

What Pacific Northwest Cities and Utilities Are Doing To Prepare For Climate Change

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2018 TACOMA PNWS-AWWA



Introduction

Climate Change Planning: Planning efforts to minimize social, economic, and environmental health risks by adapting water and wastewater infrastructure to the projected effects of climate change.

? *How do we as water and wastewater professionals, **plan for and adapt** to the realities that may come from major shifts in our environment due to climate change?*

Agenda

01

Survey Results

Survey Demographics

Trends in Planning
Experience

02

Predictions and Planning Resources

Climate Change
Predictions

Resources/Tools

03

Case Studies

Seattle Public Utilities

Portland Water Bureau

Portland Bureau of
Environmental Services

Honolulu Board of Water
Supplies

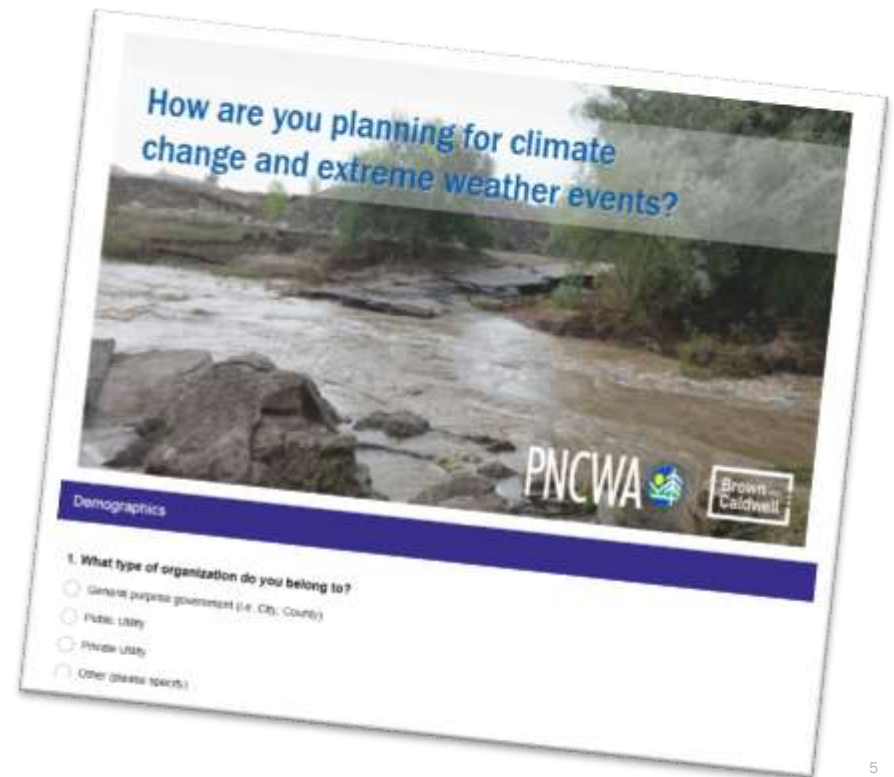
01

Survey Results

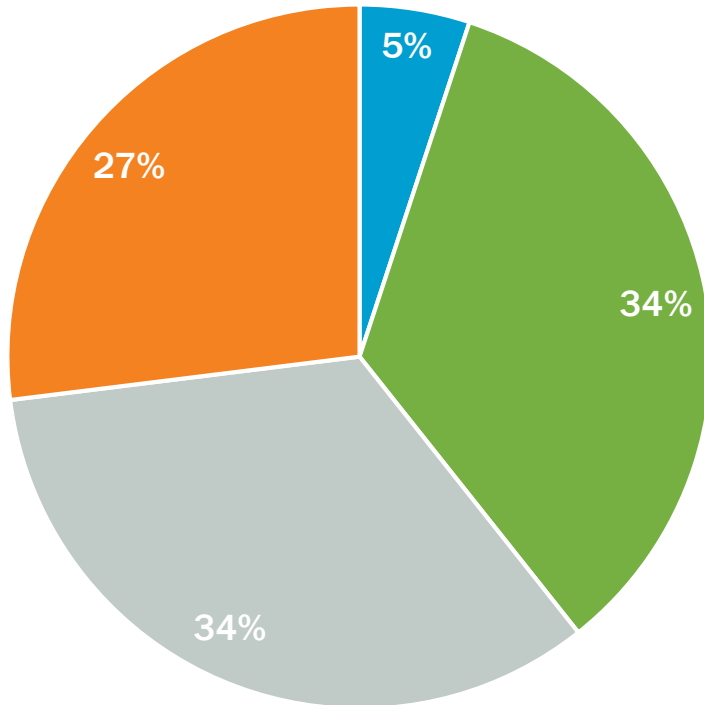


Survey Results

- BC developed survey of 20+ questions
- Ran for 1.5 months
- Sent to WA DOH subscribers, BC Water News followers, and PNCWA membership
- 182 respondents
- 130 utilities or government agencies (e.g. city, county)



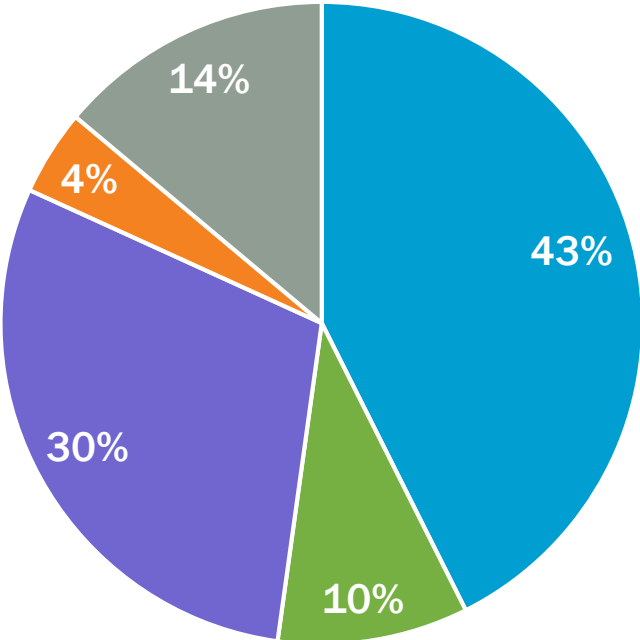
Type of Organizations Represented



- Private Utility
- Public Utility
- General purpose government (i.e. City, County)
- Other (please specify)

- 29 of 48 (60%) - Consultants
- Included (in order of response):
 - Government state/federal
 - Educational Institutions
 - Manufacturers
 - Retirees
 - NGOs
 - Contactors

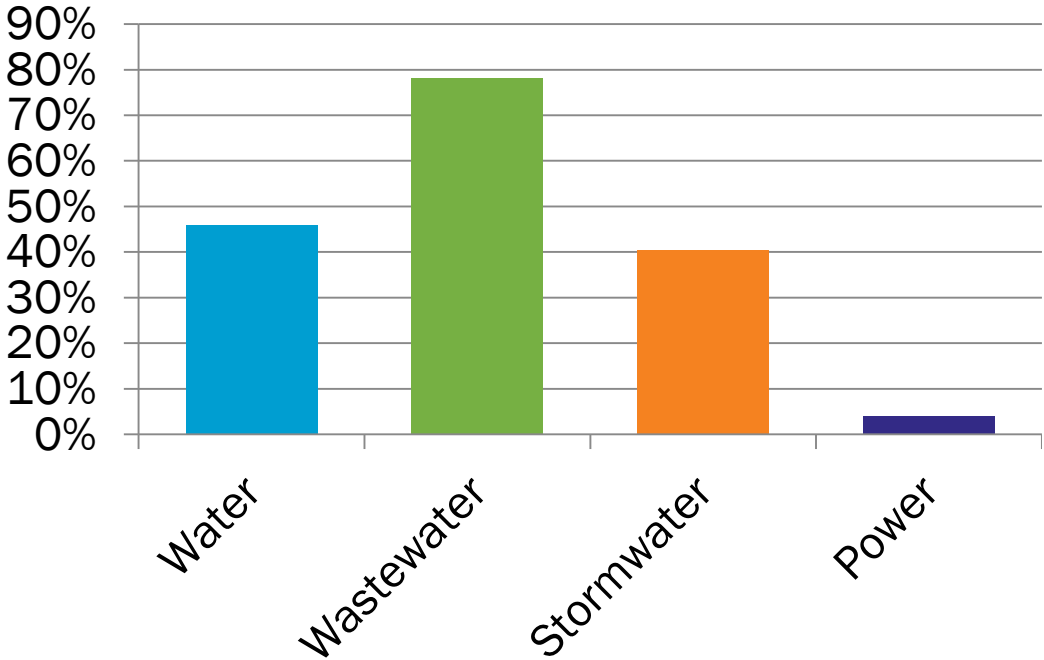
Responses by Region



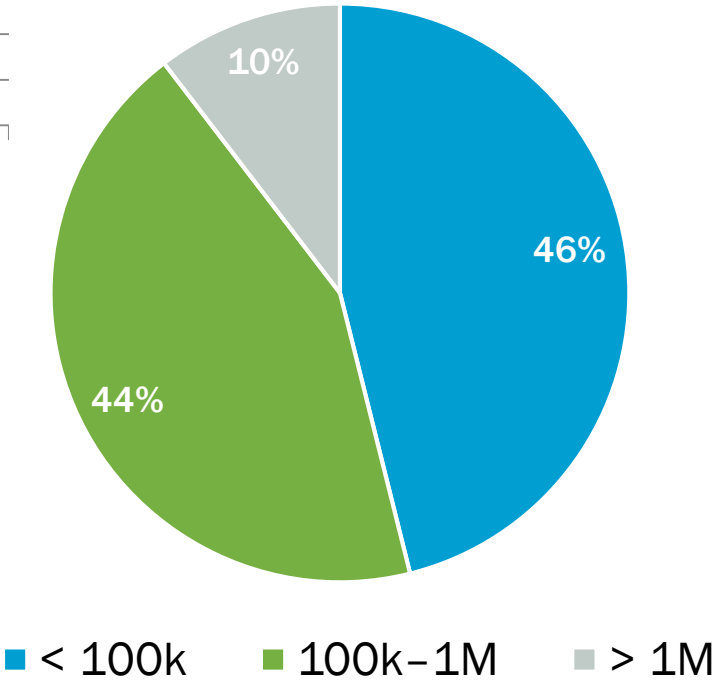
- Western Washington
- Eastern Washington
- Western Oregon
- Eastern/Central Oregon
- Idaho

