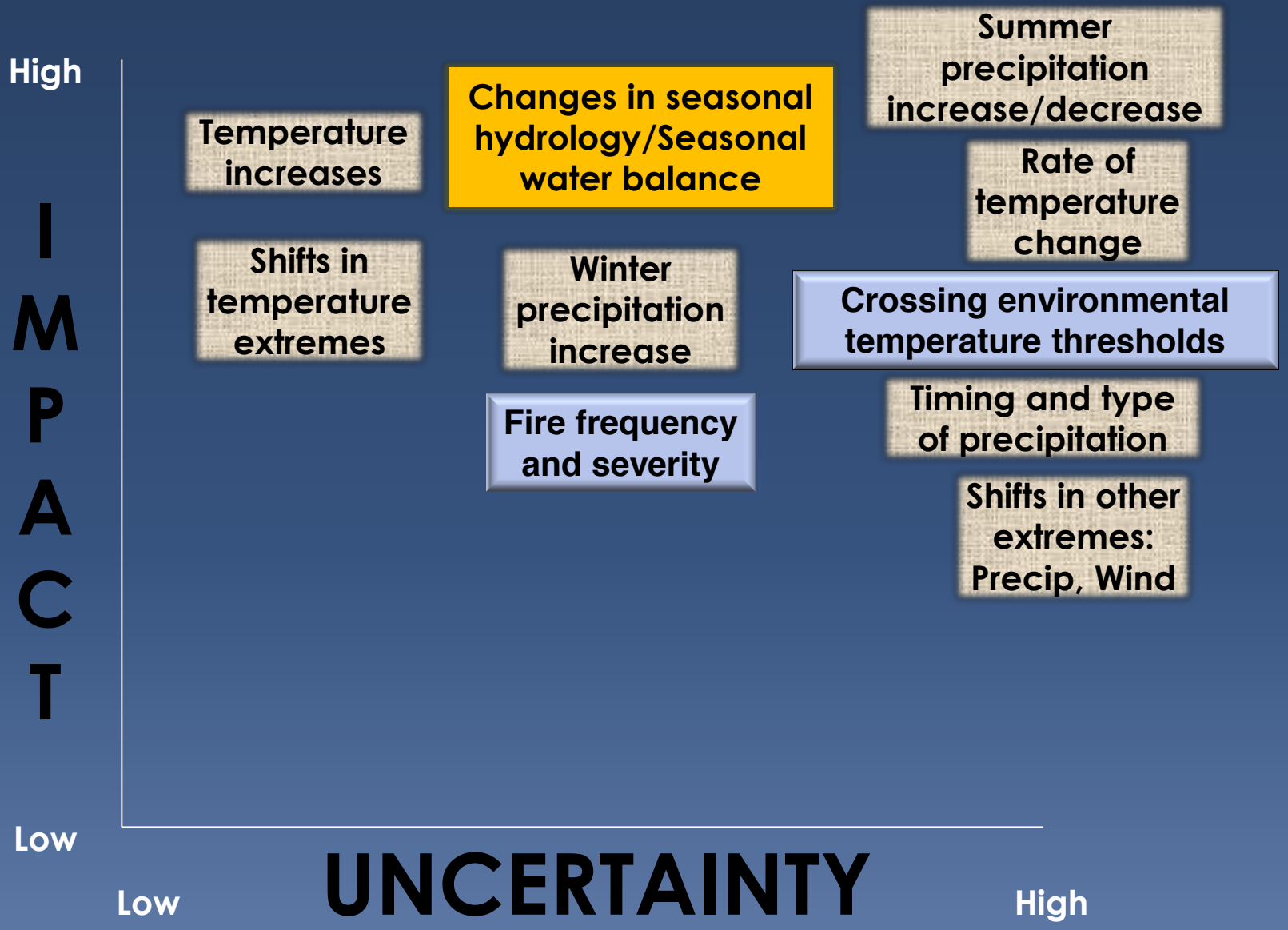
Dominant Climate Drivers



Building Scenarios

8. Identify key drivers and variables
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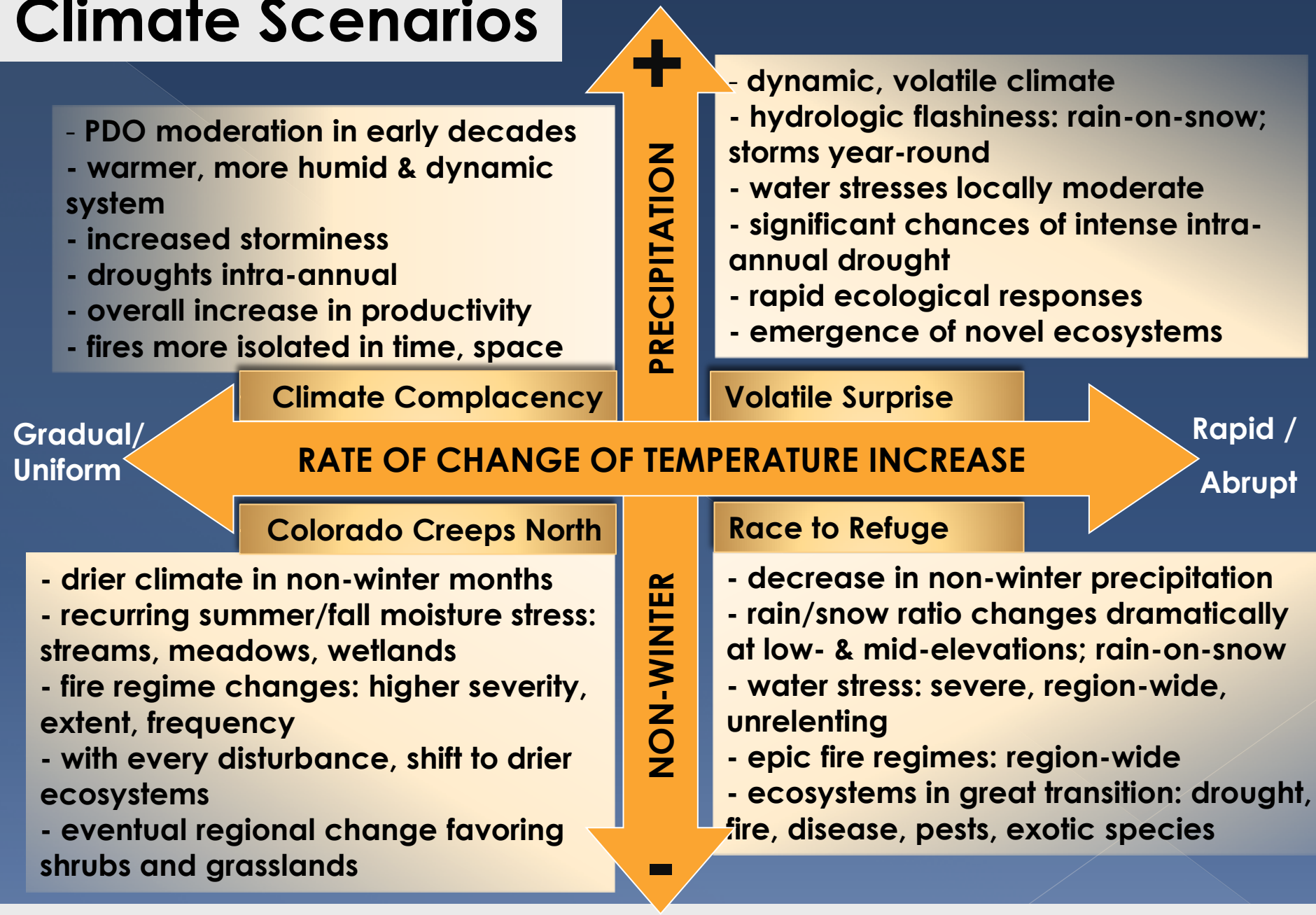
10. Explore and select scenario logics

– Four quadrant approach

Climate Scenarios



FOR ALL QUADRANTS: Temperatures and extremes increasing; Environmental thresholds exceeded; Winter precipitation stable or increasing ; Earlier spring runoff; Growing season & Fire season extended; Phenological mismatches

Building Scenarios

8. Identify key drivers and variables
- *8A.* exogenous drivers
- *8B.* potential impacts
- *8C.* linkages, feedbacks, thresholds

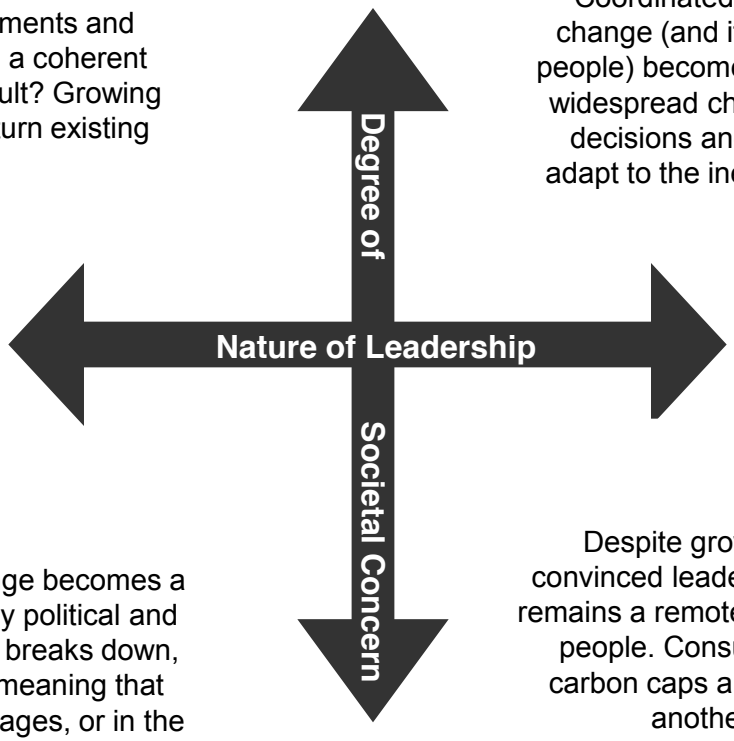
9. Prioritize drivers

10. Explore and select scenario logics – Four quadrant approach

- **Nested scenarios:** national, regional, local
- Chained scenarios: short-, long-term

Nested Scenario Development

➢ *Cross the critical uncertainties together to form a high-level matrix. This creates 4 different pictures for the future social and political landscape around climate change*



Broad Understanding

Heightened Urgency

Riots and Revolution

At a time of growing social concerns and fear about the impacts of climate change, governments and political leaders are unable to articulate a coherent set of policies and approaches. The result? Growing public unease, and movements to overturn existing systems and structures.

