

Futureproofing Wastewater Management Solutions: The Case for Adaptive Planning

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What Is Driving Retooling of Wastewater Infrastructure?

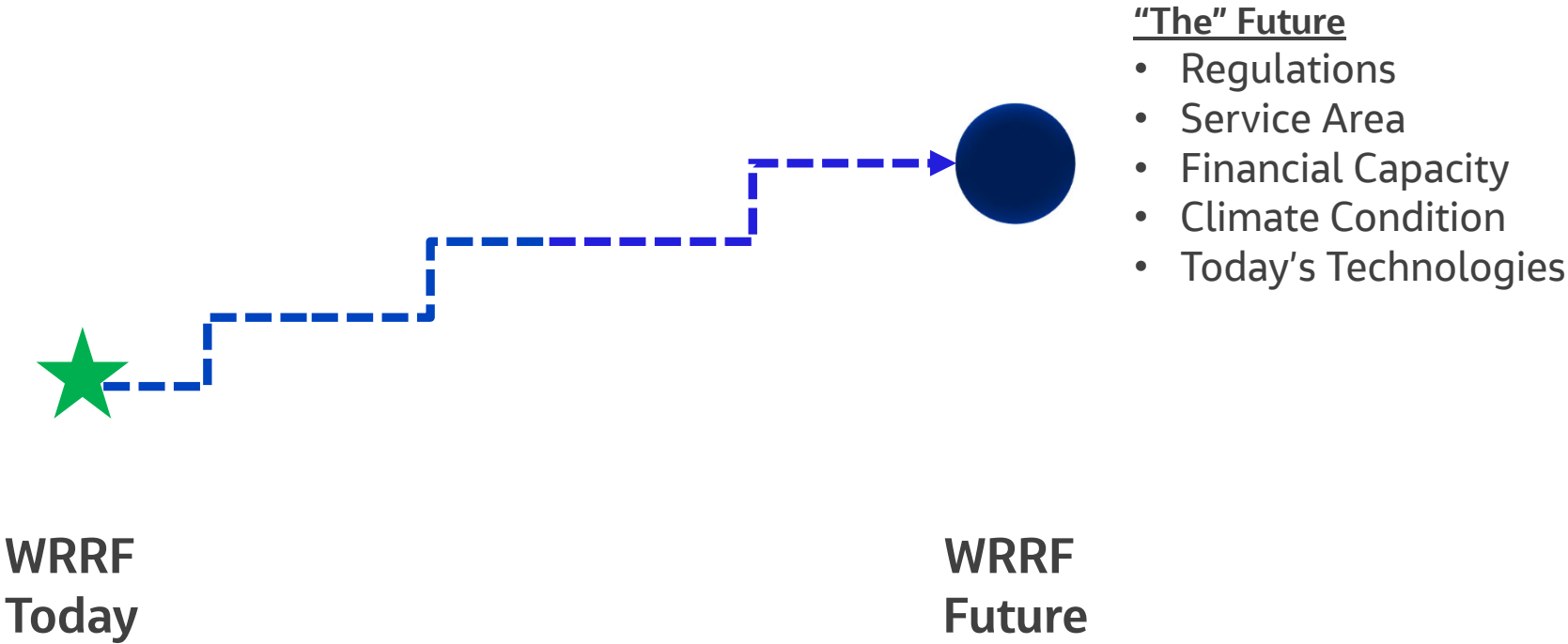
Addressing today's issues...

- Aging infrastructure
- Service area changes
- Climate stress
- Increased regulation
- Space limitations
- Improved O&M efficiencies
- Water equity and community impacts
- Insufficient funding