Utility/Government Composition

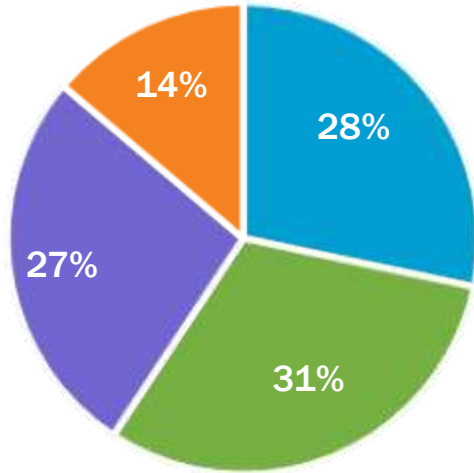
Services



Customers Served



Climate Change/Extreme Event Planning Experience



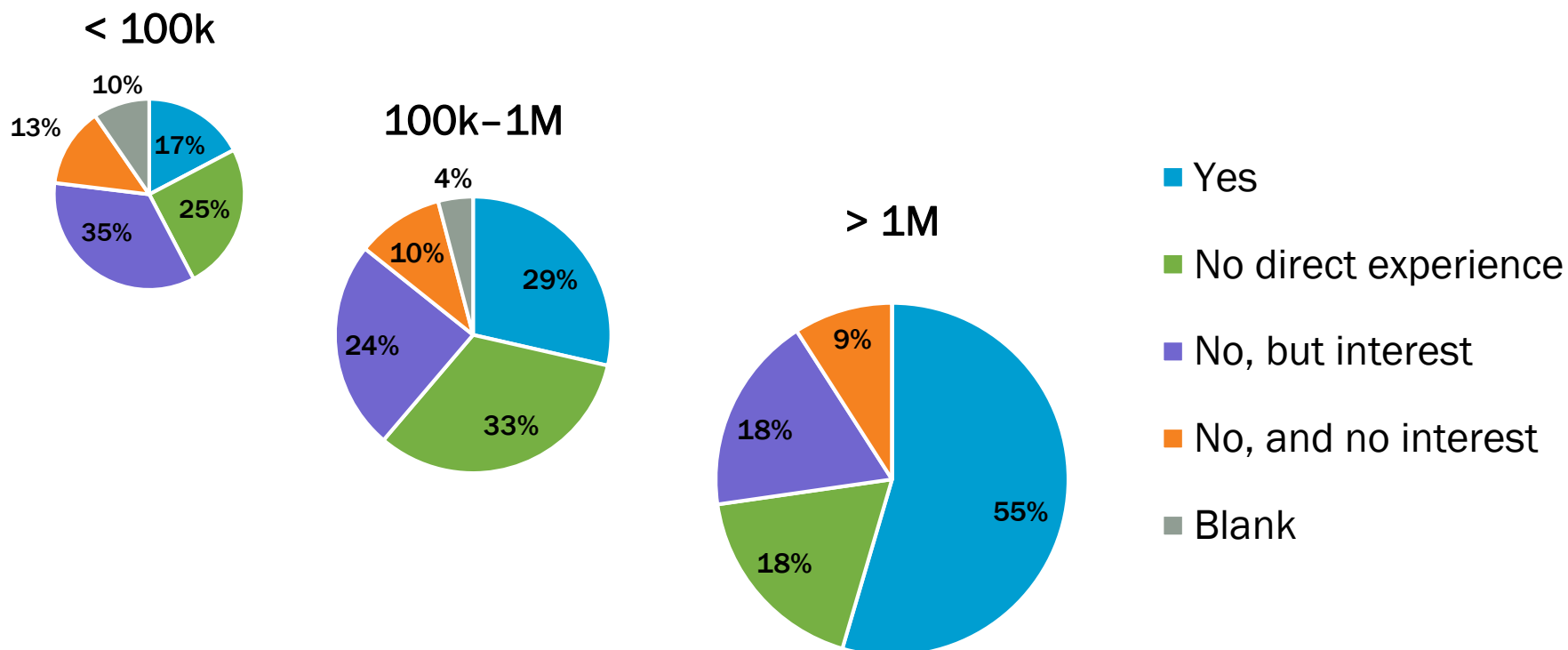
- Yes
- No, direct implementation experience, but I have knowledge and/or consideration of
- No, but I have interest in learning more
- No, and I have no interest in pursuing further

30%

✓ Yes

About one third of the survey respondents said they have experience with climate change planning.

Planning Experience by Service Area Population

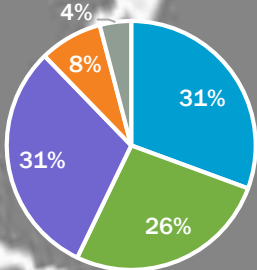


There seems to be a trend of larger utilities having more climate change and extreme event planning experience

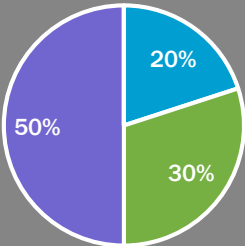
Planning Experience by Region

- Yes
- No direct experience
- No, but interest in learning more
- No, and no interest
- Blank

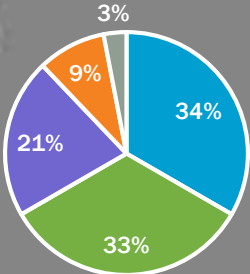
Western Washington



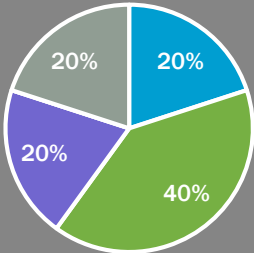
Eastern Washington



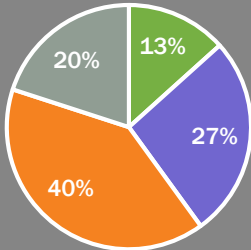
Western Oregon



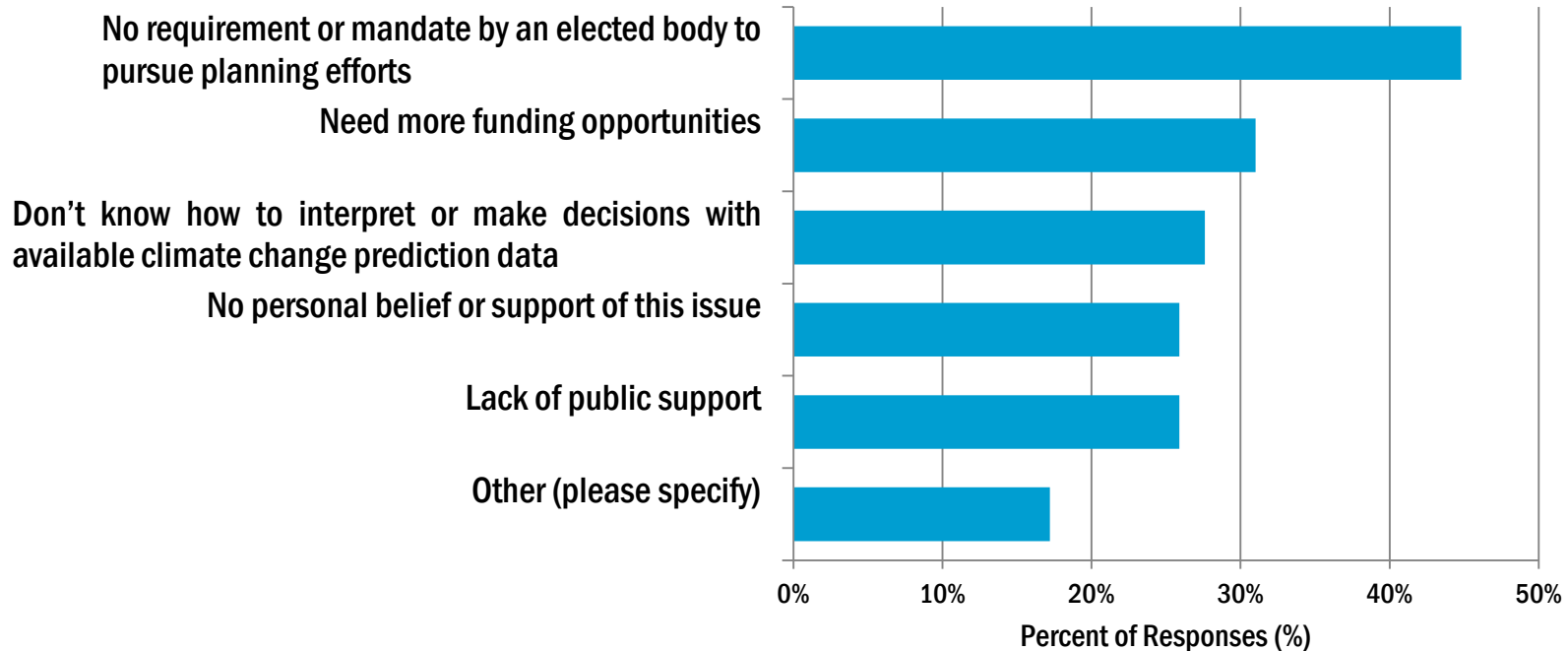
Eastern Oregon



Idaho



Major Reasons for Not Embarking in Climate Change/Extreme Weather Planning



- Seems less pressing than other more immediate issues
- More operational time demanded in other areas

Drivers for Planning Efforts

- **83%** driven by concern over infrastructure resiliency
- 45% driven by public demand
- 43% responding to impacts already
- 35% ordinance, regulation, or government mandate adopted
- 13% had a funding opportunity to complete a study



Top Vulnerabilities

#1

Increase in frequency of extreme precipitation events and flooding

- More severe droughts and floods
- Reduced mountain snow pack
- More variability in stream flow
- Rising sea levels
- Degraded water quality



Partner Engagement

- **Internal Partners:** Other utilities or City/County departments within your organization
- **External Partners:** Local community/public, environmental organizations, regulatory agencies, business/industry, agriculture, other NGOs

22% have no internal partner engagement

60% identified partners, but no studies initiated

17% have projects proposed with partners

30% completed studies with partners

Internal Partner Engagement Process



29% had no external partner engagement

42% have identified external partners

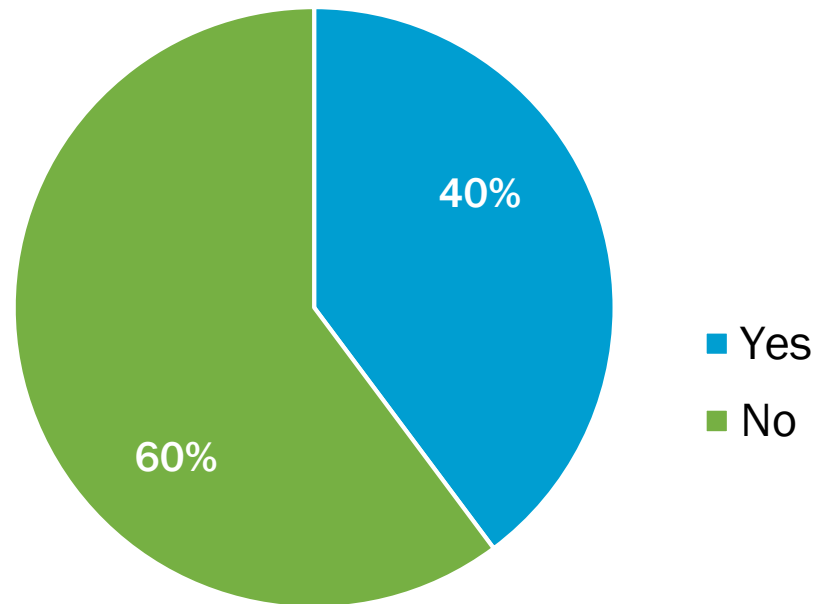
50% have done outreach to stakeholders

30% have convened stakeholder meetings or workshops

External Partner Engagement Process



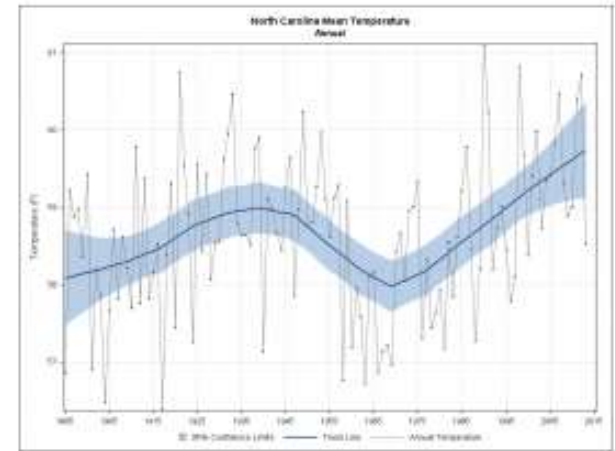
Staff Dedicated to Climate Change Planning