Big Problems, Big Solutions

Coordinated action around the world as climate change (and its effects on weather, resources and people) becomes seen as an increasingly urgent and widespread challenge. Political leaders initiate bold decisions and policies to mitigate the worst, and adapt to the inevitabilities of climate change effects.

Lack of senior commitment

Varied approaches and alignment

Short-term concerns

Senior commitment

International alignment

Long-term perspectives

Is Anyone Out There?

To the frustration of many, climate change becomes a variable concern that is often ignored by political and business leaders. Scientific consensus breaks down, other societal challenges loom large, meaning that climate change is seldom on the front pages, or in the forefront of political and business leaders' minds.

Wheel-Spinning

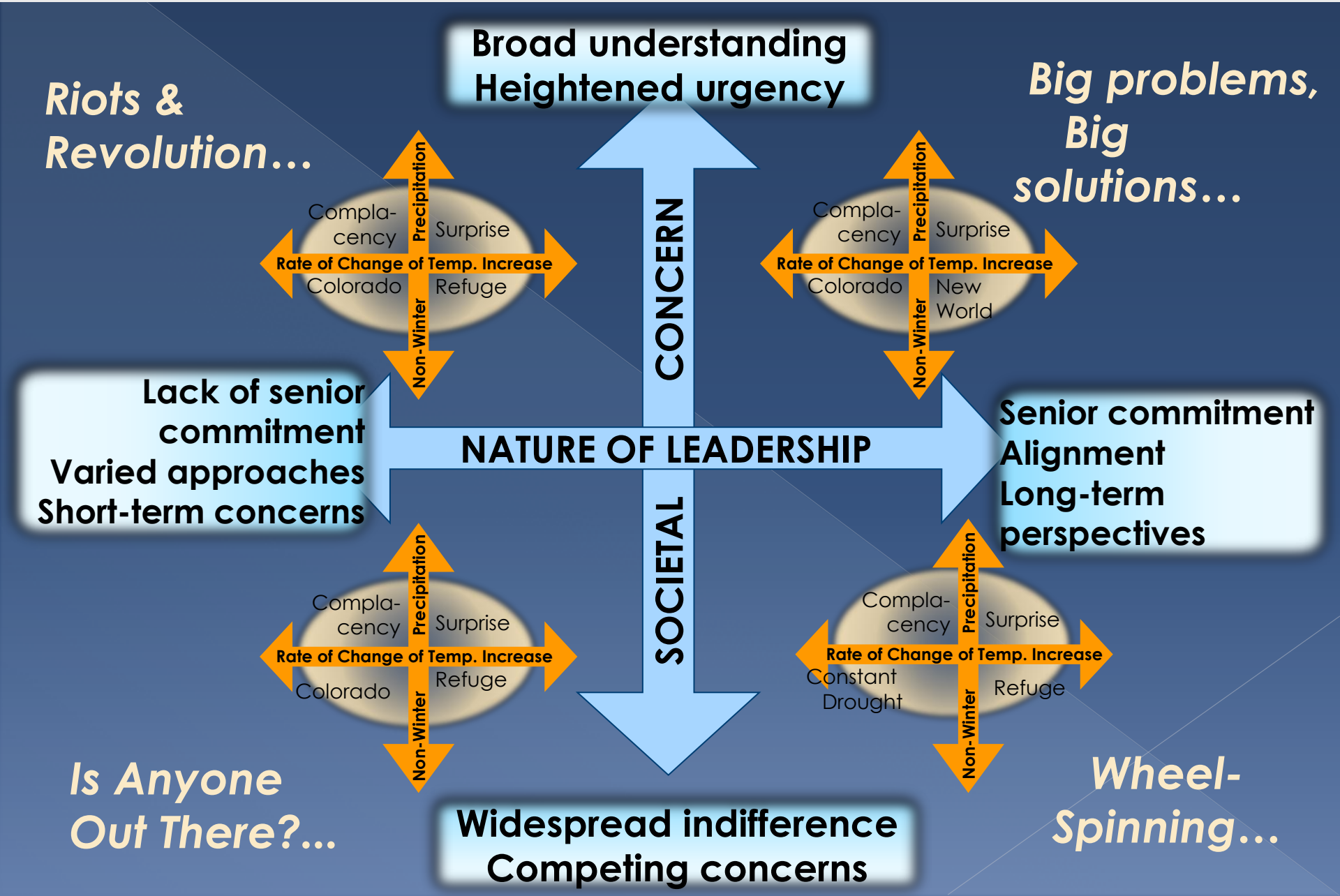
Despite growing scientific evidence that has convinced leaders across the world, climate change remains a remote concern for the majority of everyday people. Consumers and businesses rail against carbon caps and prices, claiming them to be "just another tax" imposed by the elite.

Widespread indifference

Competing concerns

NPS, 2010

Nested Scenarios for Planning



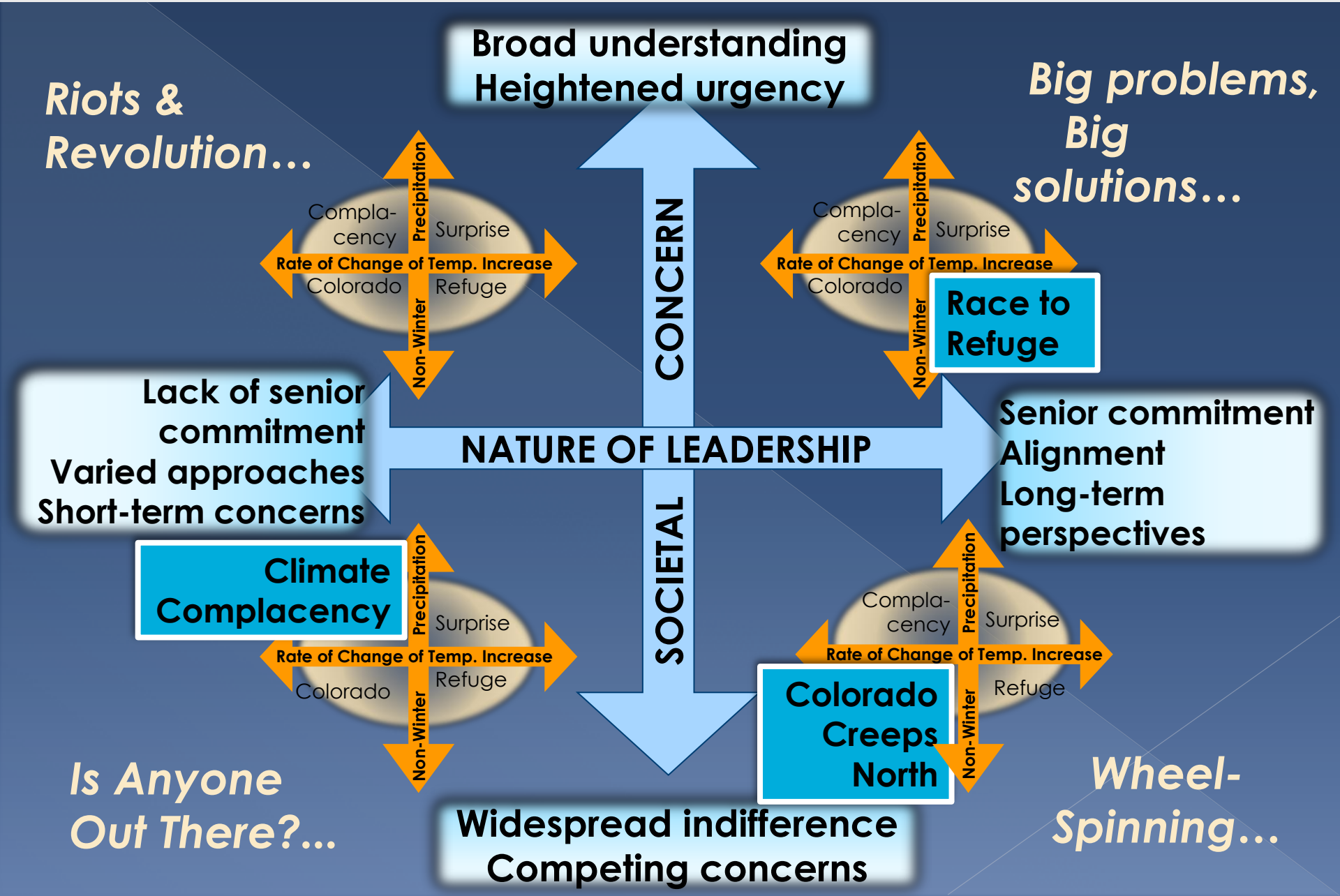
Building Scenarios: Scenario Development

8. Identify key drivers and variables
9. Prioritize drivers: illustrate in chart
- Nested scenarios: local floodplain management units
- Chained scenarios: short-term uncertainties

10. Explore and select scenario logics

- Strategically select 3-5 diverse and challenging scenarios for build-out

Nested Scenarios for Planning



Building Scenarios

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- *8C.* linkages, feedbacks, thresholds

