

Guiding Regional Reuse Options – A Distributed Systems Approach

Supplemental information to support CUWA's February 2019 fact sheet



CALIFORNIA URBAN WATER AGENCIES

Advancing water reuse in California with a distributed systems approach

Climate change, population growth, and regulatory drivers are putting pressure on California's urban water supplies, inspiring greater water supply diversification. California has goals to increase recycled water use by 2.5 million acre-feet per year (afy) by 2030, and evolution in water reuse has enabled the potential blend of multiple strategies.

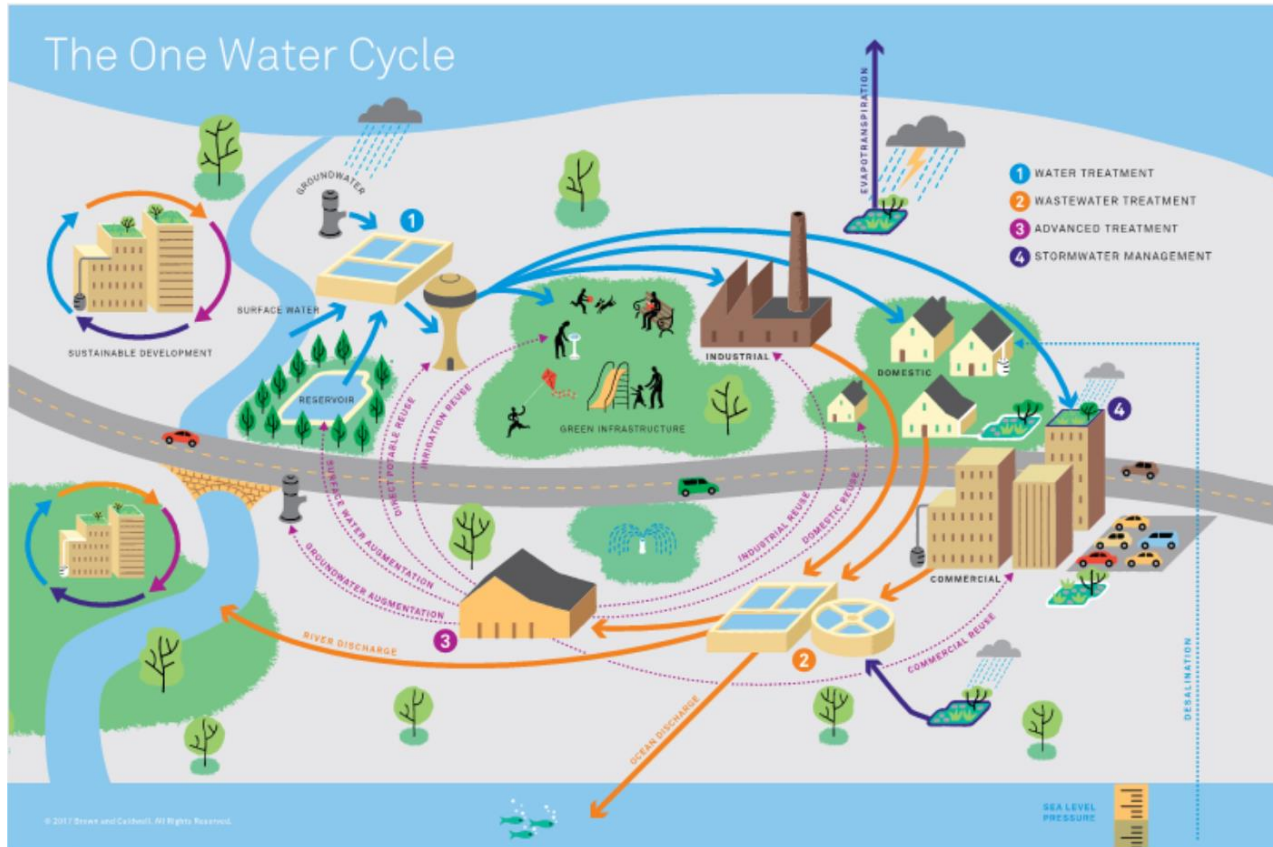
- Centralized non-potable reuse
- Onsite (i.e., decentralized) reuse
- Potable reuse

While no one reuse strategy fits all communities, an integrated water management approach can help utilities tailor their water supply portfolio to meet site-specific conditions and objectives.