Typical staff ranges from 1 to 5 people

Top Obstacles

- **70%** funding
- 30% don't know how to interpret or make decisions with available climate change prediction data



NOAA Temperature data



“Available data are not adequate for extreme weather planning”

“Highly complex, technical, and inconsistent scientific information makes planning a challenge”

“Lack of proper cross agency governance structures”

“Convincing people that climate change is real”

Steps to Overcome Planning Obstacles

Collaboration

- “Interconnections with other water suppliers” (*No name*)
- “Initiated a program to identify available information and brought together a group from different departments within our organization to determine what impacts might be on our operations” (*Clean Water Services*)
- Encourage state and federal government support (*City of Olympia*)

Steps to Overcome Planning Obstacles

Go to the experts

- “Building capacity in understanding decision support systems and processes that can help us plan for a range of uncertainty and potential climate futures” (*Portland Water Bureau*)
- Investing in research (*King County*)
- Working with EPA and Climate Impacts Group (*City of Bremerton*)

02



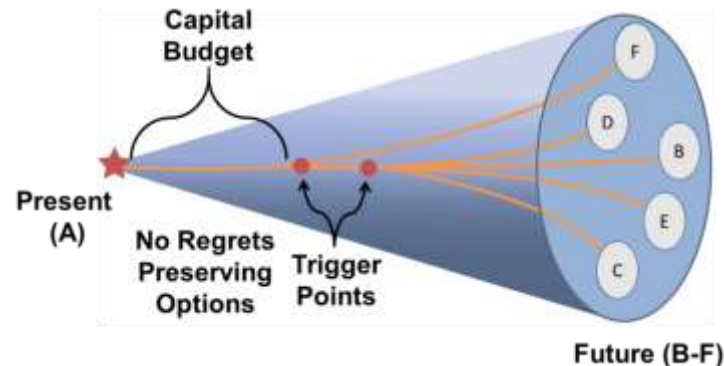
Predictions and Resources

Adaptive Planning

- Approach to long-term planning using an iterative process to promote flexible decision making in the face of uncertainties and to increase an organization's preparedness



- Scenario Planning - define the range of future scenarios and maintain traditional scenario(s) for comparison

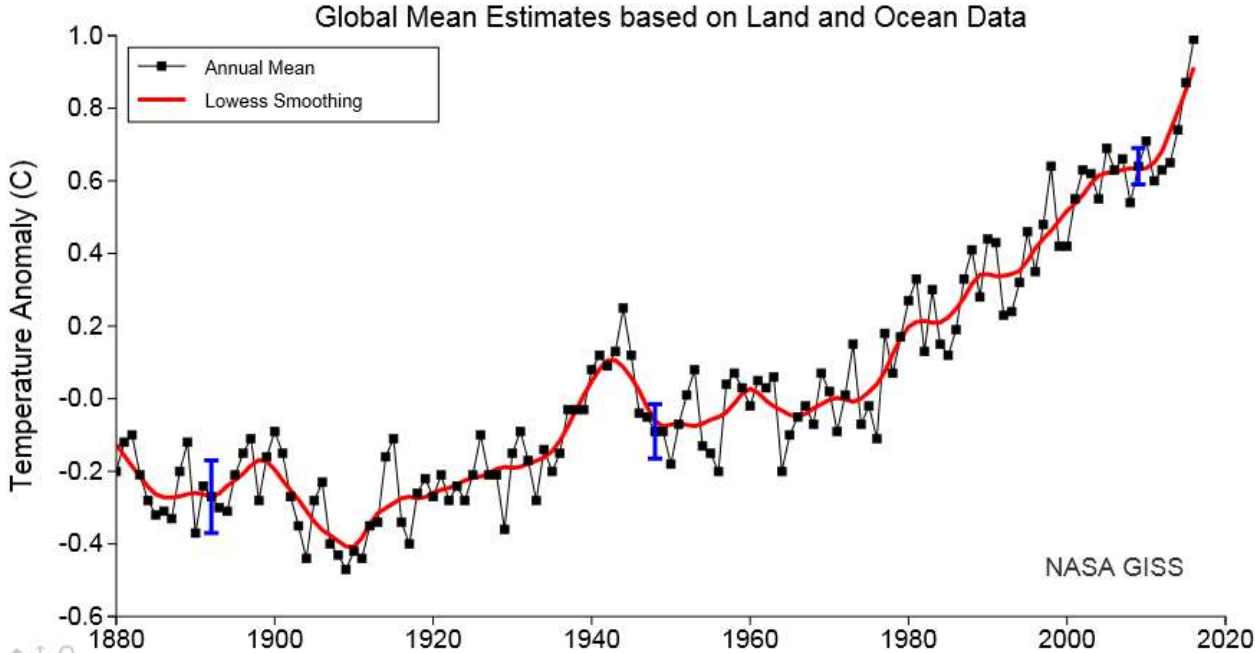


Driving Forces - Steadily Rising Temperatures

The Washington Post

U.S. scientists officially declare 2016 the hottest year on record. That makes three in a row.

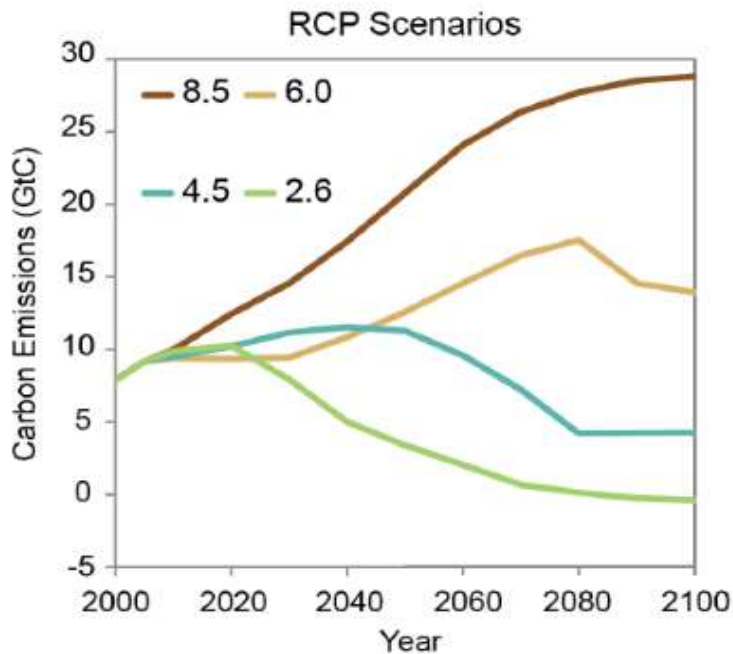
By **Chris Mooney** January 18 at 1:30 PM



Source: Hansen et al. 2010. Global surface temperature change. *Rev. Geophys.*, 48. RG4004, doi:10.1029/2010RG000345