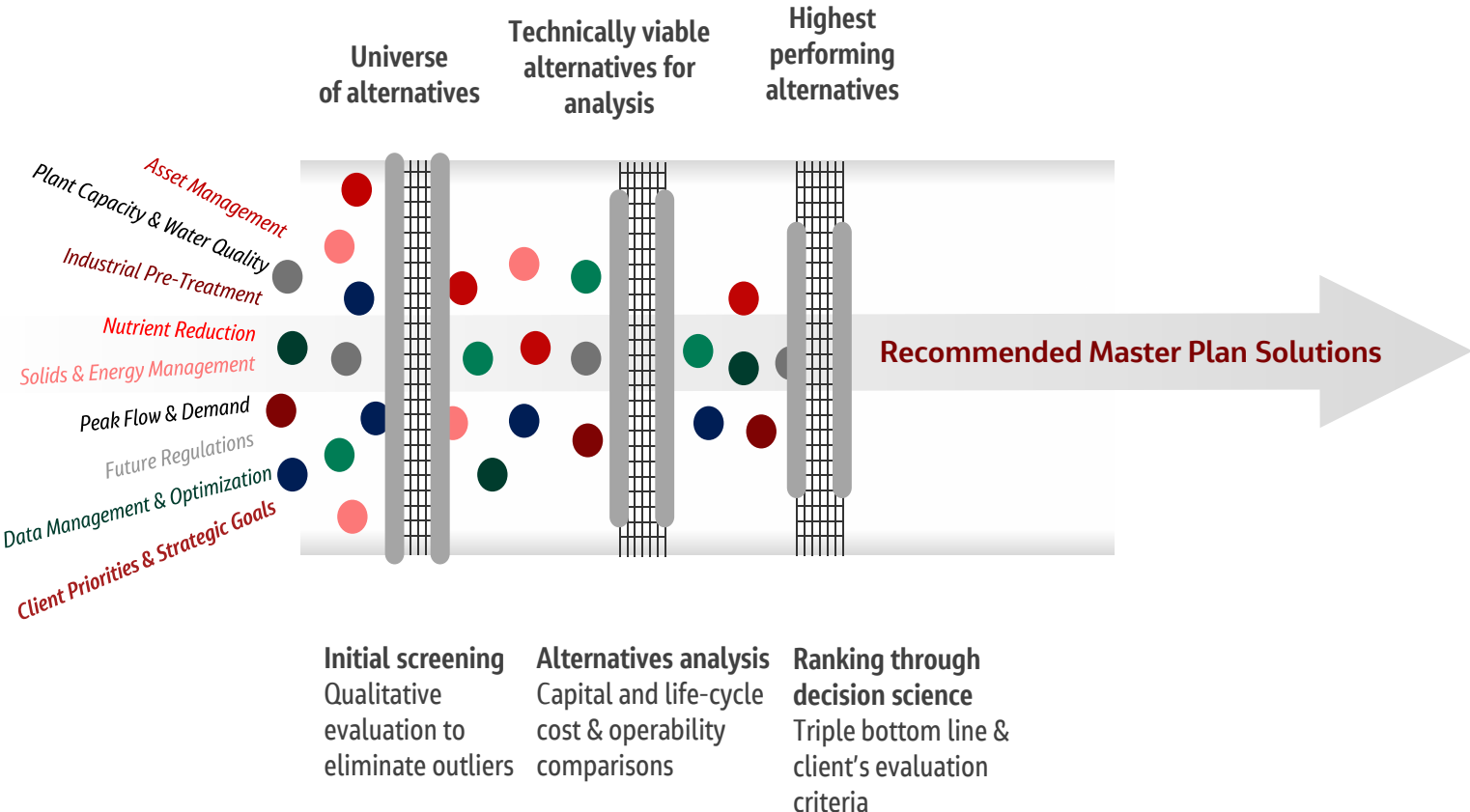
**While positioning
for the future...**



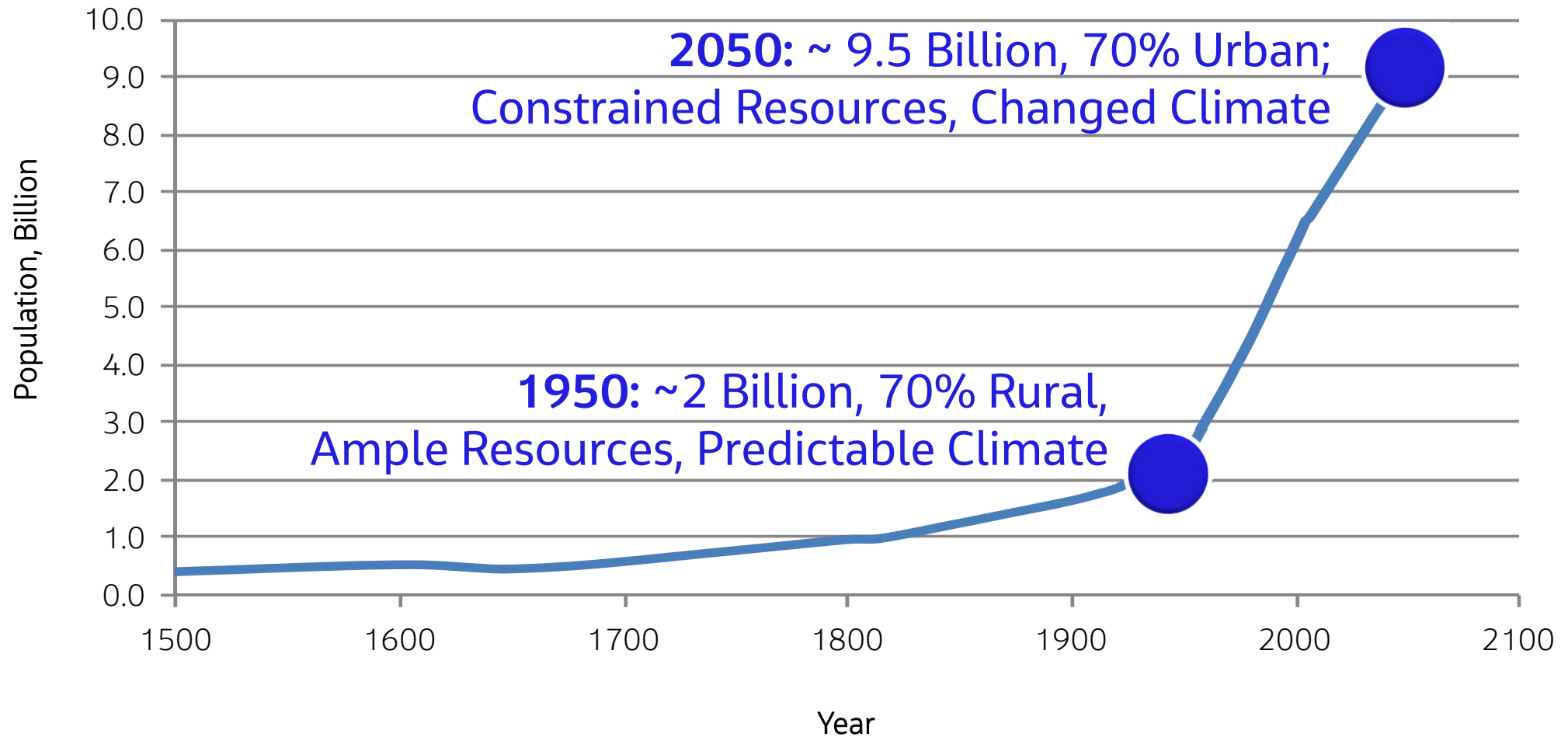
The “Traditional” Master Planning Approach Is based on Accurately Forecasting “The” (one) Future



Traditional Alternative Evaluation Approach: Screening, Analysis, and Ranking Based on Meeting the Needs of “The” Future

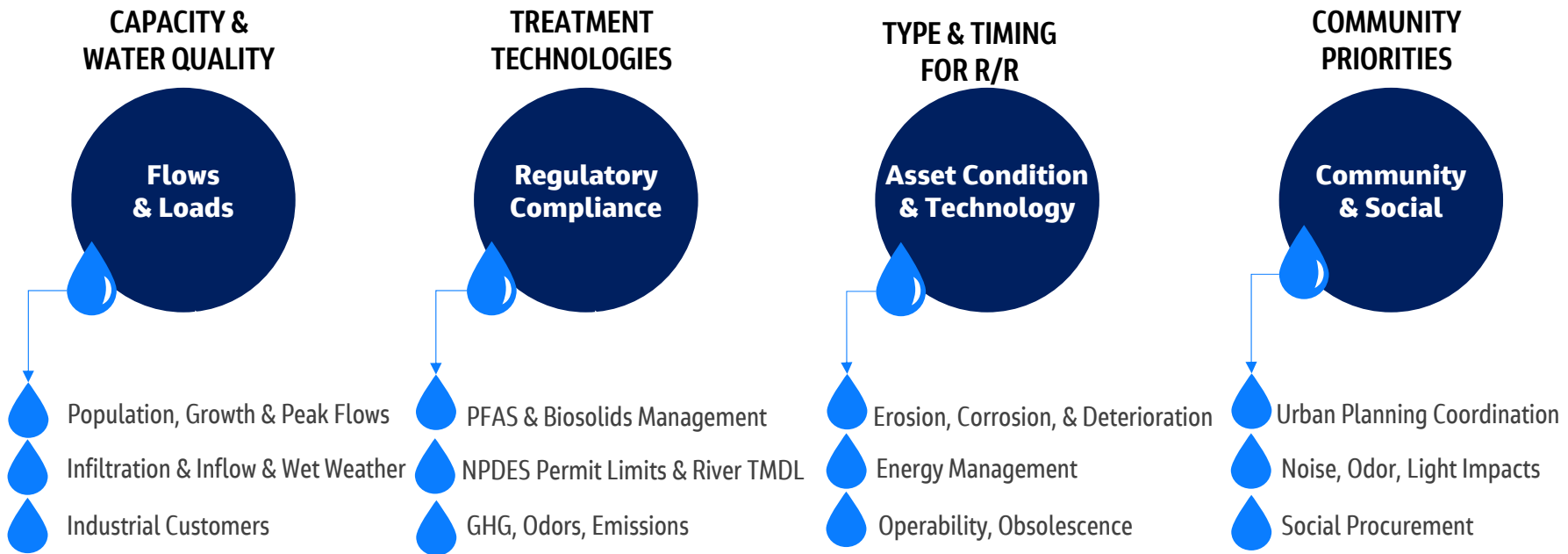


Will Current Planning Approaches Meet Future Needs?