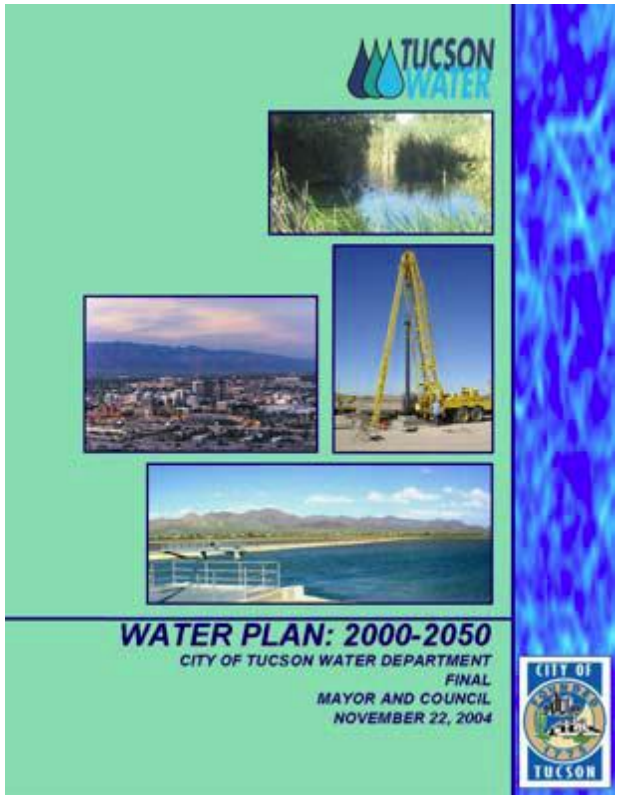
9. Prioritize drivers

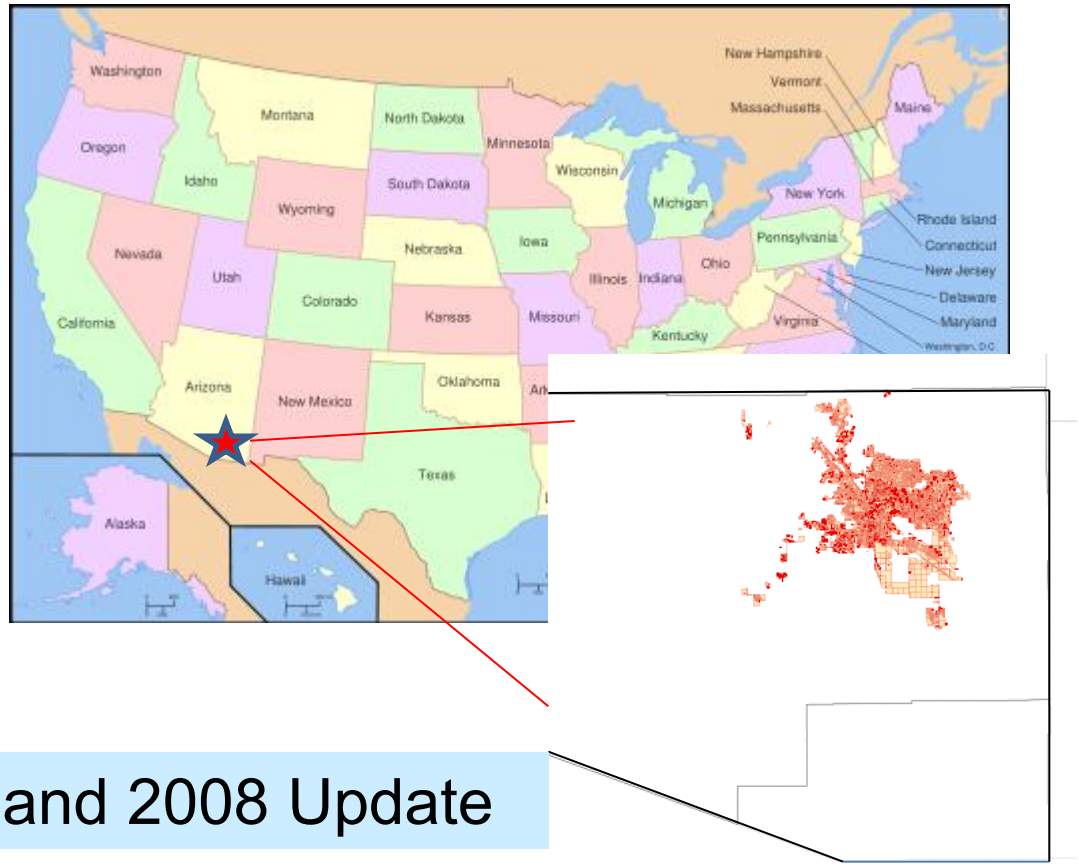
10. Explore and select scenario logics – Four quadrant approach

- Nested scenarios: national, regional, local
- **Chained scenarios:** short-, long-term

Chained Scenarios: Tucson Water 2000-2050, 2008 Update, and Beyond

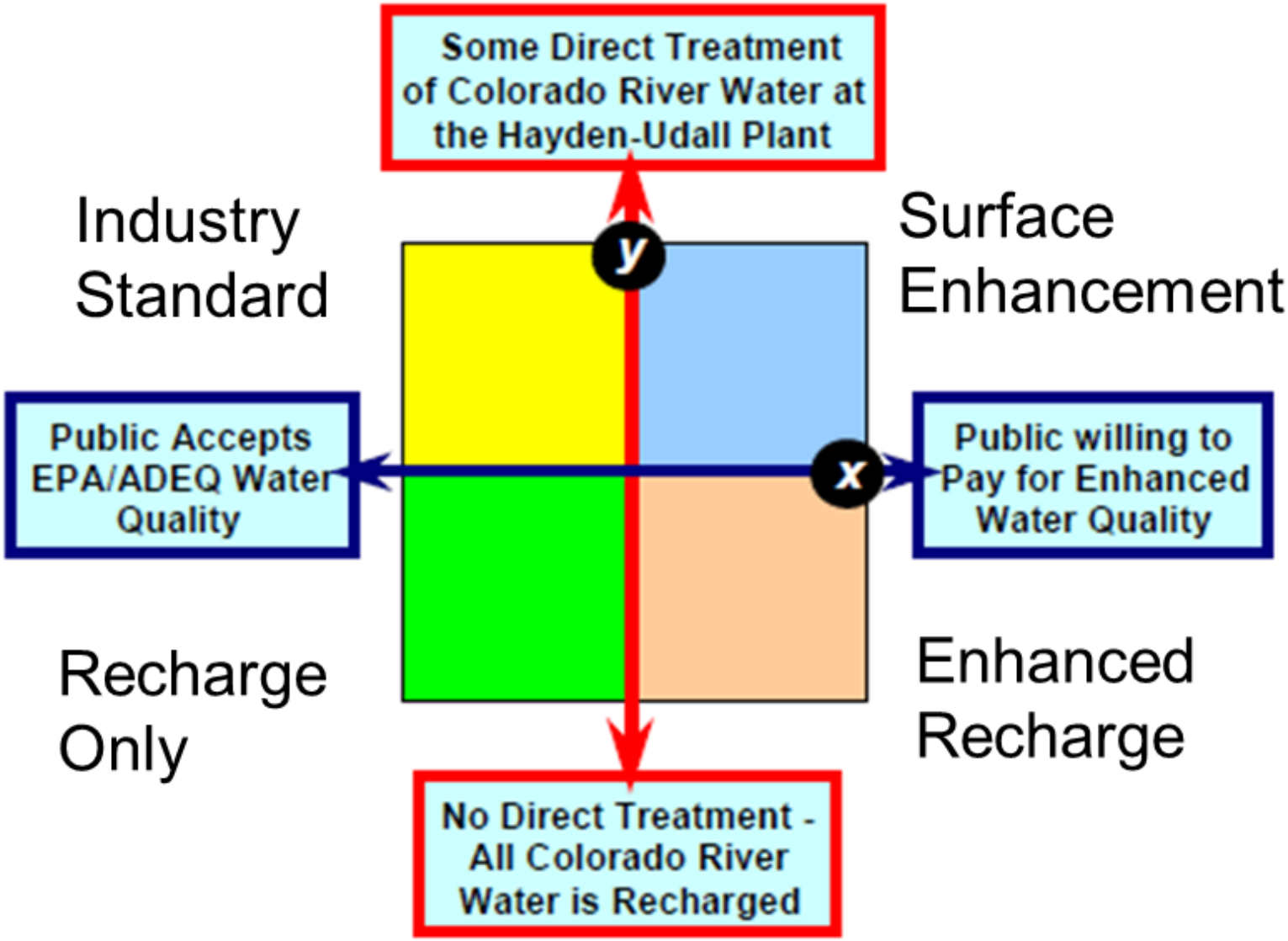
Tucson Water: 225,000 connections, 775,000 people, 350 square miles