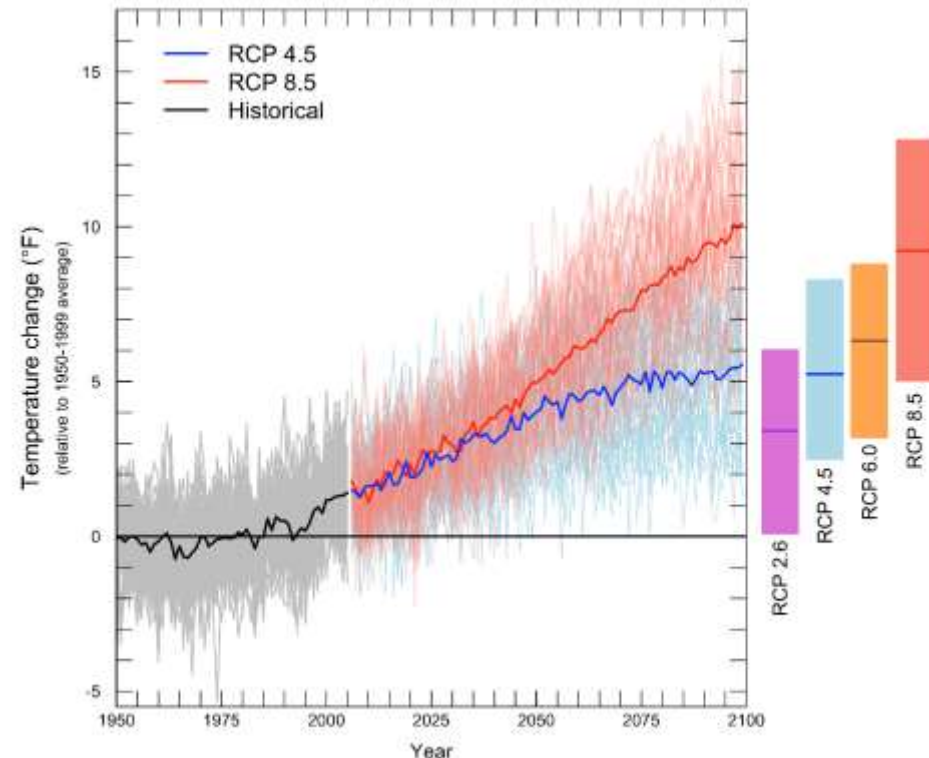
Understanding Predictions - Temperature

Global Climate Models



Source: 2013 IPCC Report

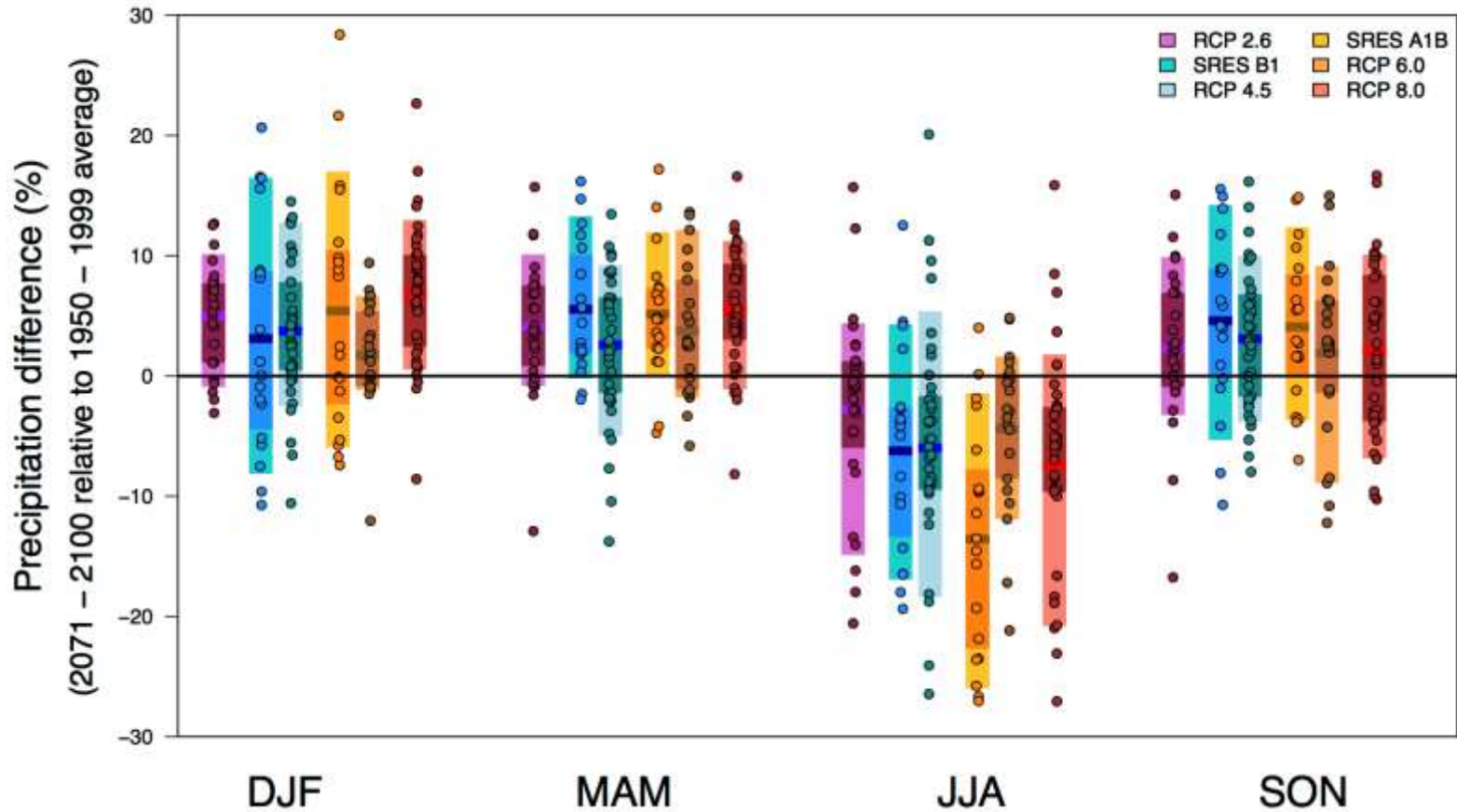
Downscaled Projections



Source: University of Washington Climate Impact Group

Using the worst case scenario (RCP 8.5), around the year 2050, temperatures are predicted to rise 3 to 8 °F

Climate Change Predictions - Precipitation



Source: University of Washington Climate Impact Group

The majority of models project increases in winter, spring, and fall precipitation, ranging from 2 to 7% increases on average and dryer summers 6 to 8% less rain

Types of Tools/Resources to Assess Vulnerabilities and Develop Strategies



The following tools were recommended by survey respondents:

- Long range forecasts
 - Climate model predictions models
 - Hydrologic models for surface water flow monitoring
- Decision support planning processes/scenario planning
- Asset management risk assessments
- First responder training, community emergency response simulation exercises
- Incorporate resiliency planning in capital improvement planning and operations hydraulic modeling

Suggested Resources from Respondents

National resources

- EPA CREAT for Climate Resilient Utilities

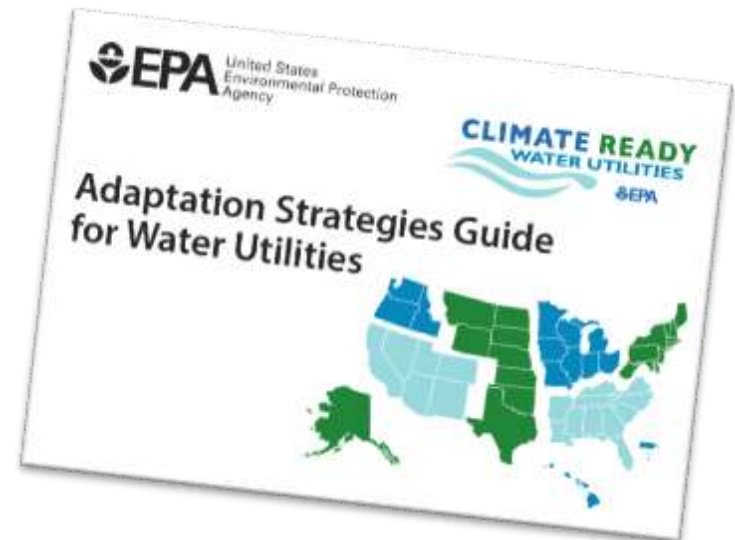
<https://www.epa.gov/crwu/build-climate-resilience-your-utility>

- EPA Climate Ready Utilities

https://www.epa.gov/sites/production/files/2015-04/documents/updated_adaptation_strategies_guide_for_water_utilities.pdf

- EPA National Stormwater Calculator
(*“simple to explain to government officials”*)

<https://www.epa.gov/water-research/national-stormwater-calculator>



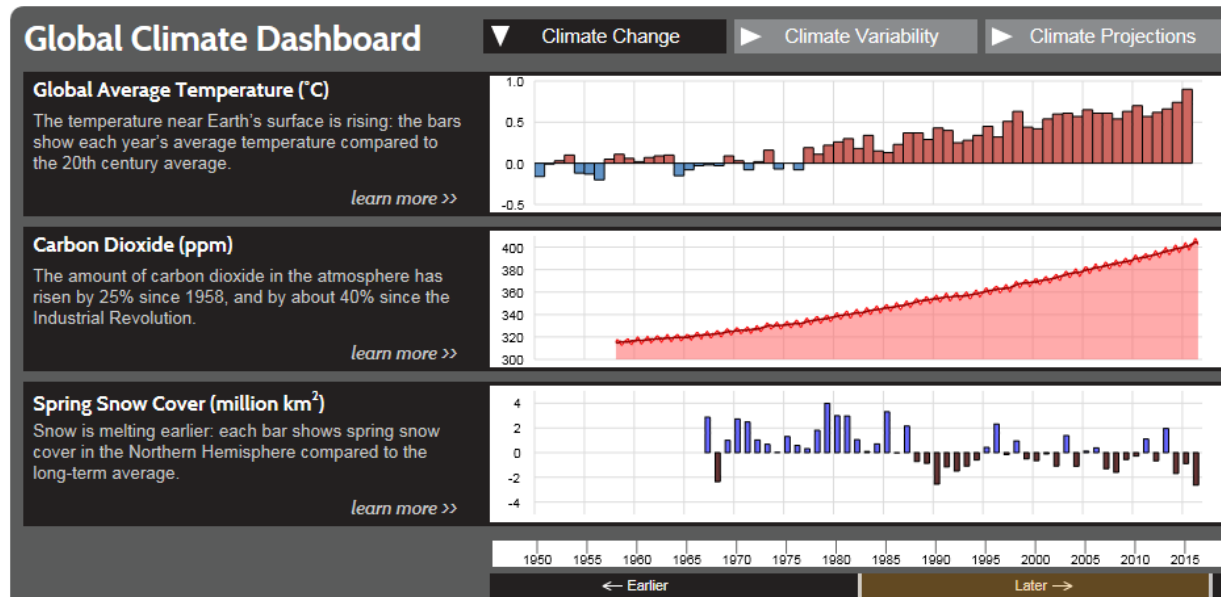
Suggested Resources from Respondents

- Current climatological data from UW/UI/OSU has been instrumental in determining potential impacts
- SWMM with CAT (“more detailed”)
- SENSEI data management software (Cascade Energy)
- Water balance modeling tools; SimCLIM or other climate change models to predict temperature/precipitation changes
- Good Carbon Calculator (G3C), a proprietary GHG inventory tool

Suggested Resources from Respondents

- NOAA climate change Resiliency Toolkit

<https://toolkit.climate.gov/>



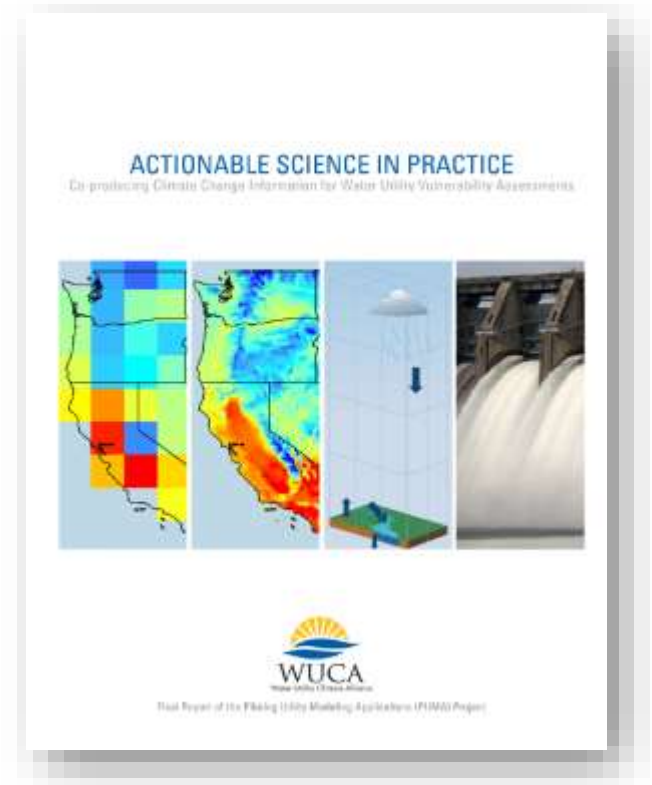


Case Studies

Seattle Public Utilities, Portland Water Bureau

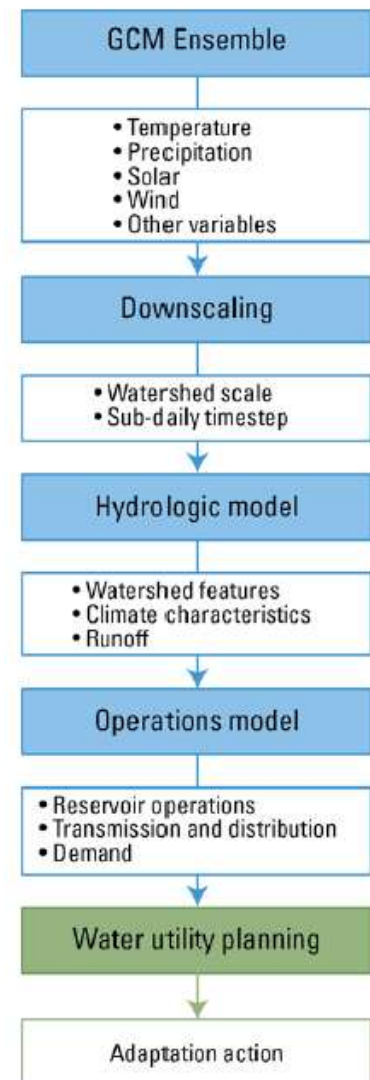
- Part of the Water Utility Climate Alliance
 - coalition of 10 utilities
- Supply drinking water for 43 million