Future Uncertainty is Our New Reality

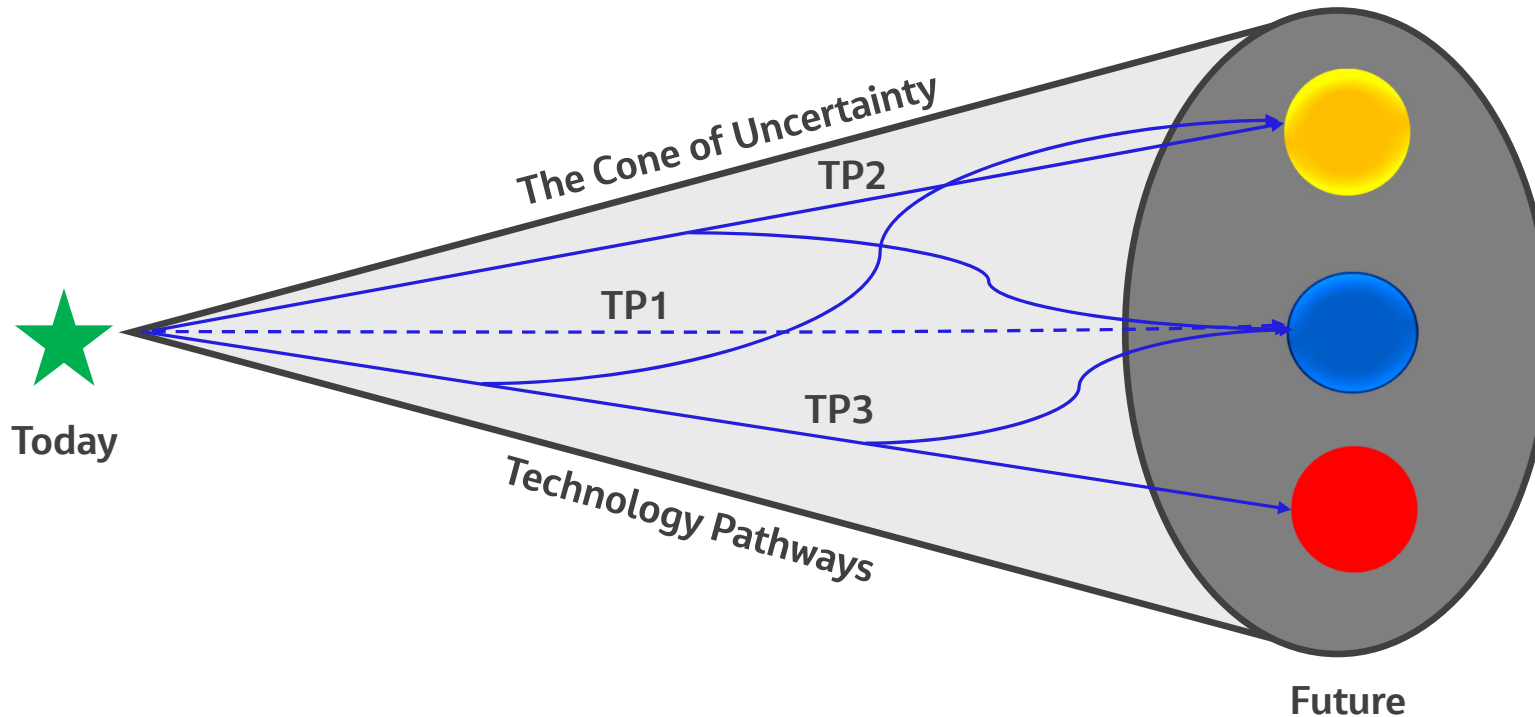
Planning needs to consider a robust set of potential future conditions



Timing: the choice, judgment, or control of when something should be done.

The Case for Adaptive Planning

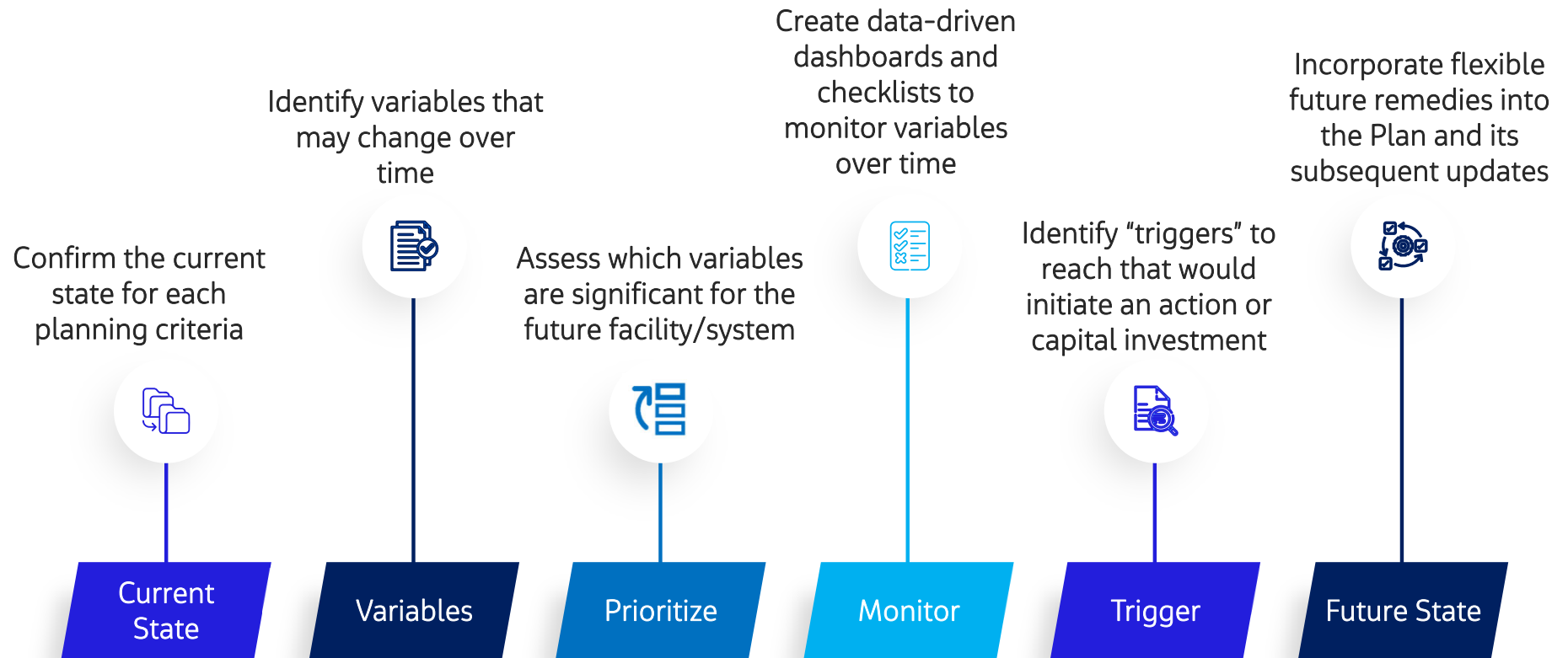
For all planning tasks, there is a cone of uncertainty that require assumptions



Potential Future Variables

- Regulatory Requirements
- Financial Capacity
- Climate Adaptation
- Population Dynamics
- Technology Innovations
- Politics