With several reuse options available, utilities can apply a **distributed systems approach**, defined as a regionally optimized combination of water reuse strategies for local conditions, to produce an effective “fit-for-community” reuse strategy.



Water reuse is a sustainable way to improve water supply reliability and enhance quality of life



The One Water Cycle considers the water cycle as an interconnected system, and water reuse is an important part of integrated water management.

By recycling water, agencies can extend their local water supplies to improve supply reliability and resiliency, support growth and development, and supplement environmental flows. There are many uses for recycled water, including agricultural uses, landscape irrigation, industrial uses, environmental protection, and augmenting potable water supplies.

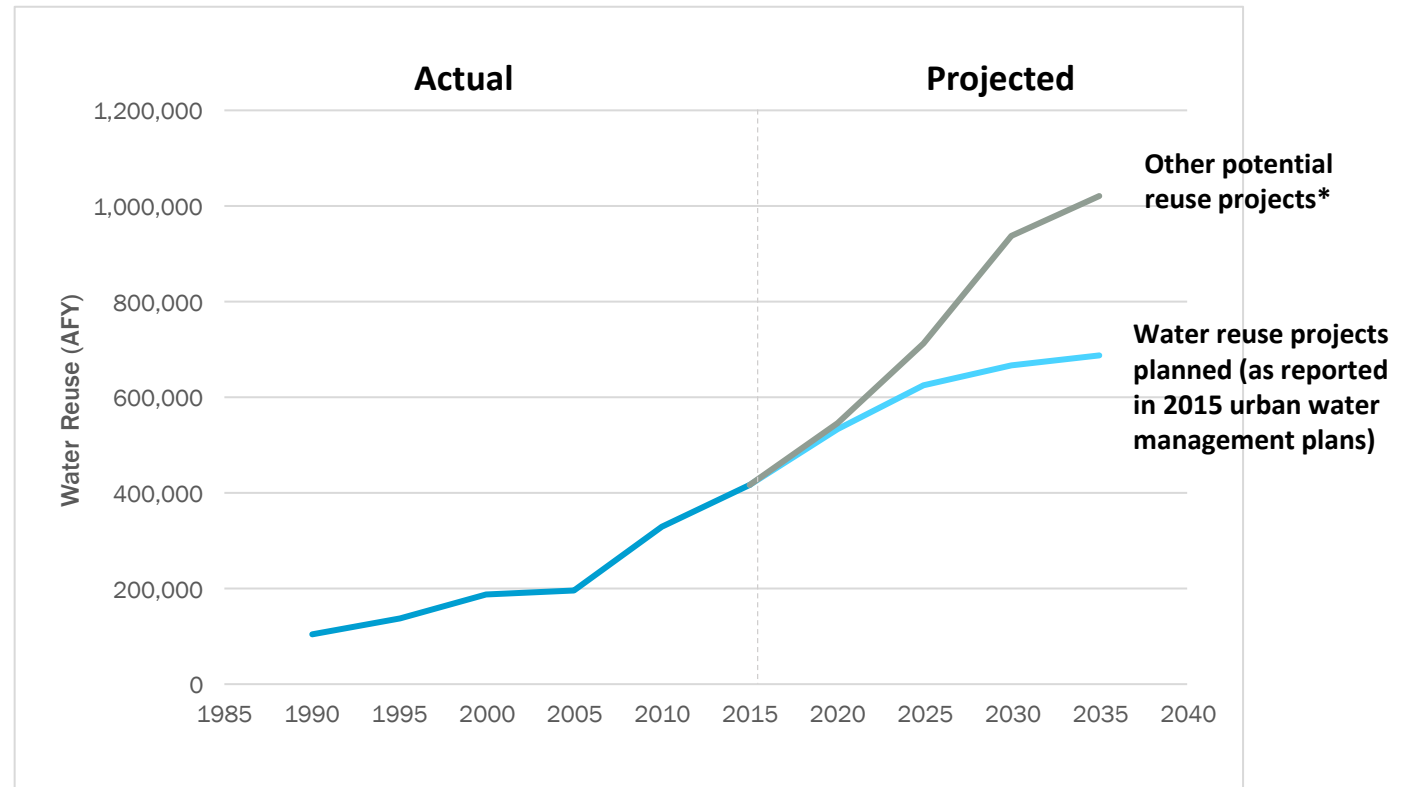


California has goals to increase recycled water use by 2.5 million acre-feet per year (afy) by 2030

California's Recycled Water Policy has goals to increase recycled water use from 714,000 afy in 2015 to 1.5 million afy by 2020 and 2.5 million afy by 2030. In alignment with this plan, CUWA agencies have conceptual plans to double water reuse by 2035.