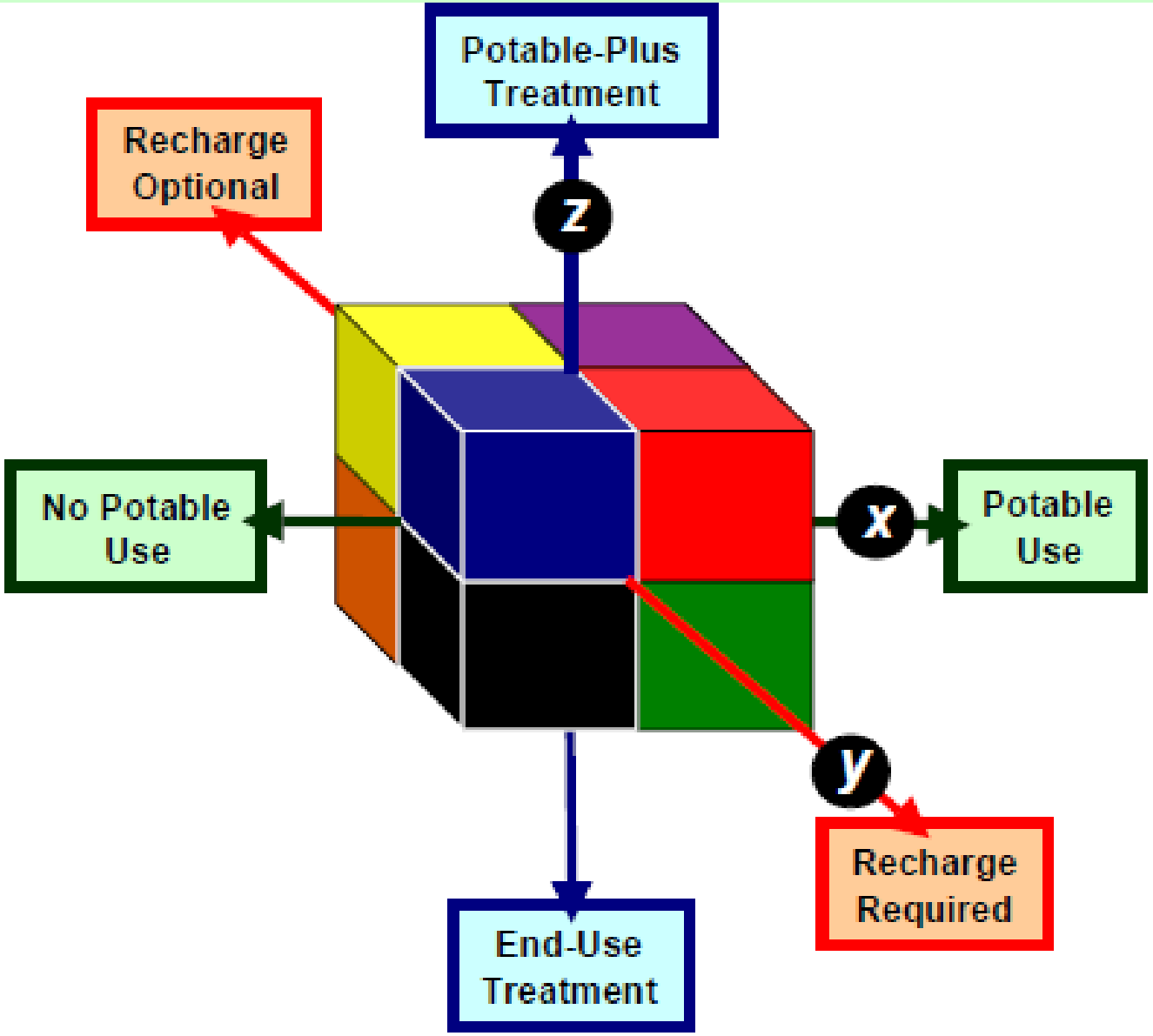


and 2008 Update

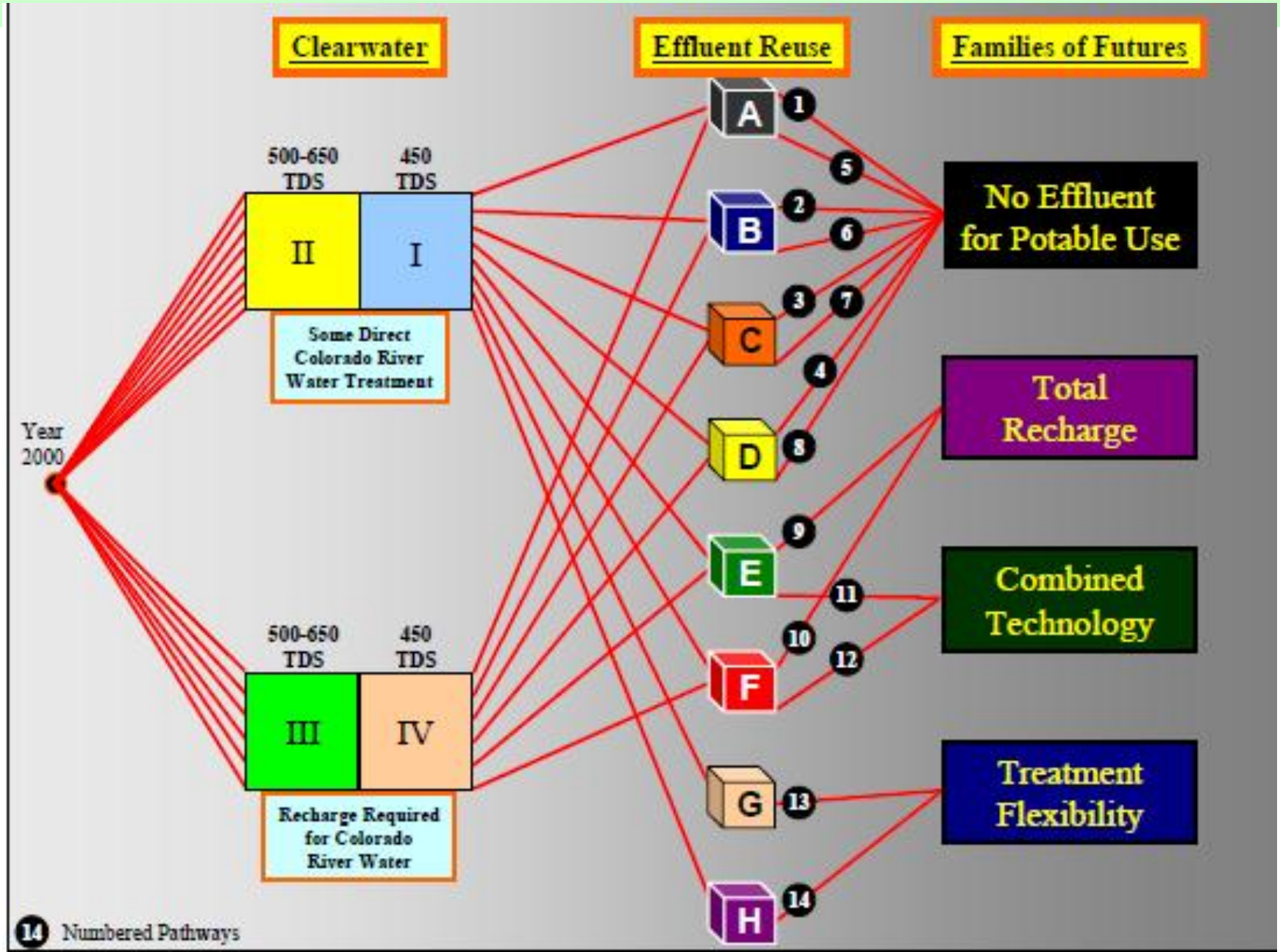
Tucson Water: Values about Use of Colorado River Water



Tucson Water: Values about Use of Wastewater Effluent



Combining Short- and Long-term Scenarios



Building Scenarios

8. Identify key drivers and variables
9. Prioritize drivers
10. Explore and select scenario logics
11. Develop time-evolving outlines

- Beginning, middle, end
- Legacy components ('pre-determined')
- Surprise

  A: Env surprise that has social implications

  B: Soc that has environmental implications

  C: Soc that forces environmental change

  D: Env that forces social change

Building Scenarios

8. Identify key drivers and variables
9. Prioritize drivers
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11. Develop time-evolving outlines
12. Develop scenario narratives

- All have "good" and "bad" parts
- Characters
- Plot lines: Winners/losers, Crisis/response, Generations (new cultures), Perpetual transition

Part 3: Using Scenarios

Using Scenarios

13. Vet scenarios
14. Assess vulnerability and opportunity
15. ID possible strategic directions
16. Test strategies against scenarios
17. Assess implications (e.g., least risk, goals, values)
18. Prioritize actions (via your planning processes)
19. Communicate strategy & decision outcomes
20. Connect with implementation