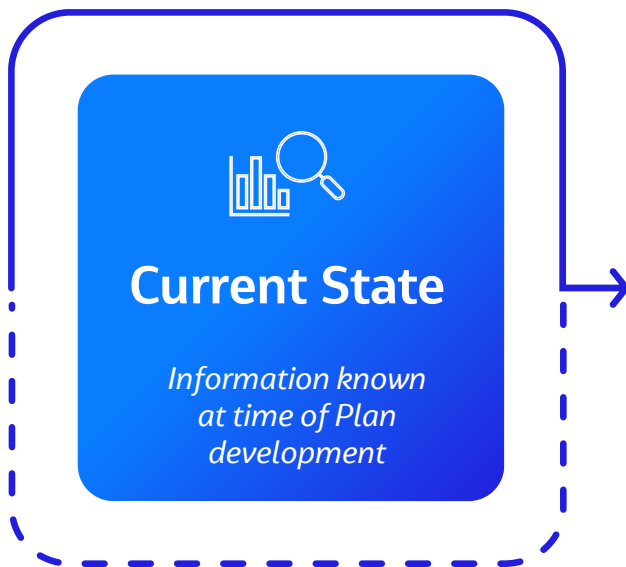
The Adaptive Planning Process



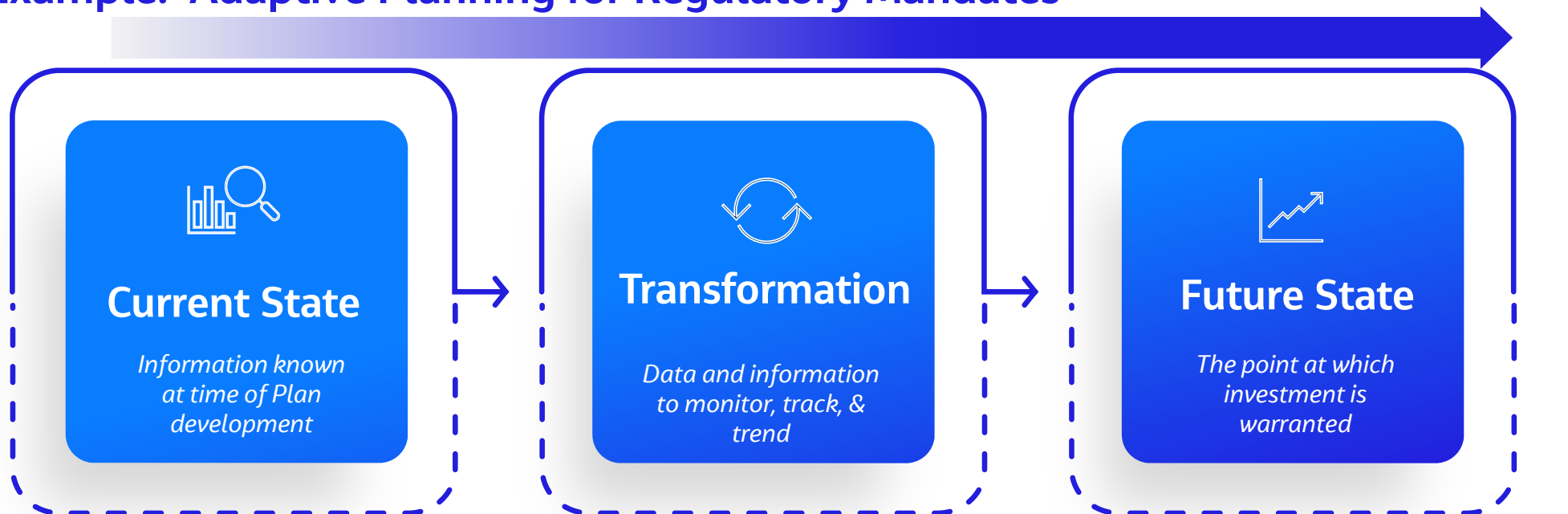
Planning needs to remain flexible to account for future conditions

Evaluate potential adaptive pathways and their potential impact to your plan

ADAPTIVE PLANNING PROCESS



Example: Adaptive Planning for Regulatory Mandates

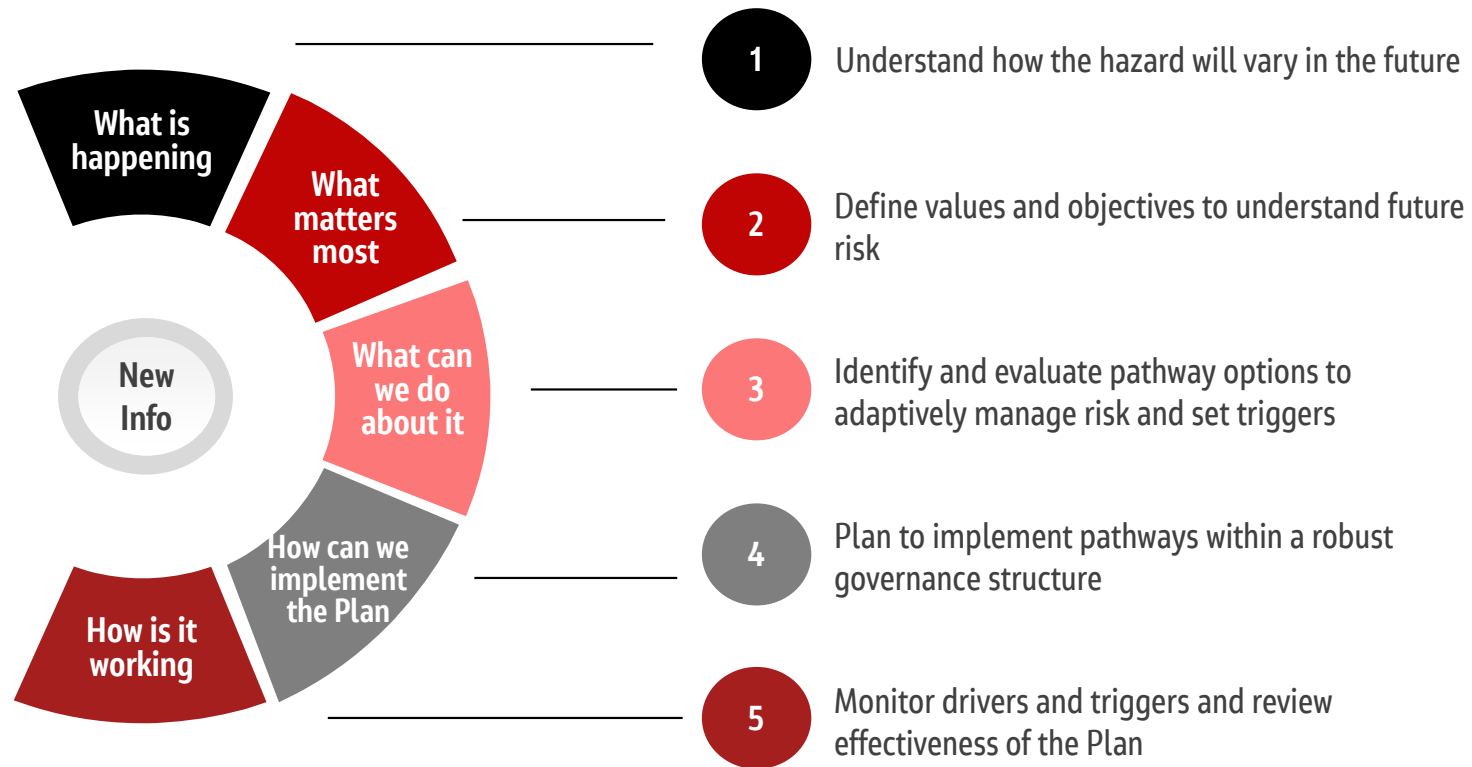


- Draft rule making
- Future requirements (e.g. nutrients)
- Notice of violations
- Current permit conditions
- Receiving water testing/modeling