<https://www.wucaonline.org/>



Seattle Public Utilities, Portland Water Bureau

- Engaged in a modeling process to understand how climate changes might affect their systems
 - SPU used “Chain-of-Models” exercise and “bottom up,” approach to querying downscaled climate data to create “climate storylines”
- Partnered with climate change experts
 - Pacific Northwest Climate Impacts Research Consortium (CIRC)



Chain-of-Models Concept

Seattle Public Utilities, Portland Water Bureau

- Lessons learned
 - Assessment was local, and one size did not fit all
 - The scientist and utility-manager learning process was a two-way street
 - Need to customize outputs of climate models and understand local hydrology
 - Important to consider using a bottom-up as well as a top-down approach to climate modeling
 - Extreme events are difficult to capture
 - Learned to adopt a “don’t hesitate to innovate” strategy

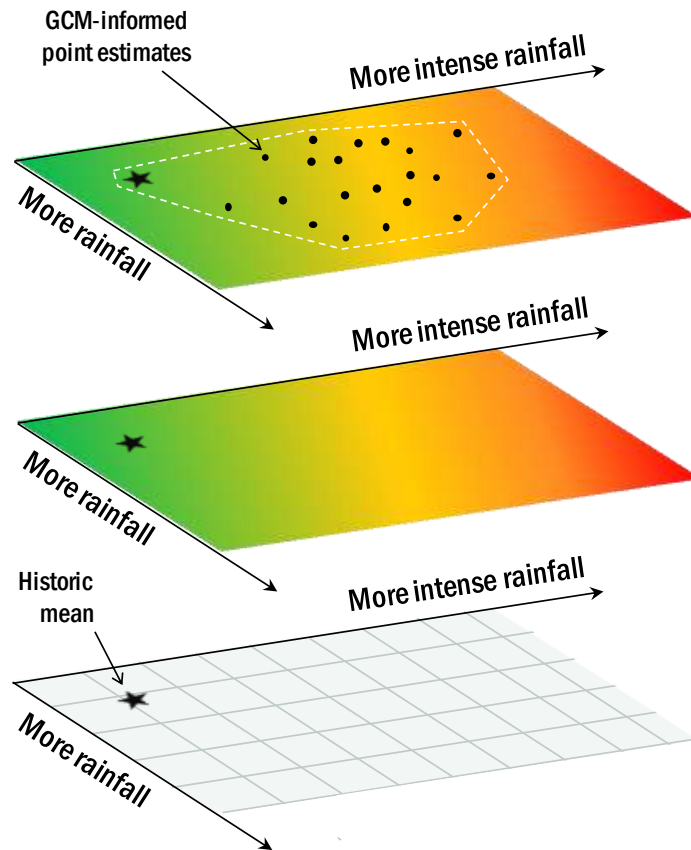
Source: WUCA. Actionable Science in Practice: Co-producing Climate Change Information for Water Utility Vulnerability Assessments. Lead Author: Jason Vogel. May, 2015.

Portland Resiliency Master Plan

City of Portland, Oregon

- Seismic risk assessment
- Climate risk assessment
- Scenario planning
- Cross-agency involvement
- No-regrets actions

Using scenario planning to evaluate vulnerabilities



How does this compare with what global climate models predict?

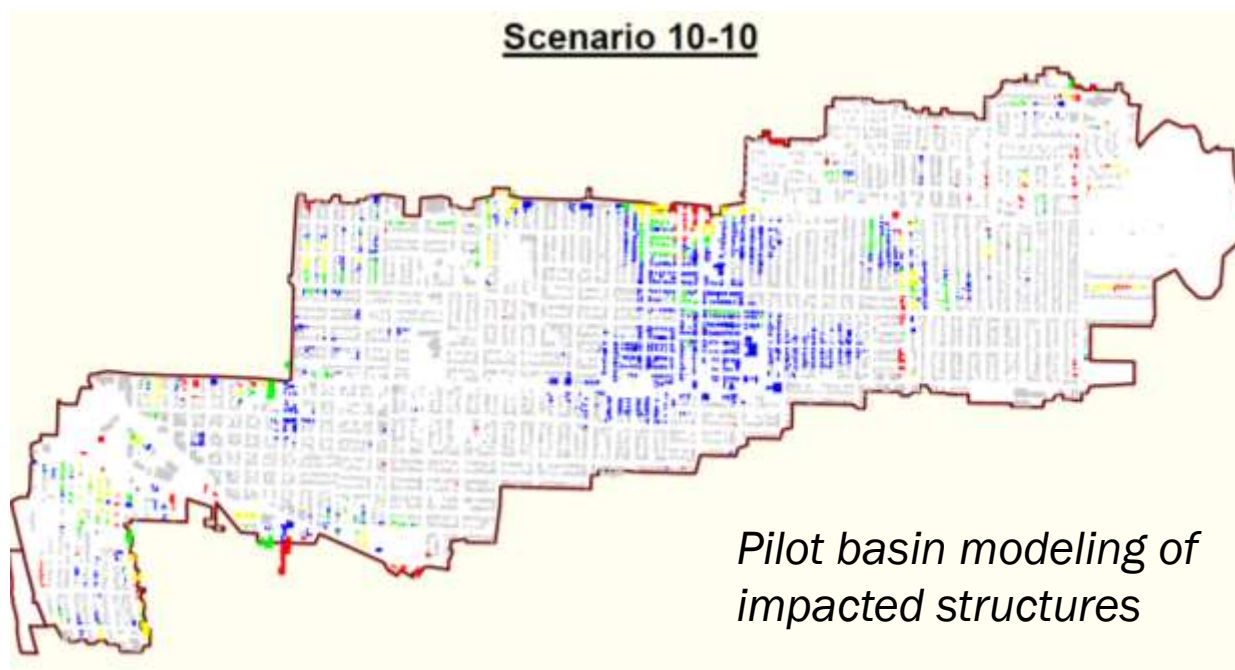


Simulate performance across domain.



Define a vulnerability domain.

Using stress testing to evaluate vulnerabilities

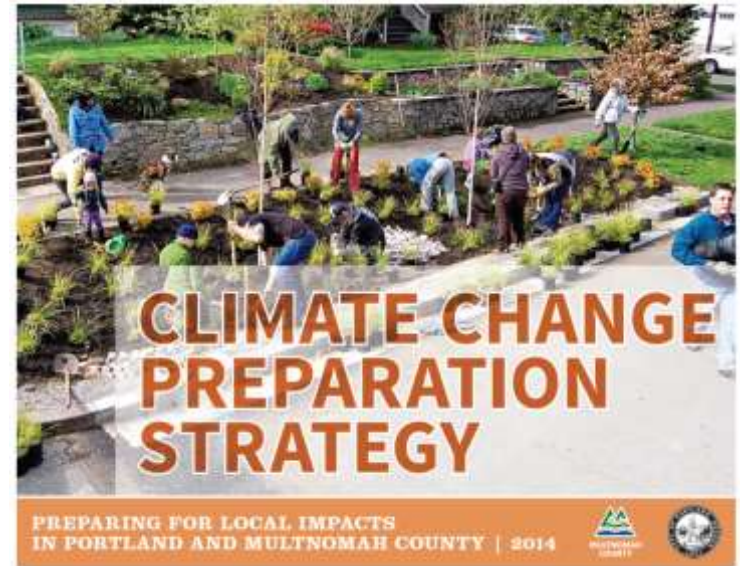


How do changes in rainfall affect the system?

		Estimated Risk Cost (\$M)					
		0%	10%	20%	30%	40%	50%
Intensity Increases	50%	\$92	\$97	\$99	\$105	\$110	\$114
	40%	\$74	\$78	\$82	\$86	\$90	\$95
	30%	\$58	\$62	\$65	\$68	\$72	\$74
	20%	\$44	\$47	\$49	\$53	\$56	\$59
	10%	\$34	\$35	\$37	\$39	\$42	\$47
	0%	\$25	\$25	\$26	\$28	\$30	\$33
		0%	10%	20%	30%	40%	50%
		Volume Increases					

Early Actions

- Prioritize sustainability in projects and programs
- Support 2016 Mitigation Action Plan recommendations
- Continue to work with stakeholders
- Consider flexibility and robustness
- Monitor changes and effects