Scenario Planning: Strategic Thinking about Responses to Increasing VUCA

Volatility

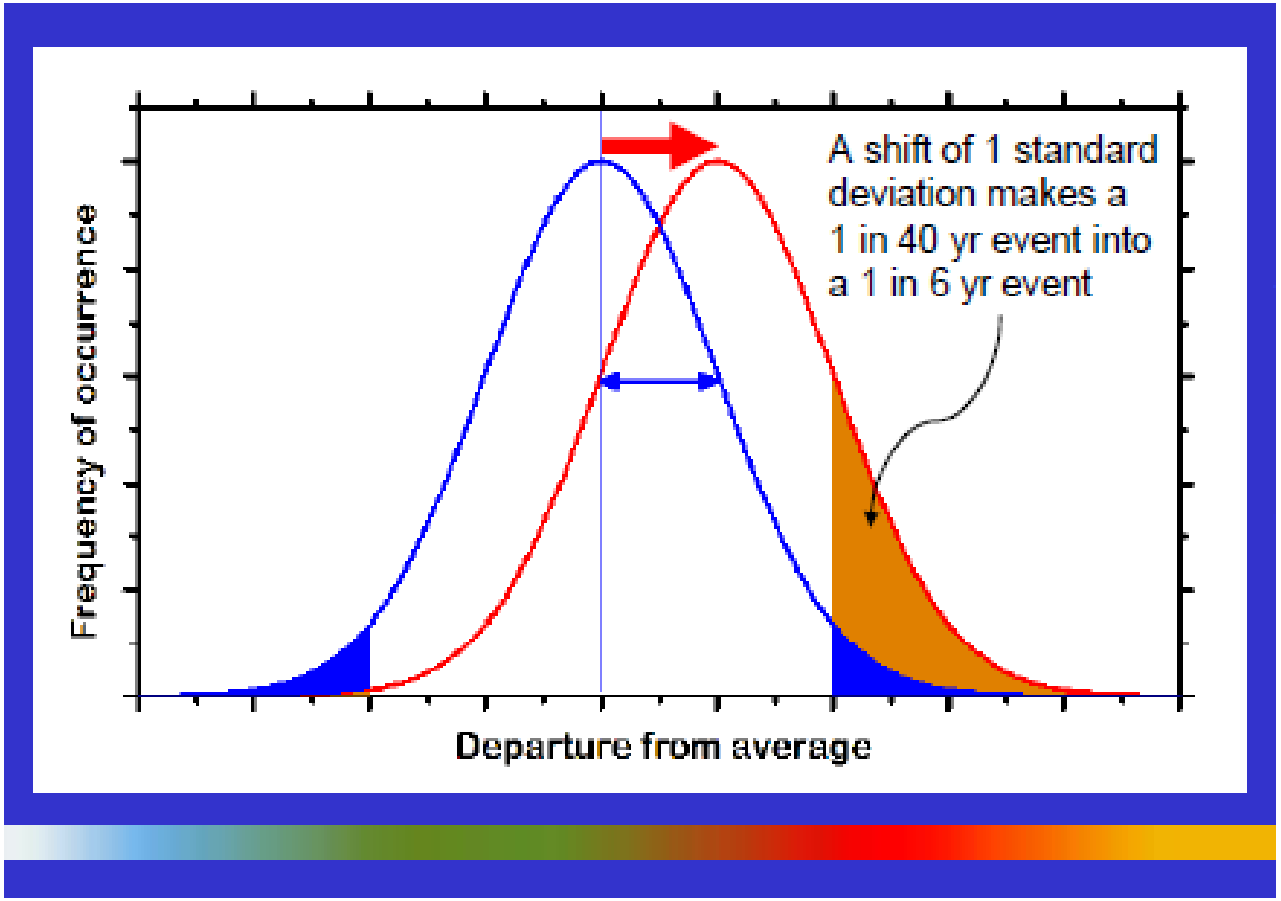
Uncertainty

Complexity

Ambiguity

Institute for the Future

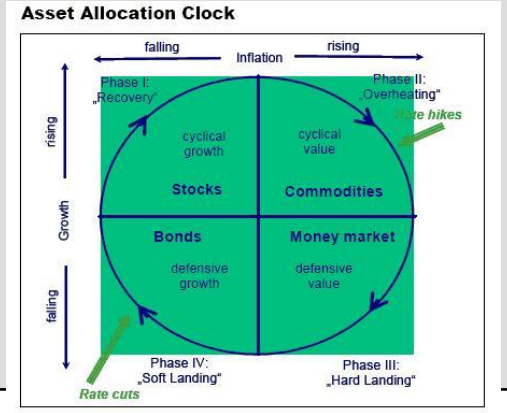
IPCC WG1



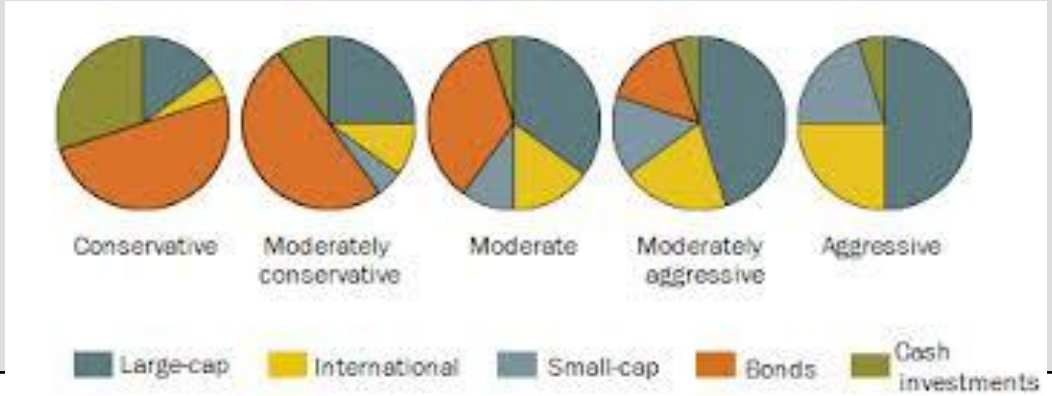
But what follows the scenarios and brainstorming?

Step 15. ID Possible Decision Strategies

- Punt!
- Delay and assess
- Commit with fallbacks
- Shape the future
- Robust: good across all scenarios
- Portfolio of options: shifting over time



Source: Merrill Lynch



Categories of Adaptation Options

1. **Resistance:** defend against change (Homeland Security)
2. **Resilience:** 'bounce back' after disturbance (Health Care)
3. **Response:** facilitate change (Beginners Mind), e.g., regional approaches, interconnections, diversity
4. **Realignment**: accept different systems, focus on function (Auto Mechanics)
5. **Reduce:** *mitigation* of GHG (Good Samaritan)
6. **Triage:** let go (Pragmatic)

Adapted from Millar et al, 2007. Ecological Applications. 2008, Forest Guild presentation

No Regrets Actions – Different Concepts

No Regrets
- increase resilience

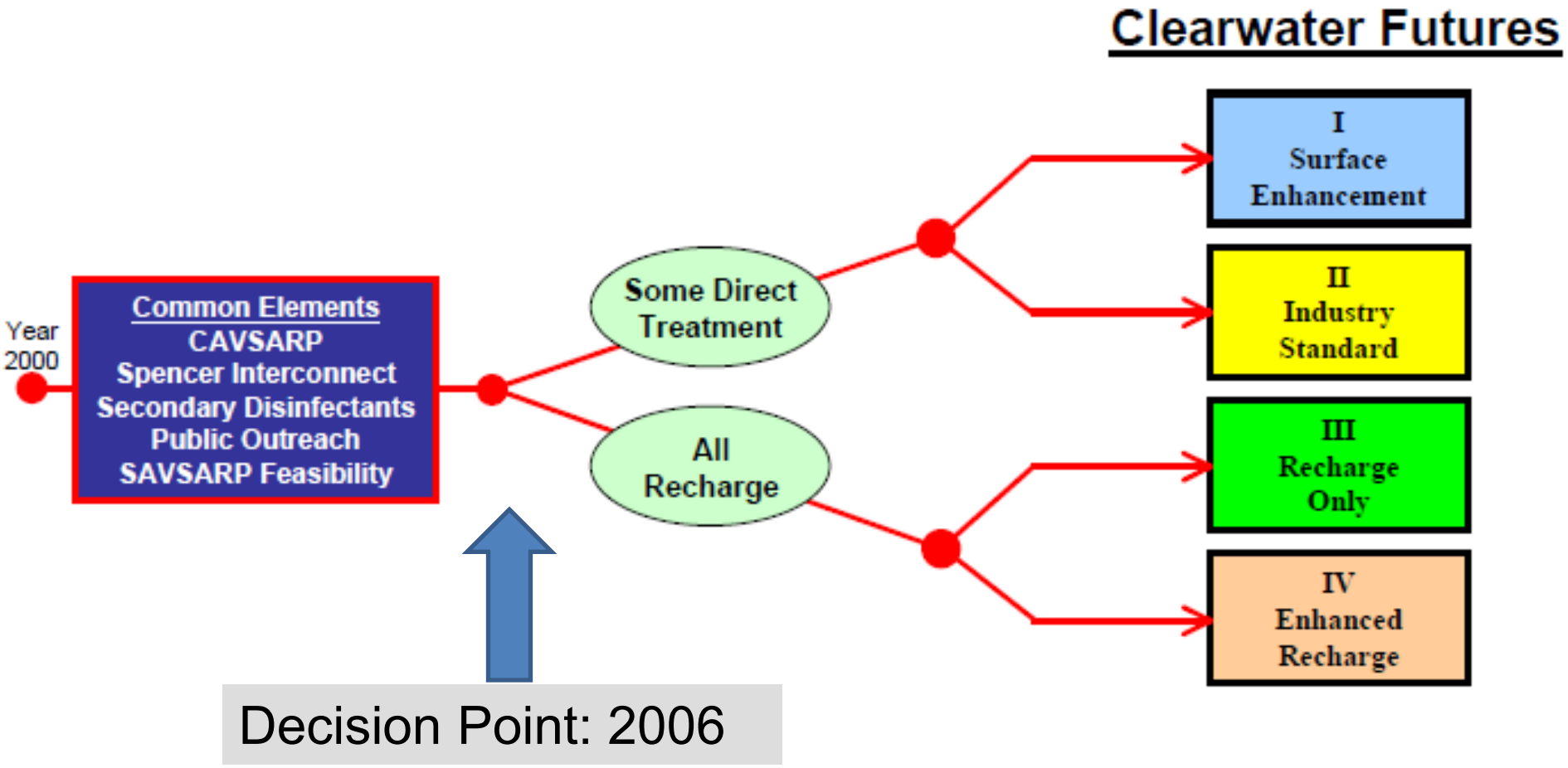
No Regrets
- avoid locking in vulnerabilities

No Regrets
- create benefits in the short-term
- win-win-win: benefits across many values, needs