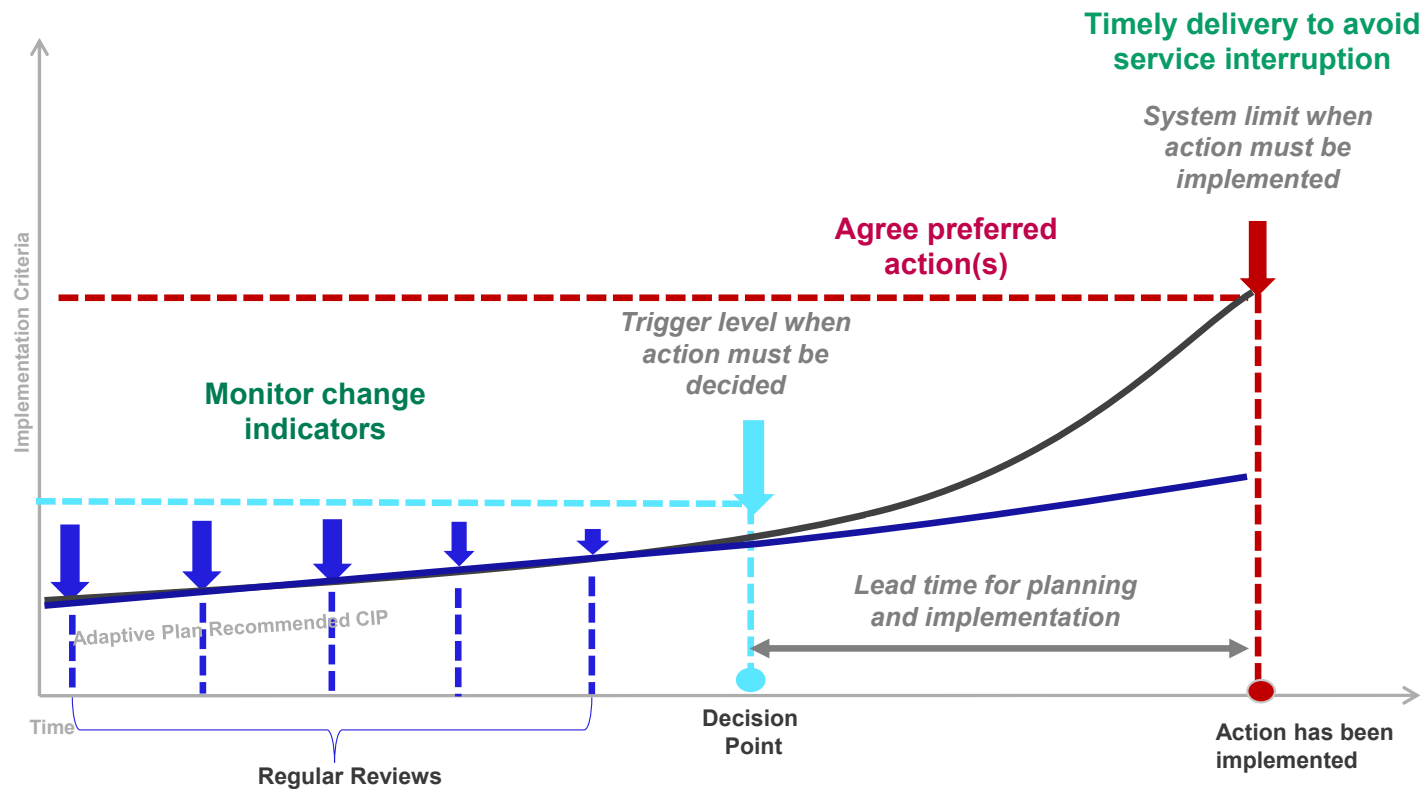
- Participate and monitor rule making processes
- Review new permits issued by agencies for other utilities
- Conduct pilot testing to evaluate compliance strategies

- New requirement or mandate
- Consent Decree, Administrative Order
- Revised permit condition(s)
- Different treatment technology(s)
- Negotiate implementation deadlines

Adaptive Prioritization Pathway



Implementation roadmap includes a “living” process to monitor change indicators and adjust/adapt for investment triggers



Capital Planning Investment Triggers Examples

Regulatory Compliance

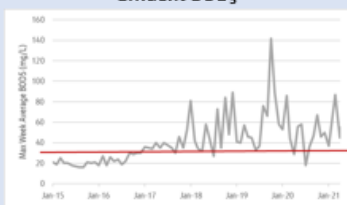
Compliance Rate FY22



Reported Permit Compliance Samples

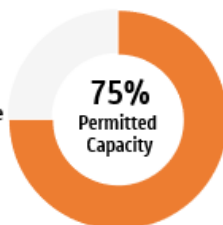


Effluent BOD₅



WWTP Flows

80 MGD Average Daily Flow



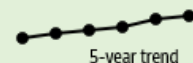
Influent Flows – Average & Max



Flow Peaking Factor 2.3



Bypass Flow 15%



Asset Management

2,500 Obsolete Assets 40%

3,500 Assets < 5 Years RUL 55%

Asset Condition Risk Scores

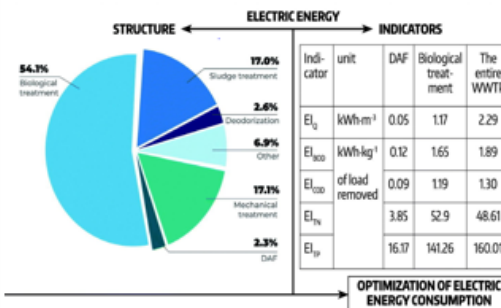
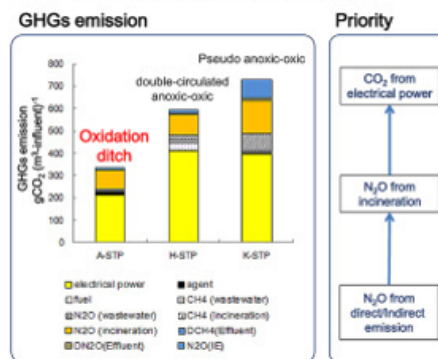
	Impact				
	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