Who is CUWA?

Established in 1990, California Urban Water Agencies (CUWA) is a nonprofit corporation of 11 major urban water agencies collectively delivering drinking water to approximately two-thirds of California's population. Water delivered by CUWA's 11 member agencies is a lifeline supporting California's urban populations and powering the bulk of the state's over \$2.7 trillion economy.

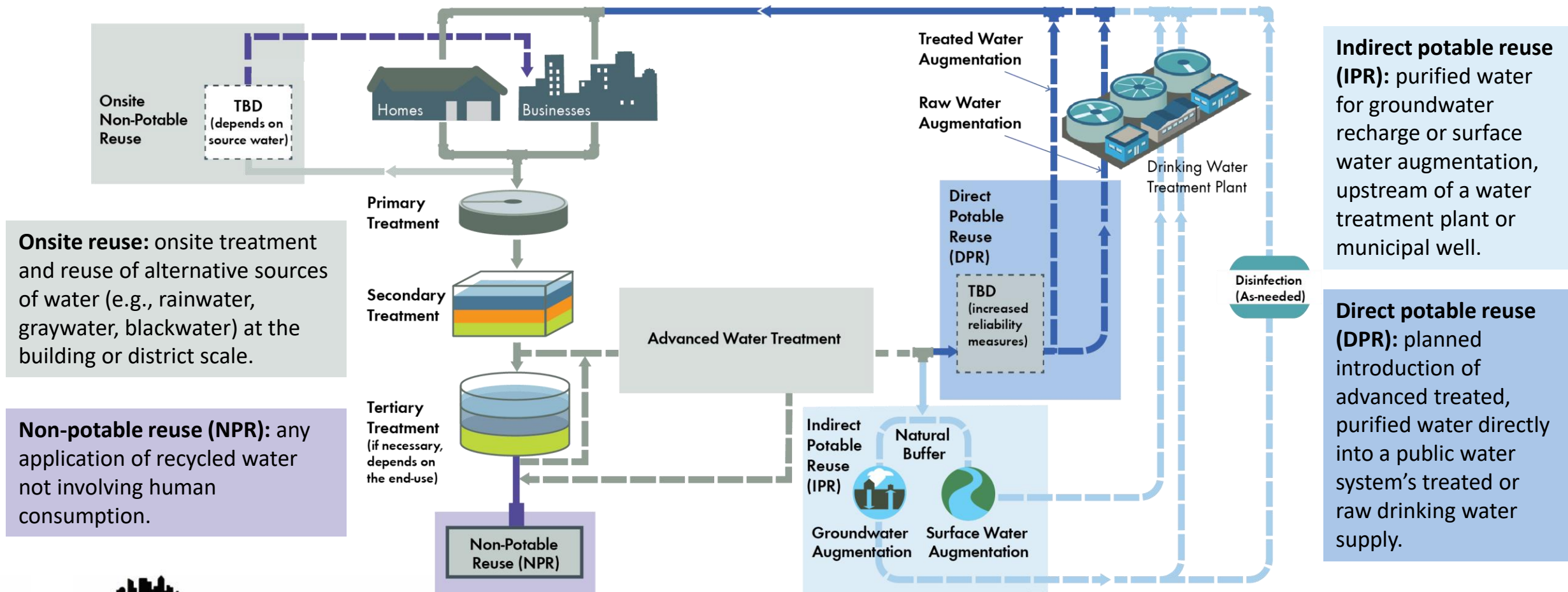


CUWA agencies' collective water reuse projections

*"Other potential reuse projects" may offset traditional supplies or augment the total CUWA-wide supply portfolio by as much as 5% in 2035.



Evolution of water reuse enables a blend of strategies, both centralized and onsite



Achieving an optimized blend of reuse strategies through a distributed systems approach

Why are some agencies moving toward potable reuse rather than expanding non-potable reuse supplies?

What local conditions favor various reuse options?

What are the needed factors for successful implementation?