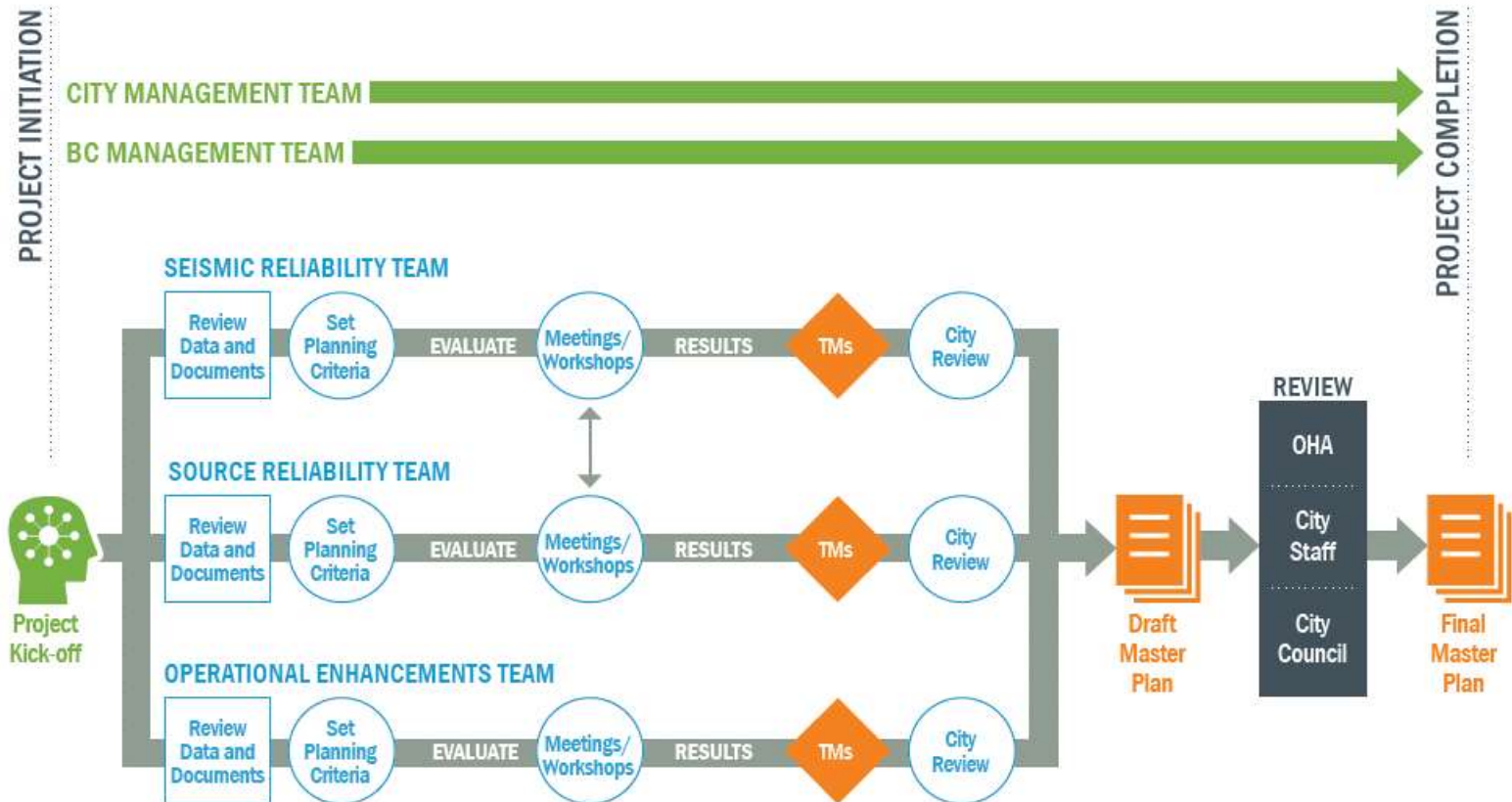


Early Actions

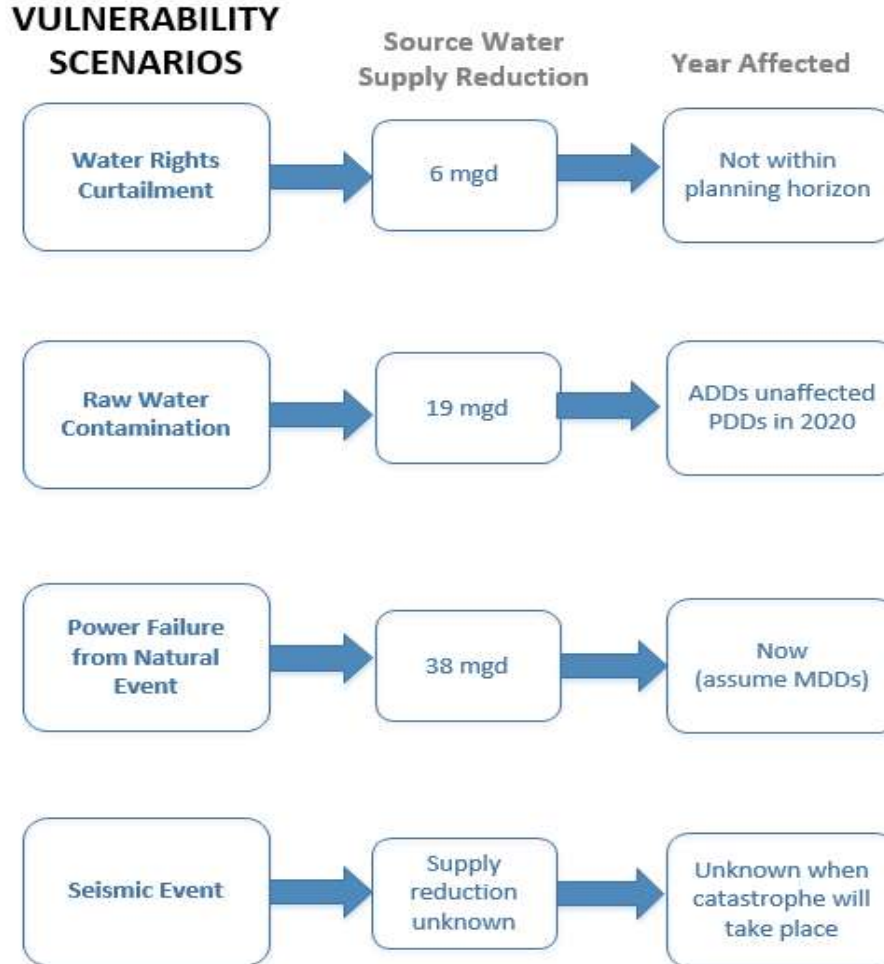
- Prioritize sustainability in projects and programs
- Support 2016 Mitigation Action Plan recommendations
- Continue to work with stakeholders
- Consider flexibility and robustness
- Monitor changes and effects
- Two pilot programs – stress testing and scenario planning

City of Lake Oswego Water Master Plan

Source Water Reliability/Resiliency Assessment focusing on Climate Change Impacts