Monthly Work Order by Type



Energy Management & Greenhouse Gas Emissions

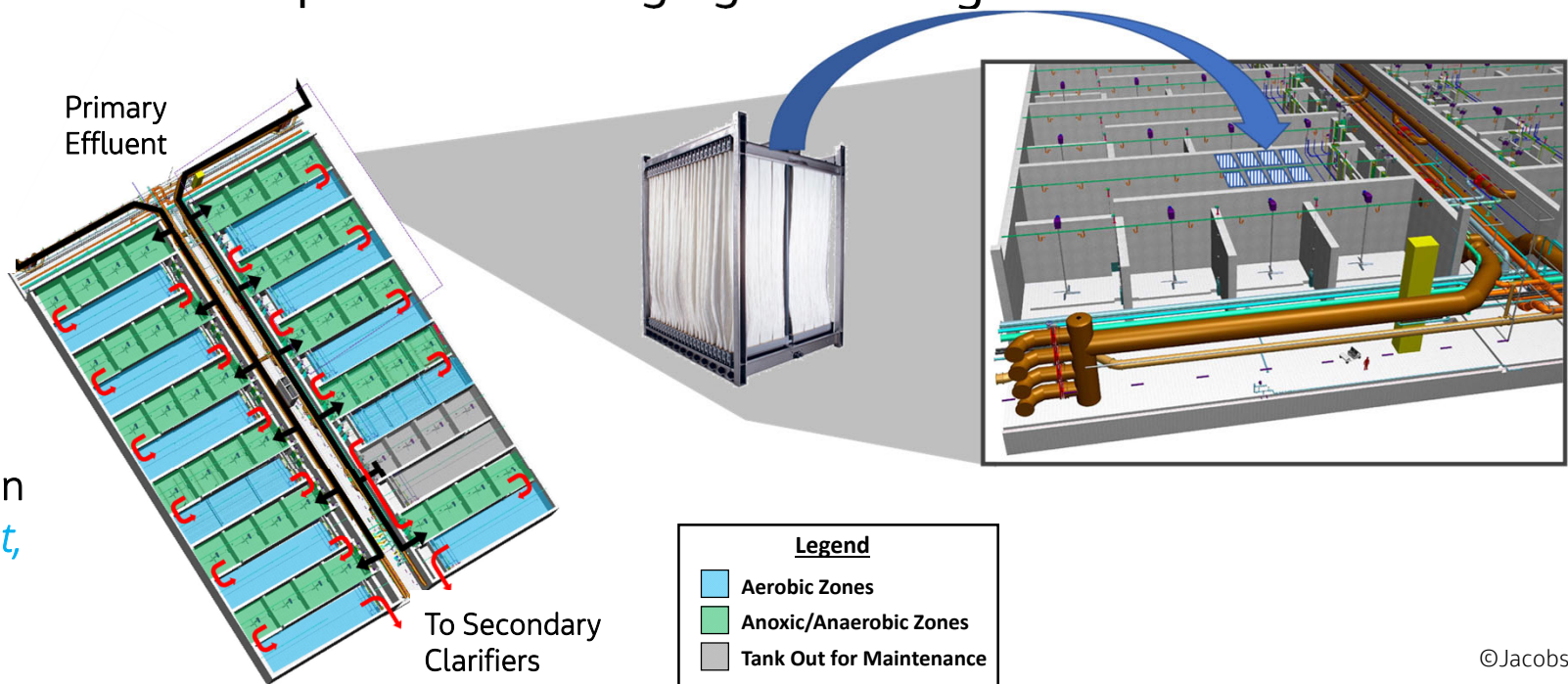
Survey in different sewage treatment plants



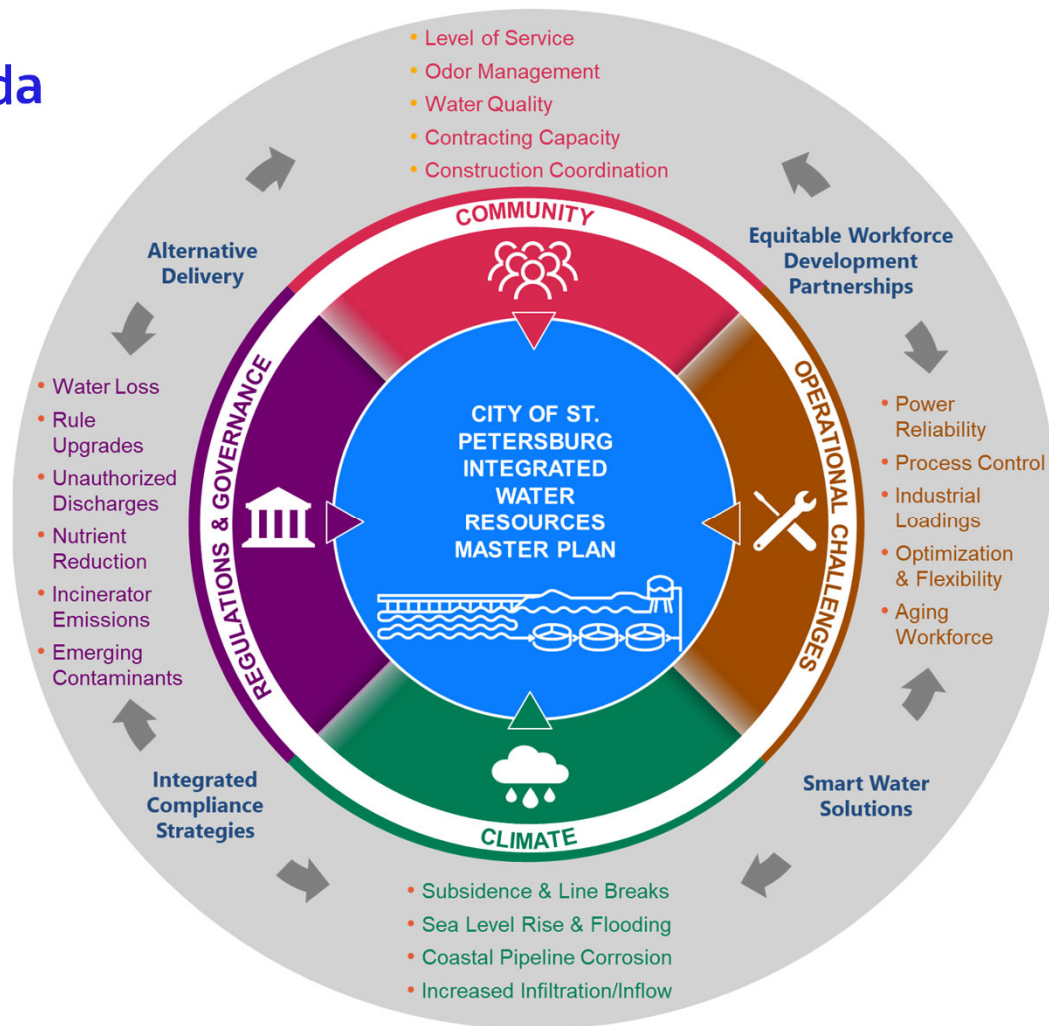
Considering Technology Developments In Planning

- One of the biggest mistakes our industry makes is selecting a **specific** emerging technology to satisfy distant needs.
- Adaptive planning tries to provide capital/space allotment for established processes with a road map for how emerging technologies can **enhance** future goals.