How do we gauge the sustainability of centralized or onsite reuse systems?

CUWA interviewed industry leaders in the U.S. and Australia employing a distributed systems approach to better understand the community considerations and enabling conditions for determining “fit-for-community” strategies.

This document addresses these questions and highlights key considerations for the range of available reuse strategies and end uses.



Optimizing the reuse portfolio for each community's unique characteristics

Community Goals

- Increasing the drought-resiliency of a water supply portfolio
- Supporting environmental stewardship
- Offsetting potable water demand through water reuse
- Relieving stress on a centralized system that's reaching capacity
- Reducing dependence on imported water supplies and increasing local autonomy

Limitations

- Lack of existing infrastructure
- Lack of an environmental buffer that meets regulatory criteria
- Budget constraints
- Environmental permitting requirements

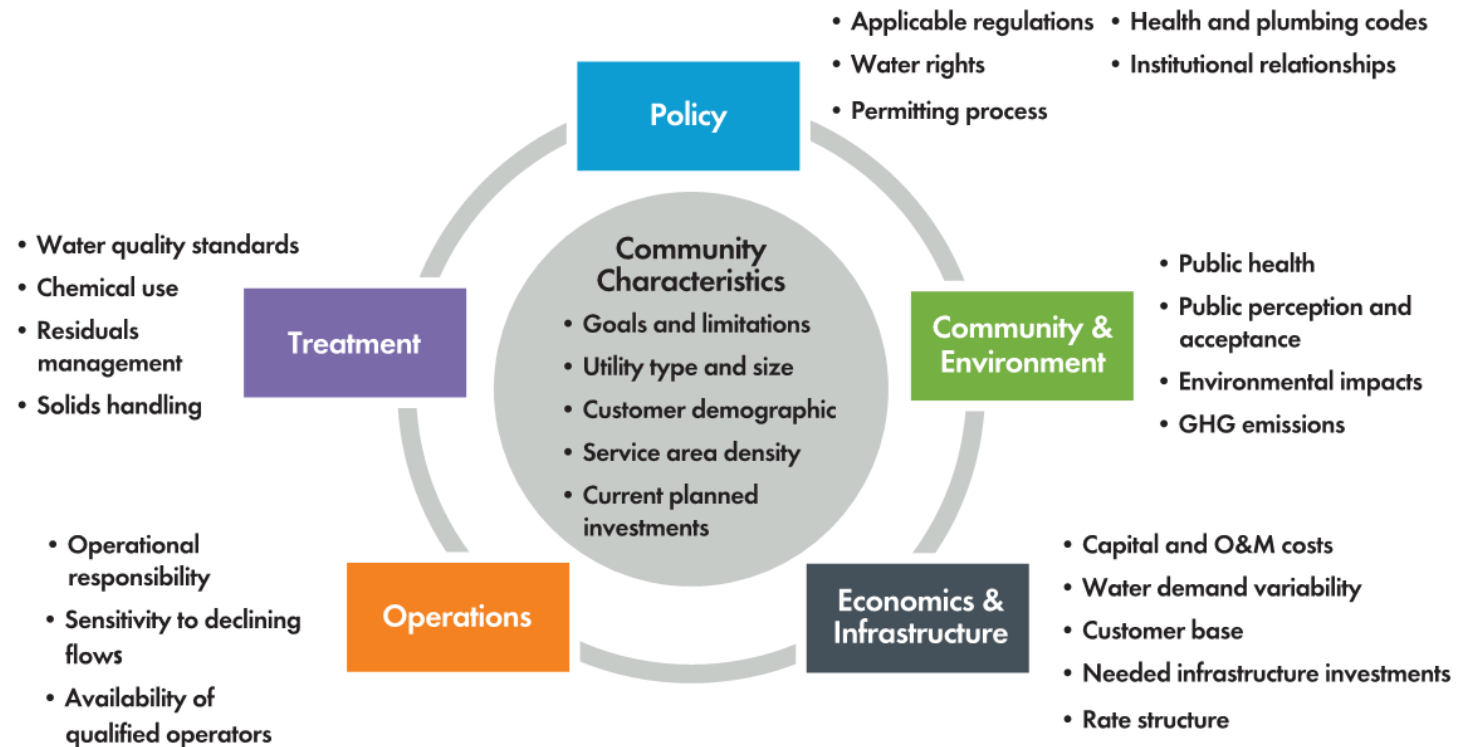
Characteristics

- Utility type and size
- Customer demographics
- Service area density
- Current and planned investments