Looking at Mitigation Strategies based on Vulnerability Scenarios





Impacts of Climate Change on Honolulu BWS Infrastructure and Water Supply

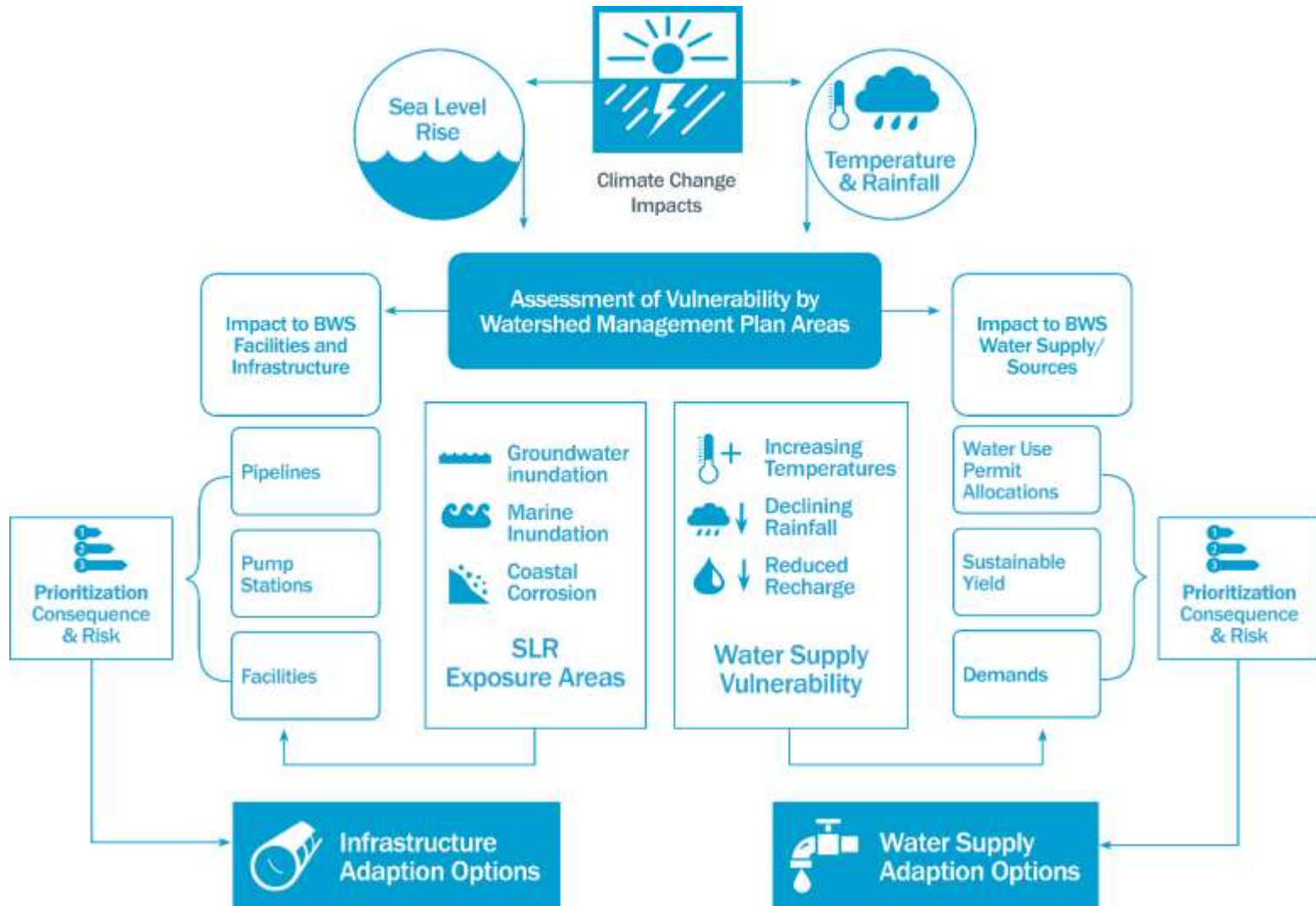


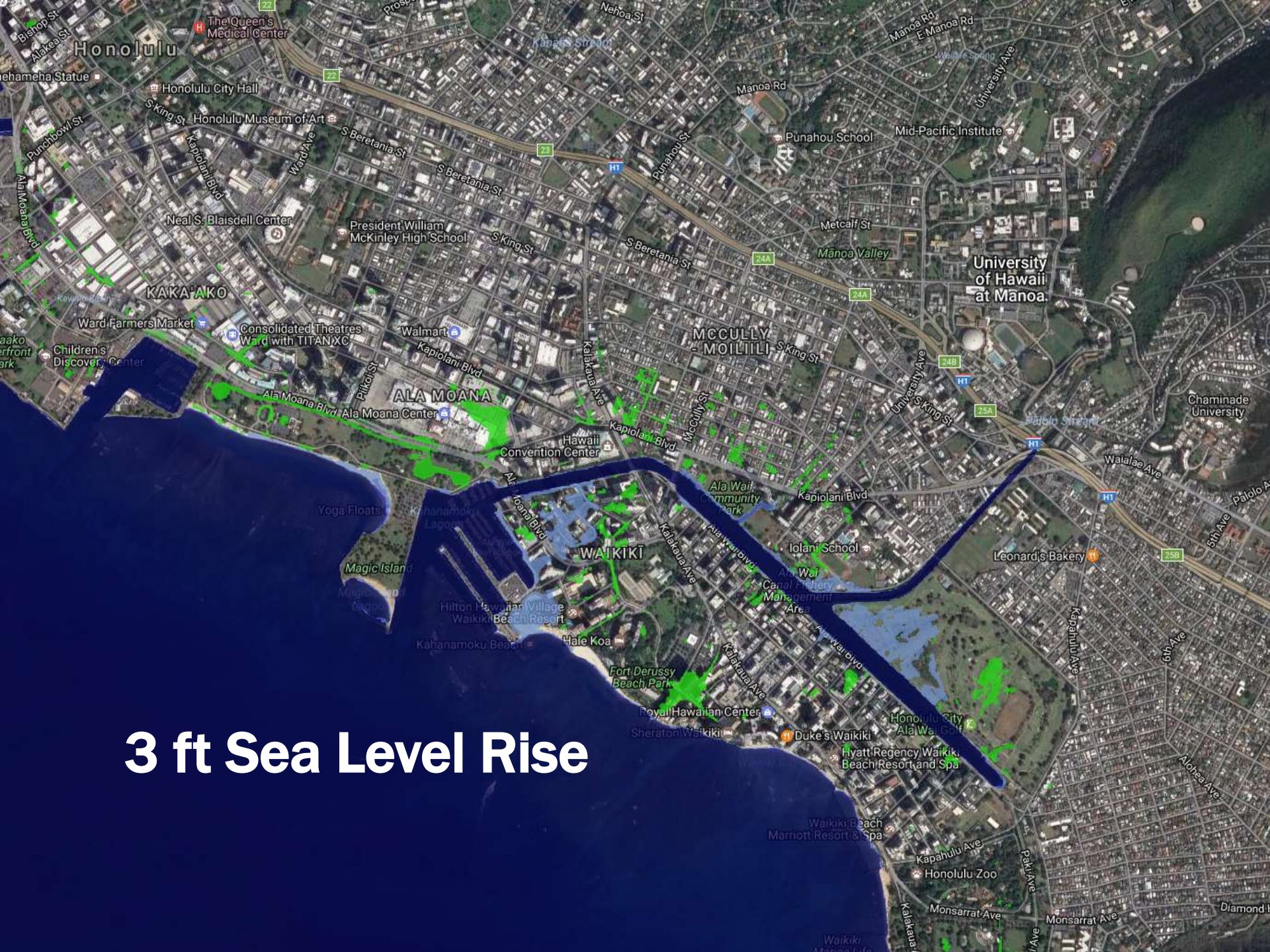
Source: Chip Fletcher,
University of Hawaii

Scenario planning to understand infrastructure, water supply, and water quality impacts



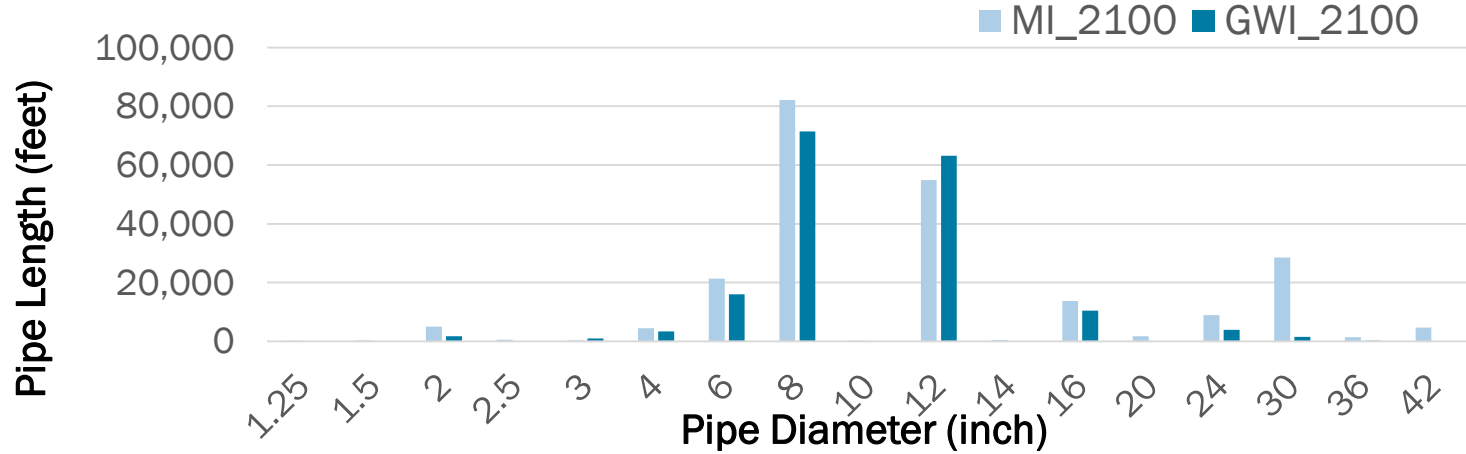
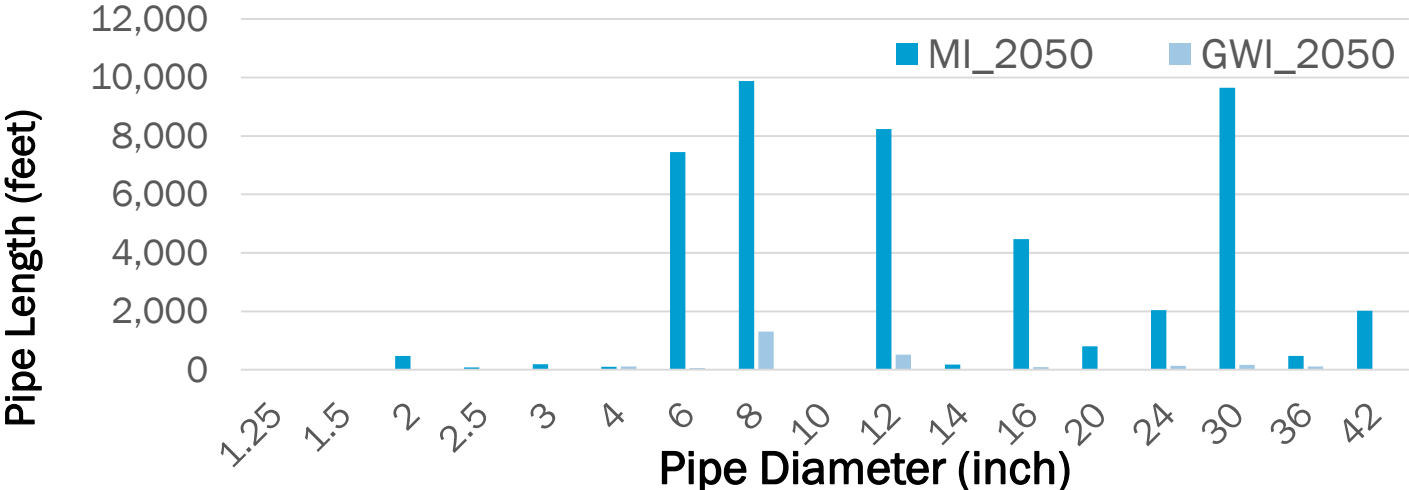
Risk and Vulnerability Assessment Approach