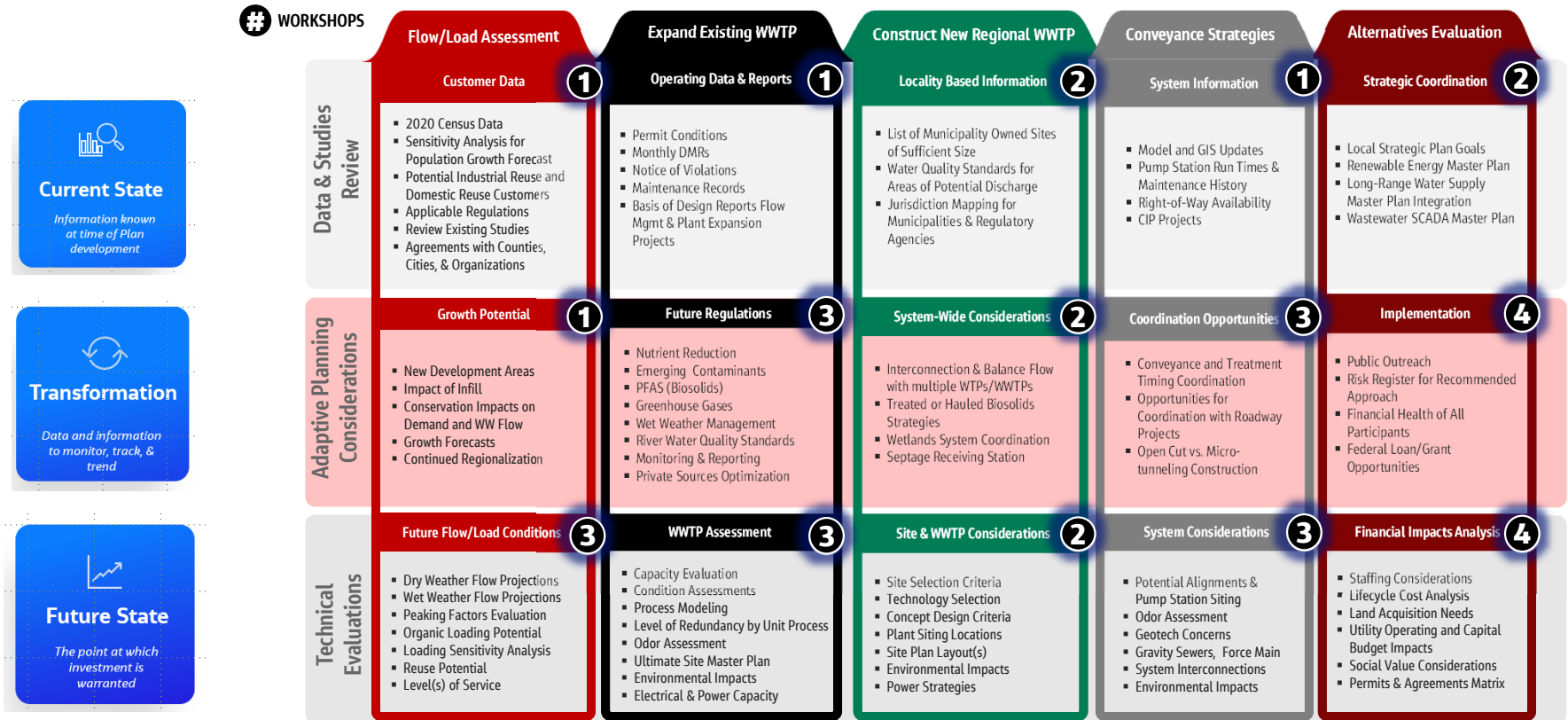
Changi WRP
Bioreactor Design
*Flexible, Compact,
Modular*



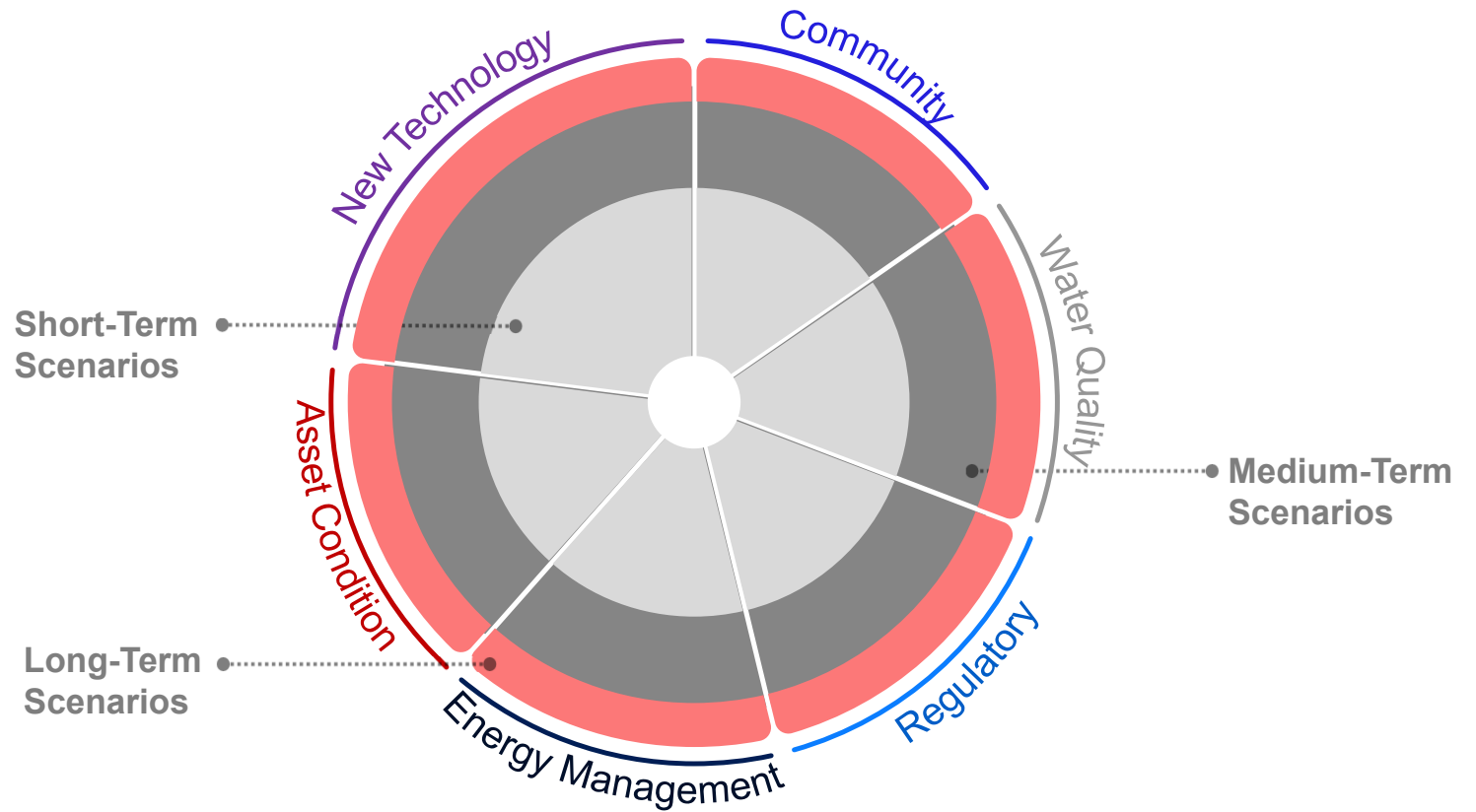
St. Petersburg Florida One Water Adaptive Roadmap