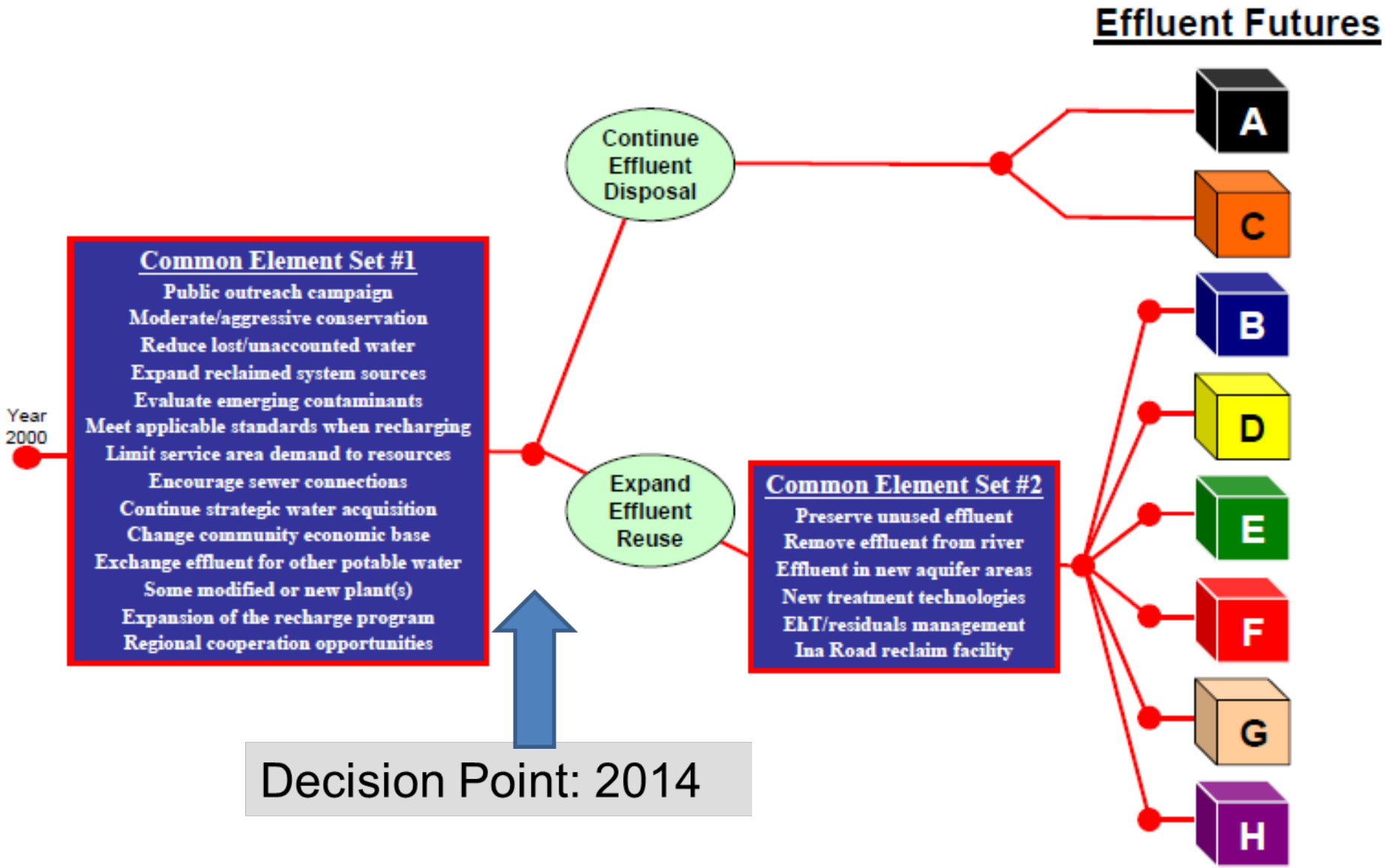
No Regrets
- appropriate across all plausible futures

No Regrets
- portfolio of weighted investments for multiple plausible futures

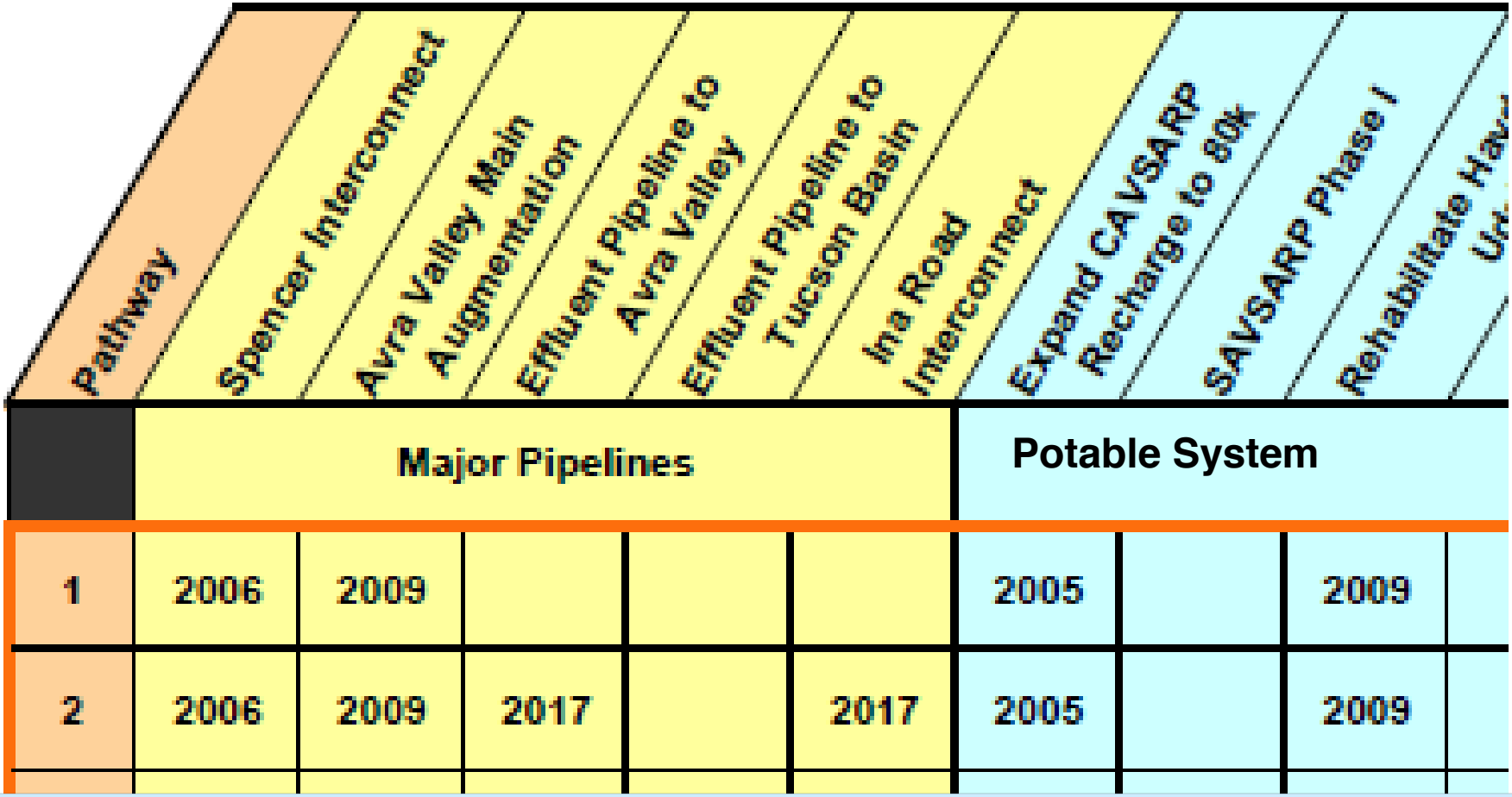
Some Options Common to All Futures: CO. R.



Options Common to All or Some Futures: Effluent



Lay Out Timelines for Each Adaptation Option



Pathway	Spencer Interconnect	Avra Valley Main Augmentation	Effluent Pipeline to Avra Valley	Effluent Pipeline to Tucson Basin	Ina Road Interconnect	Expand CAVSARP Recharge to 80k	SAVSARP Phase I	Rehabilitate Hav... Ur...
	Major Pipelines					Potable System		
1	2006	2009				2005		2009
2	2006	2009	2017		2017	2005		2009

Natural resources analog? - biological, ecological, physical, geochemical

Rate Collections of Options with Evaluation Criteria

Pathway	Colorado River Water Source Acceptance	Effluent Water Source Acceptance	Renewable Supply Utilization	Meeting Projected Water Demand	Source Reliability	Impacts To Recharge Neighbors	Riparian Issues	Salinity Control	Subsidence Prevention	TOTAL	Clearwater Fi
	<<<<<Source Water>>>>>			<<Operations>>		<<<<<<<<Environment>>>>>>>>				Overall	
1	6	10	1	1	1	10	6	4	1	38	FAIL
9	10	5	10	10	10	1	1	7	10	64	PASS!