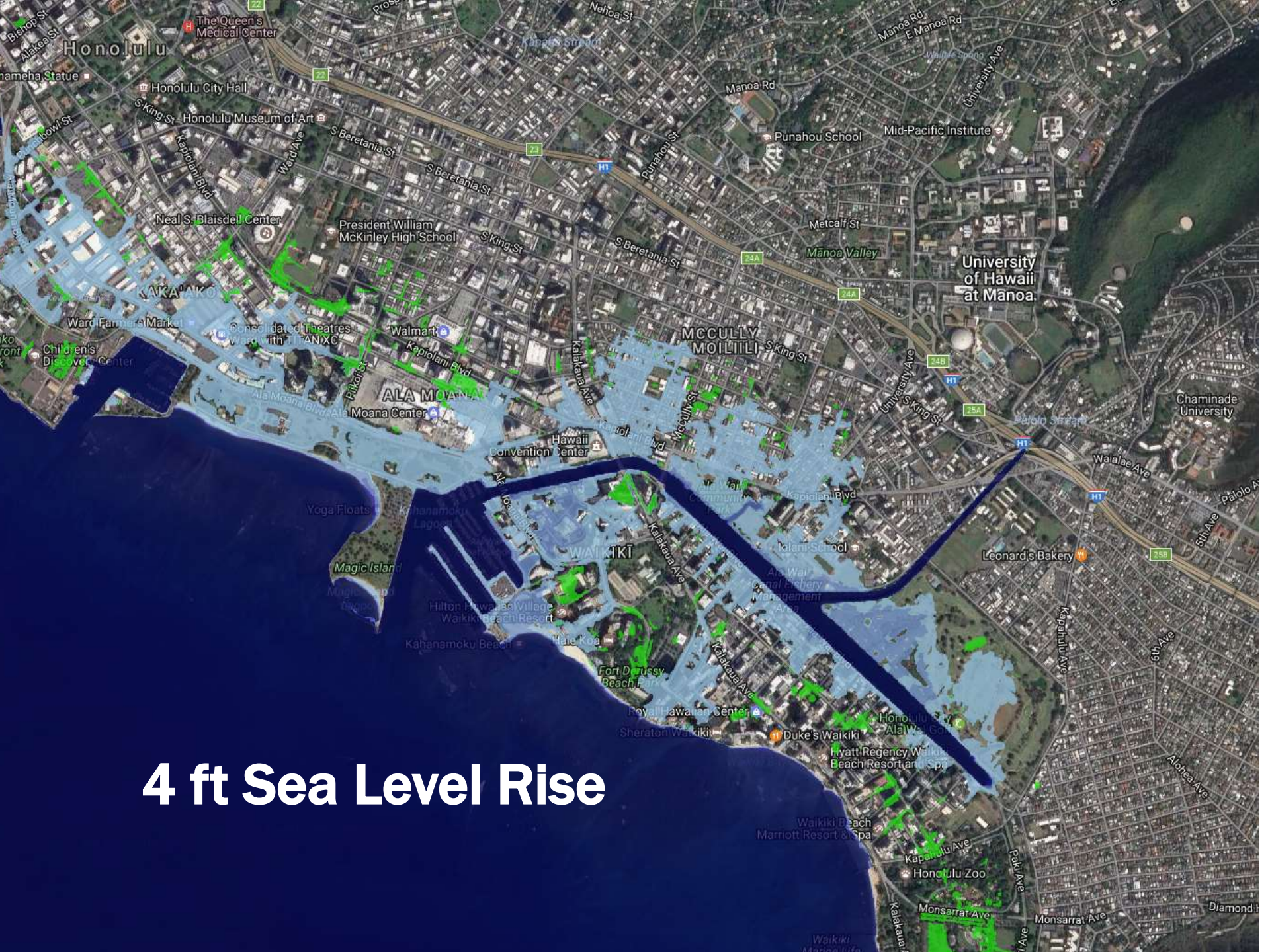
3 ft Sea Level Rise

Increasing impact to infrastructure over planning horizon

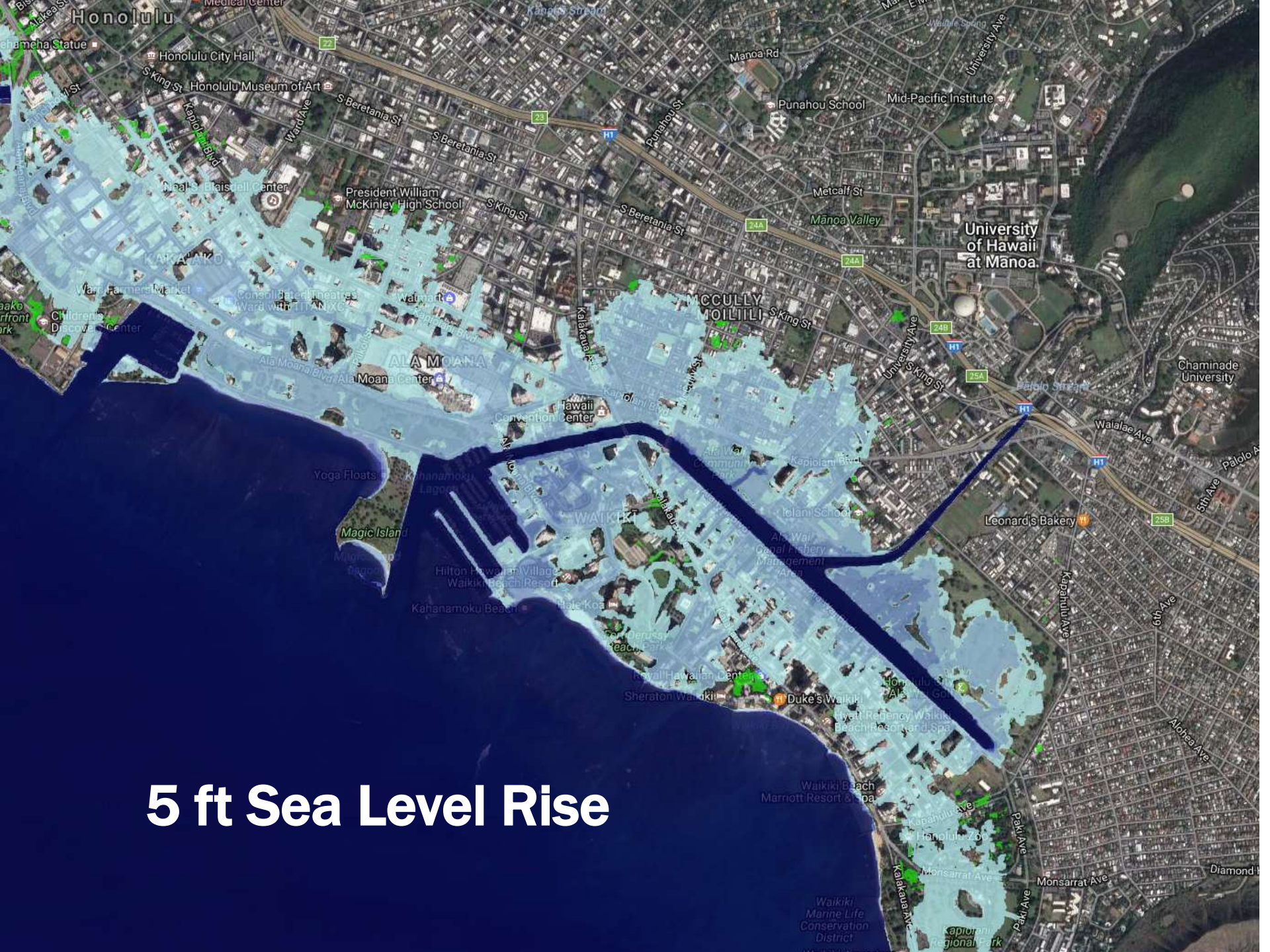




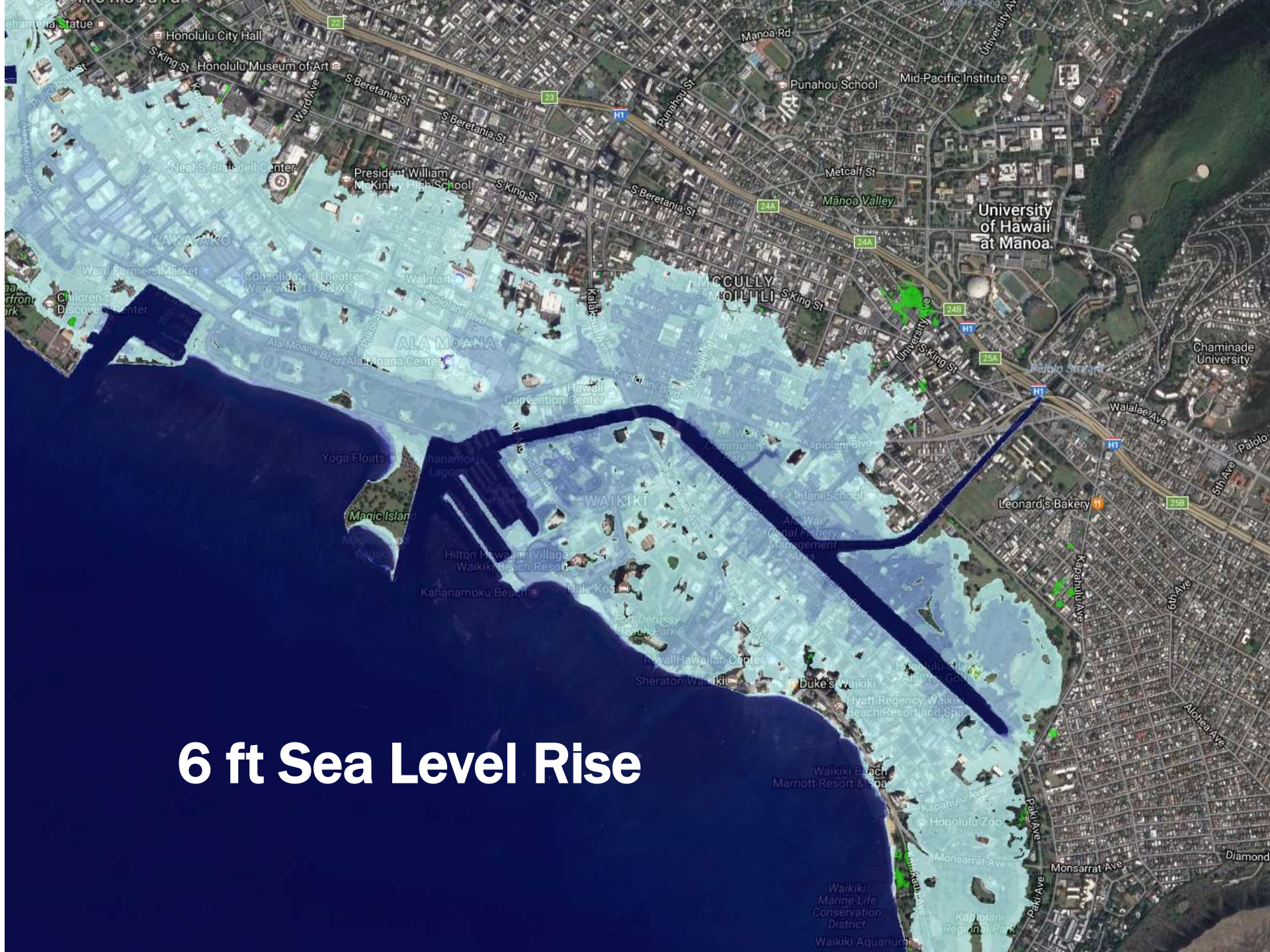
3 ft Sea Level Rise



4 ft Sea Level Rise

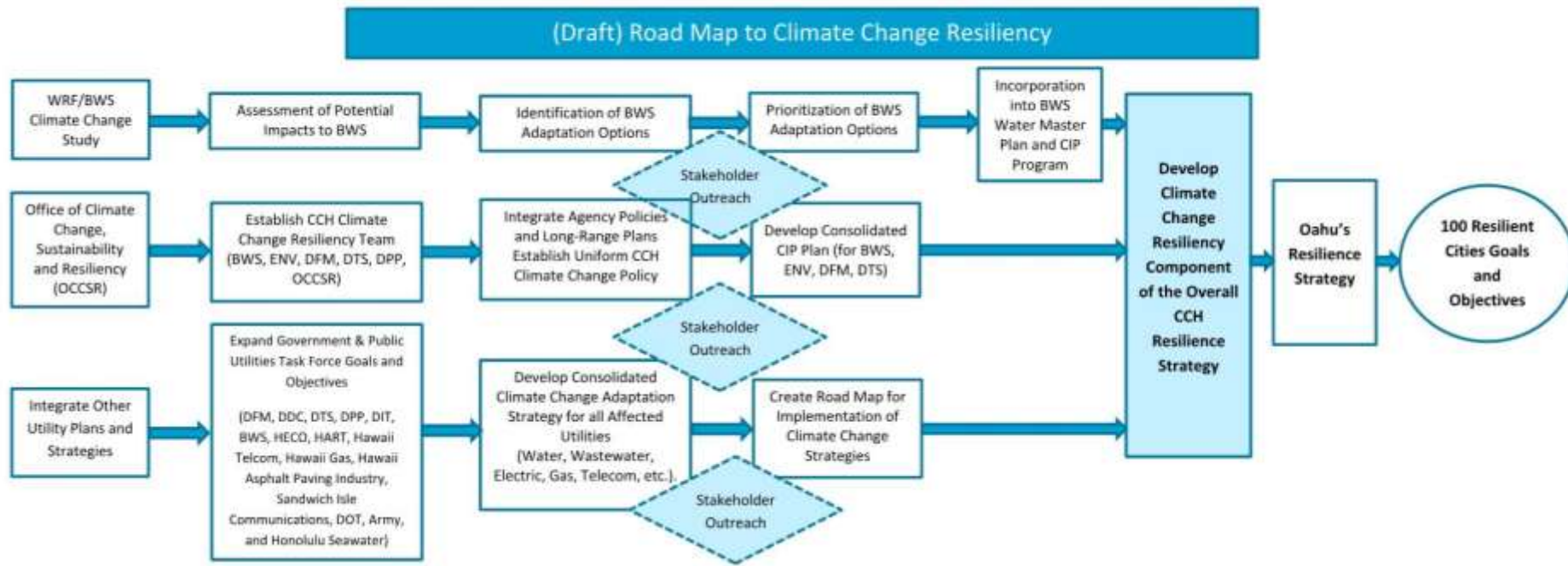


5 ft Sea Level Rise



6 ft Sea Level Rise

Framework for Collaboration with Other City and County Departments



Conclusions

- Variability across the PNW with who and how actions are being taken
 - Larger utilities have more climate change and extreme event planning experience
 - More experience in western WA and OR
- Important tools include adaptive management and scenario planning
- Water Utility Climate Alliance is a great resource!

Thank You. Questions?

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