St. Petersburg's One Water Plan Adaptive Planning Approach

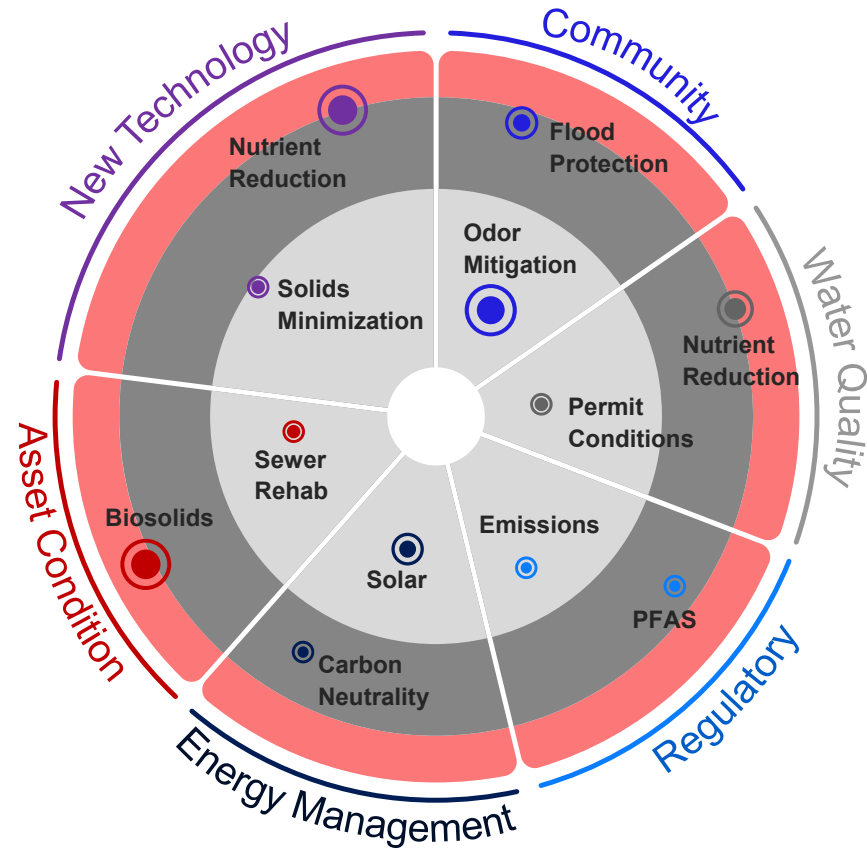


Louisville MSD Adaptive Planning Roadmap



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General Timing from Adaptive Plan Recommendations



Louisville MSD Adaptive Planning Triggers Roadmap

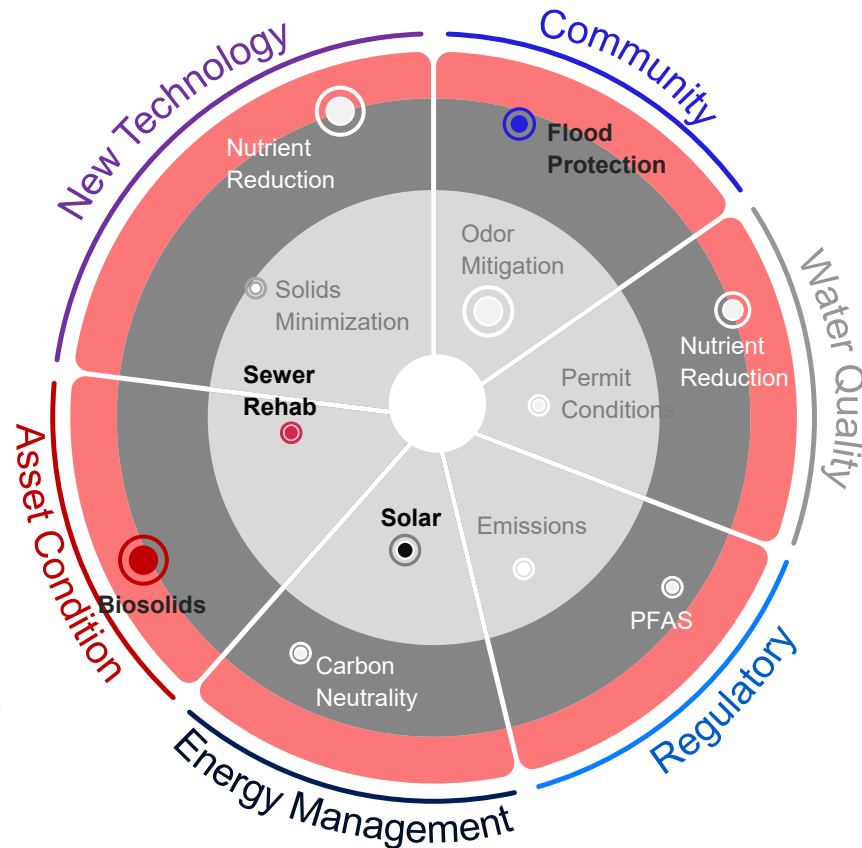
Unexpected Changed Conditions

Existing biosolids dryers had catastrophic failure \$350M interim and new biosolids facilities

US Army Corps of Engineers Flood Protection Resilience Upgrades \$60M cost portion

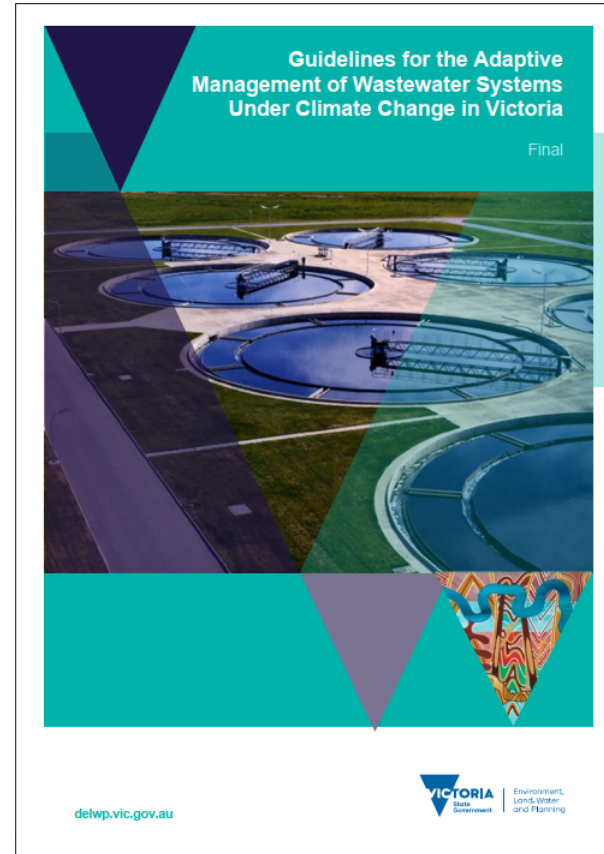
Defer some large sewer rehabs and replacements to pay for flood protection and biosolids priorities

Defer solar energy projects to pay for new priority needs



Summary Thoughts

- Utilities all over the world face a similar challenge: addressing today's issues while positioning for tomorrow's needs
- What we did yesterday is unlikely to work for future needs...including how we approach planning!
- Adaptive planning is the appropriate methodology to address an uncertain future



https://www.water.vic.gov.au/_data/assets/pdf_file/0027/663561/guidelines-for-the-adaptive-management-of-wastewater-systems-under-climate-change-in-victoria.pdf

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