NPS Analogs? Manage for biodiversity, wilderness, scenery, recreation, carbon and water storage

Rate Adaptation Combinations by Planning Goals

Planning Goals:	Clearwater Program 500-650 TDS; Recharge and/or Direct Treatment		
	Potable Use of Effluent	Long-Term Banking of Effluent	Disposal of Effluent
Meet Projected Total Demand	YES	YES	NO
Utilize Renewable Resources	YES	NO	NO
Meet Water-Quality Targets	YES	YES	YES
Achieve Sustainable Pumpage	YES	NO	NO
Manage Costs and Rate Impacts	YES	YES	YES
Comply with Assured Water Supply Program	YES	YES	NO

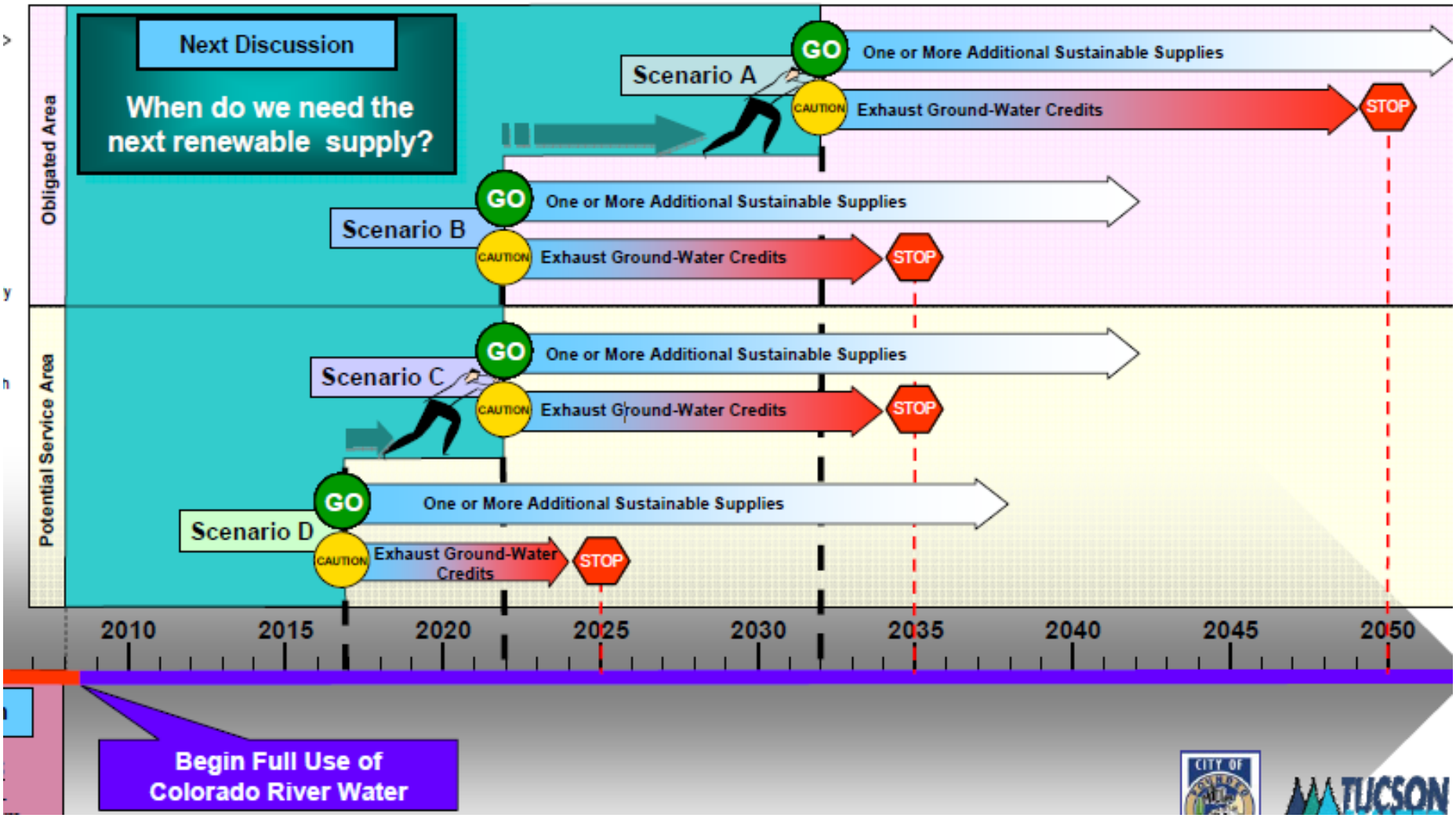
Revisiting the Scenarios in 2008

	With Additional Demand Management	Without Additional Demand Management
Obligated Area	Scenario A	Scenario B
Potential Service Area	Scenario C	Scenario D

New critical uncertainty: Water demand

Some uncertainties gone: Decision H2O in 2006/7. Customers OK with basic water standards

Tucson Water: Considering Demand



Embracing Uncertainty: Actionable, Flexible

Climate Complacency: Is Anyone Out There?

Colorado Creeps North: Wheel Spinning

Race to Refuge: Big Problems, Big Solutions

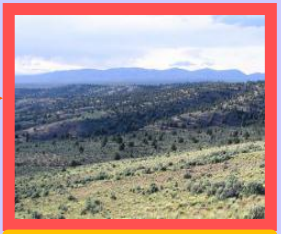
Adaptation Options

Possible Futures

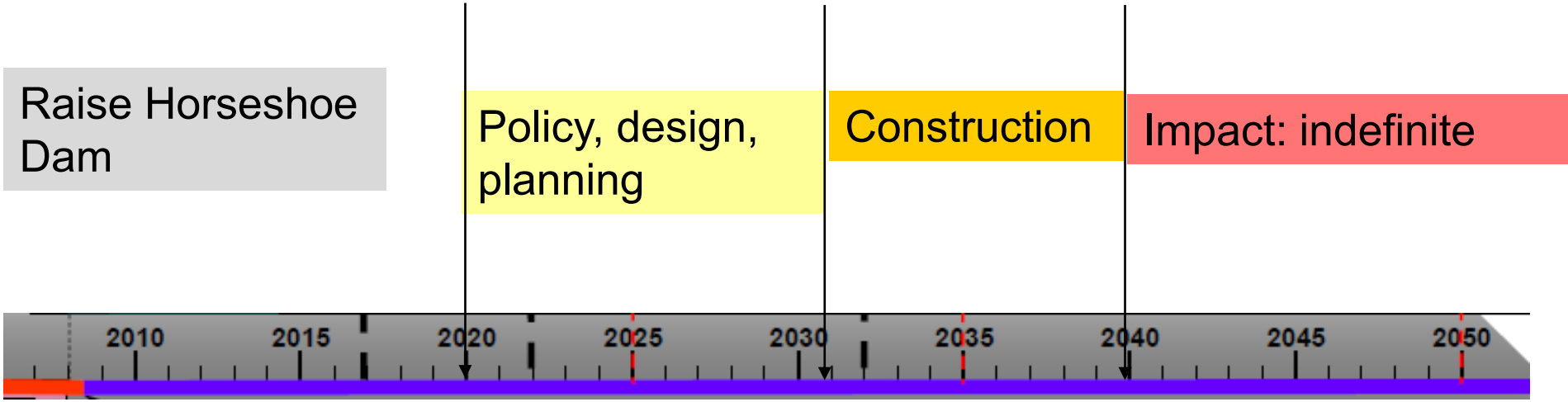
Collaboration. Communication. Inventory & Monitoring. Connectivity. Restoration in impaired locations.

Headwaters restoration across the Region. Protect refugia over other locations.

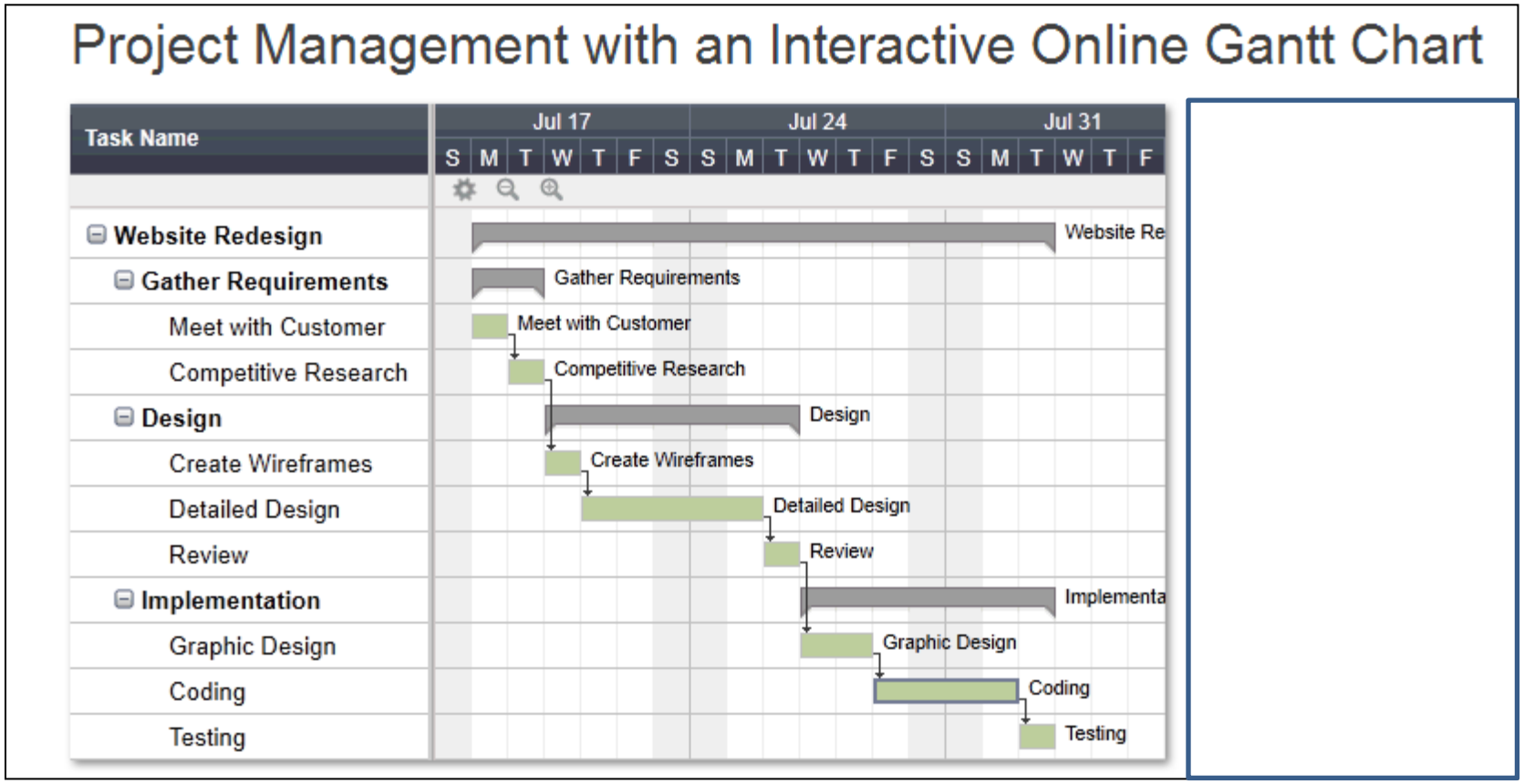
Dams in the Park. Move fish stocks north. Bring new fish stocks from south. Let some systems go.