Considerations to achieve fit-for-community solutions

The right reuse portfolio for a given region will account for system and community considerations (shown to the right) and enabling conditions. Evaluating factors in advance can help save costs, reduce greenhouse gas emissions, increase public awareness, and advance environmental stewardship within a community. **The following sections highlight the key considerations for various reuse strategies, based on the elements shown to the right.**

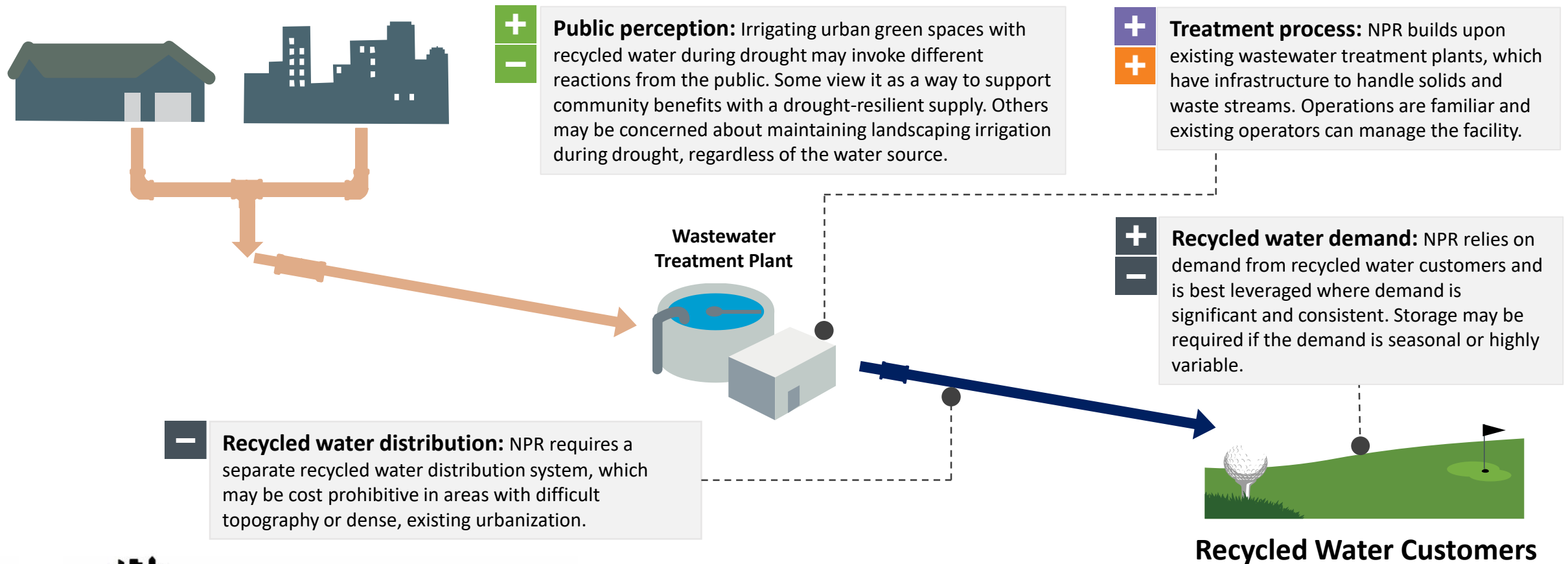


**Colors associated with each category carry through the subsequent slides.*



Key considerations for centralized non-potable reuse (NPR)

NPR has an important role to play, as using recycled water offsets demand on potable supply and helps to enhance urban green space and quality of life. NPR uses a separate distribution system, which may require significant capital investment and construction. NPR is more favored in new development or areas with existing dual distribution systems.



SFPUC optimizes regional reuse through a distributed systems approach



San Francisco Public Utilities Commission (SFPUC)

SFPUC is an example of how the distributed systems approach achieves multiple recycled water goals. The western side of SF is home to large irrigation customers, such as the Golden Gate Park. To capitalize on economies of scale, SFPUC is building a large centralized recycled water plant to serve them. The east side of SF is more densely developed with fewer contiguous areas that could benefit from centralized infrastructure (bottom figure). In 2015, SF passed an ordinance requiring new development with a footprint > 250,000 square feet to meet their own non-potable demands onsite through decentralized treatment systems. With much of the city's development boom captured under the ordinance, SFPUC has found that recycled water demands are largely addressed on the east side.