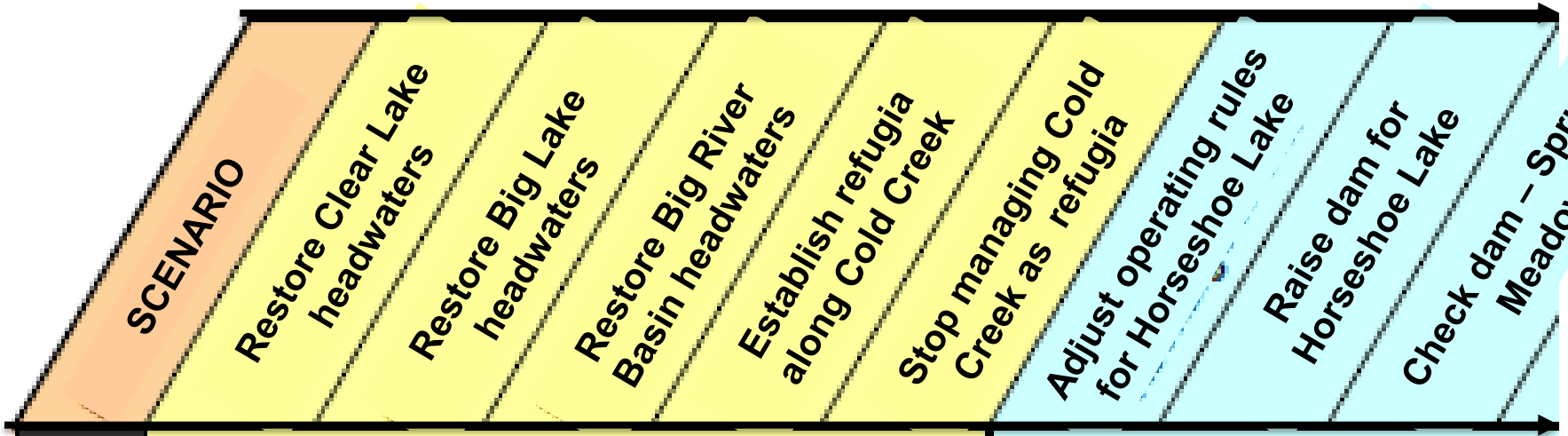
Timelines of Options: Gantt-style Charts



Gantt Charts



Timelines for Each Adaptation Option



	Ecological					Physical			
CC	2011					2080			
CCN	2011	2020	2060	2020		2050			
RR	2011	2011	2030	2011	2040	2020	2040	2030	

Categories: Institutional, biological, ecological, physical, geochemical

Decision Points

Climate Complacency: Is Anyone Out There?

Colorado Creeps North: Wheel Spinning

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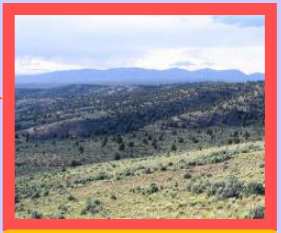
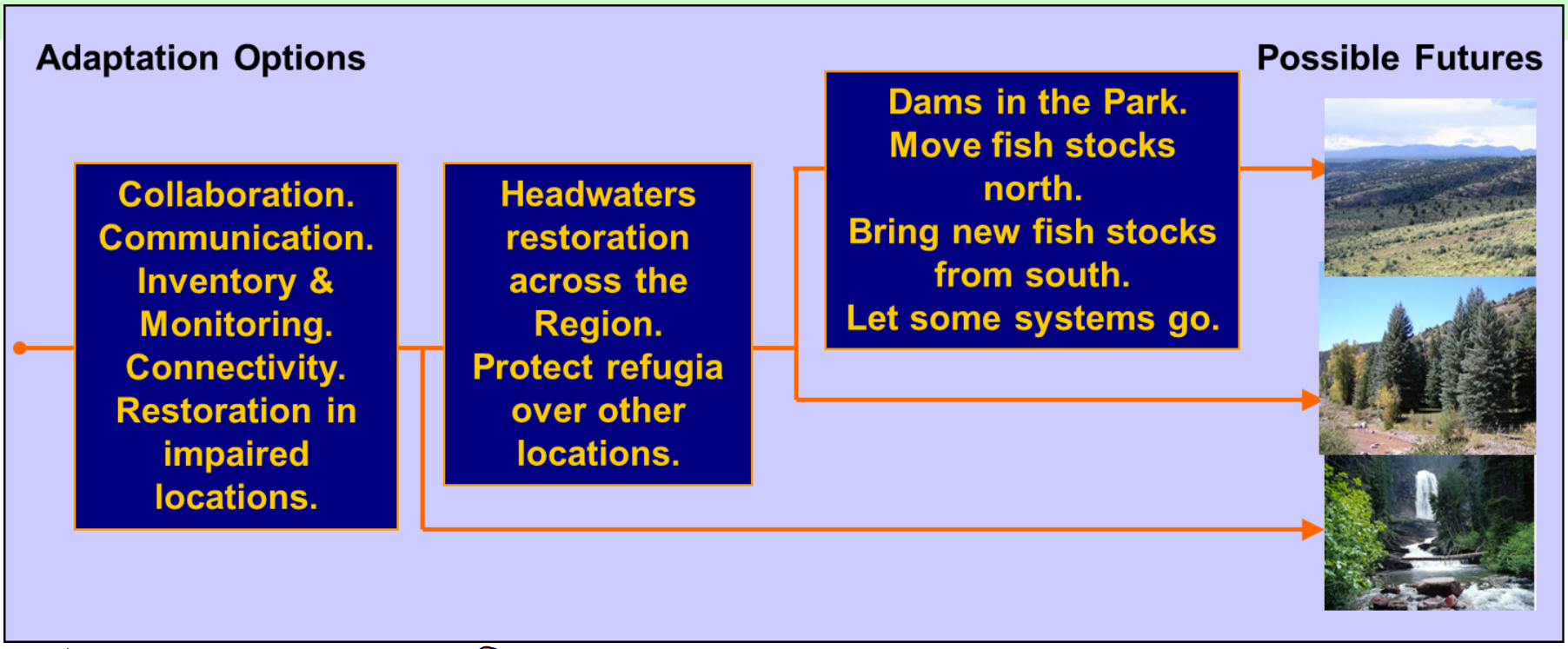
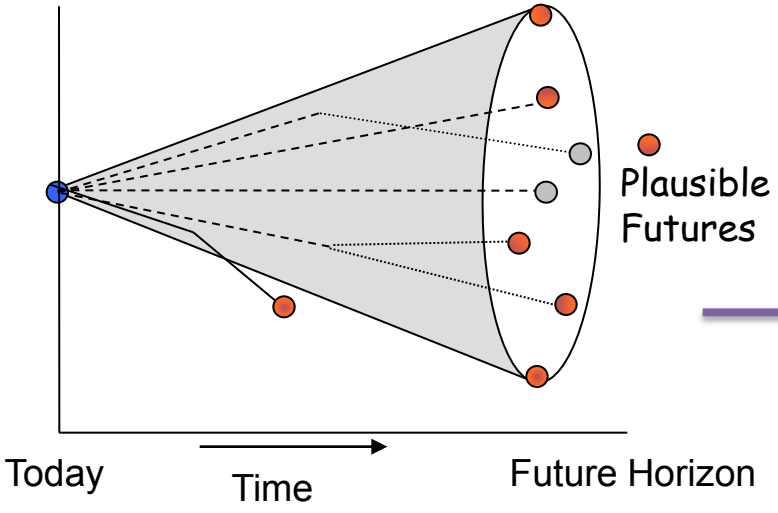
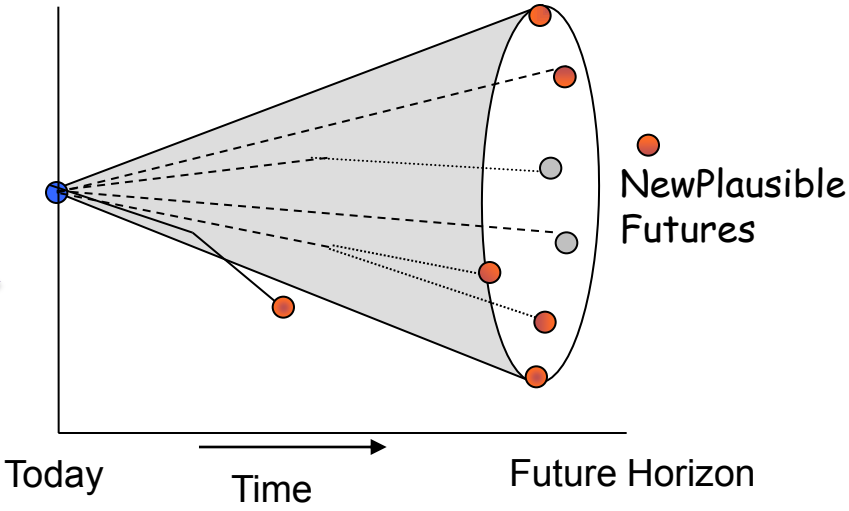


Re-starting the Scenario Planning Process







Scenario Planning

A Specific Planning Process
- organize by sequence of options
- identify ‘decision points’ or ‘indicators’ of scenario evolution
- can identify time periods for implementation of options: time for initiation, lead time for impact, impact longevity

A Flexible Planning Process
- can consider many scenarios
- can incorporate new scenarios

Accommodates Planning Standards
- can evaluate with explicit criteria
- can match against planning objectives

Public Process
- can do pre-work as working group, involve citizens through outreach and at decision points