Factor that supported NPR on the west side (top figure):

Capitalize on economies of scale to serve large irrigation customers. The western side of SF is home to the Golden Gate park, golf courses, and San Francisco Zoo.

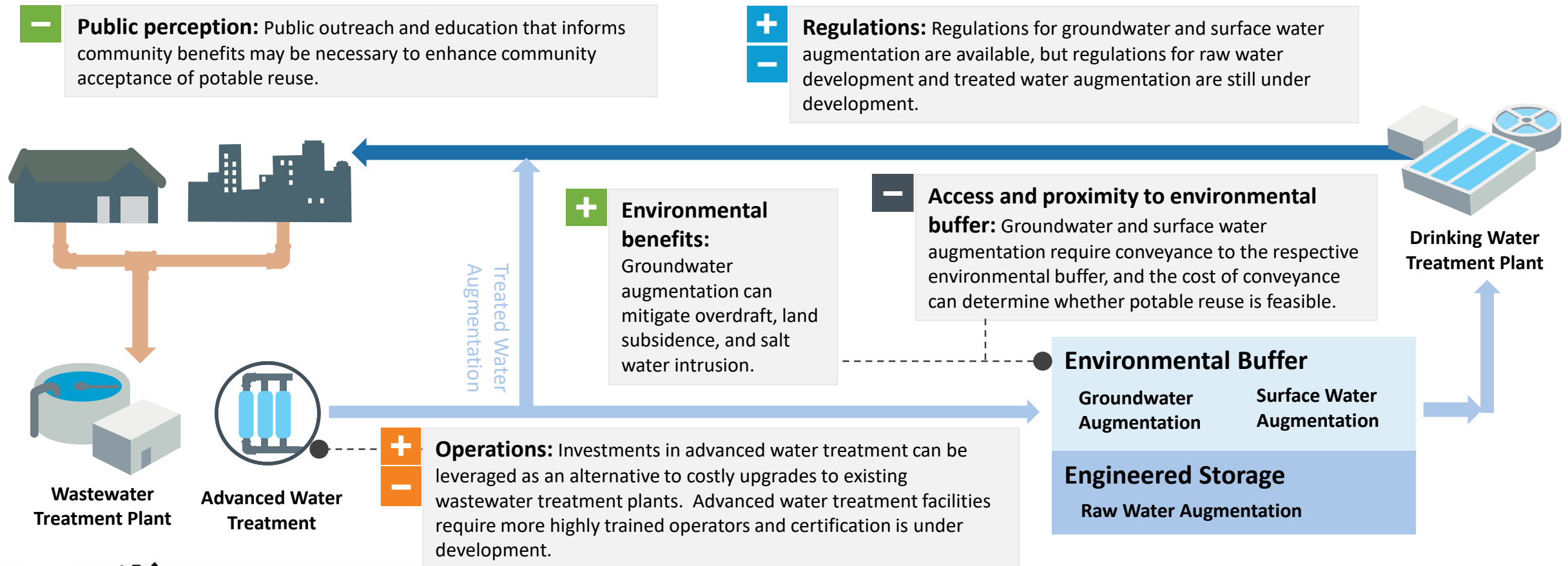
Factor that supported onsite reuse on the east side (bottom figure):

Supporting dense development through onsite reuse resulted in deferred capital costs. The east side of SF is more densely developed with fewer contiguous areas. Given the differing recycled water needs, onsite reuse was a more effective strategy.



Key considerations for potable reuse

Potable reuse has taken off recently in the U.S. and has been in practice for several decades in other countries. It leverages existing water distribution infrastructure, circumventing the need for a separate distribution system. As potable reuse continues to evolve, there is a need for further research to support regulations and safe and cost-effective implementation.



A key benefit of potable reuse is the augmentation of drinking water supplies



Pure Water San Diego Demonstration Facility
(Source: City of San Diego, 2018)

Pure Water San Diego

The City of San Diego has developed the Pure Water San Diego program, a centralized potable reuse program that will meet one third of the region's future water demands through advanced water purification.

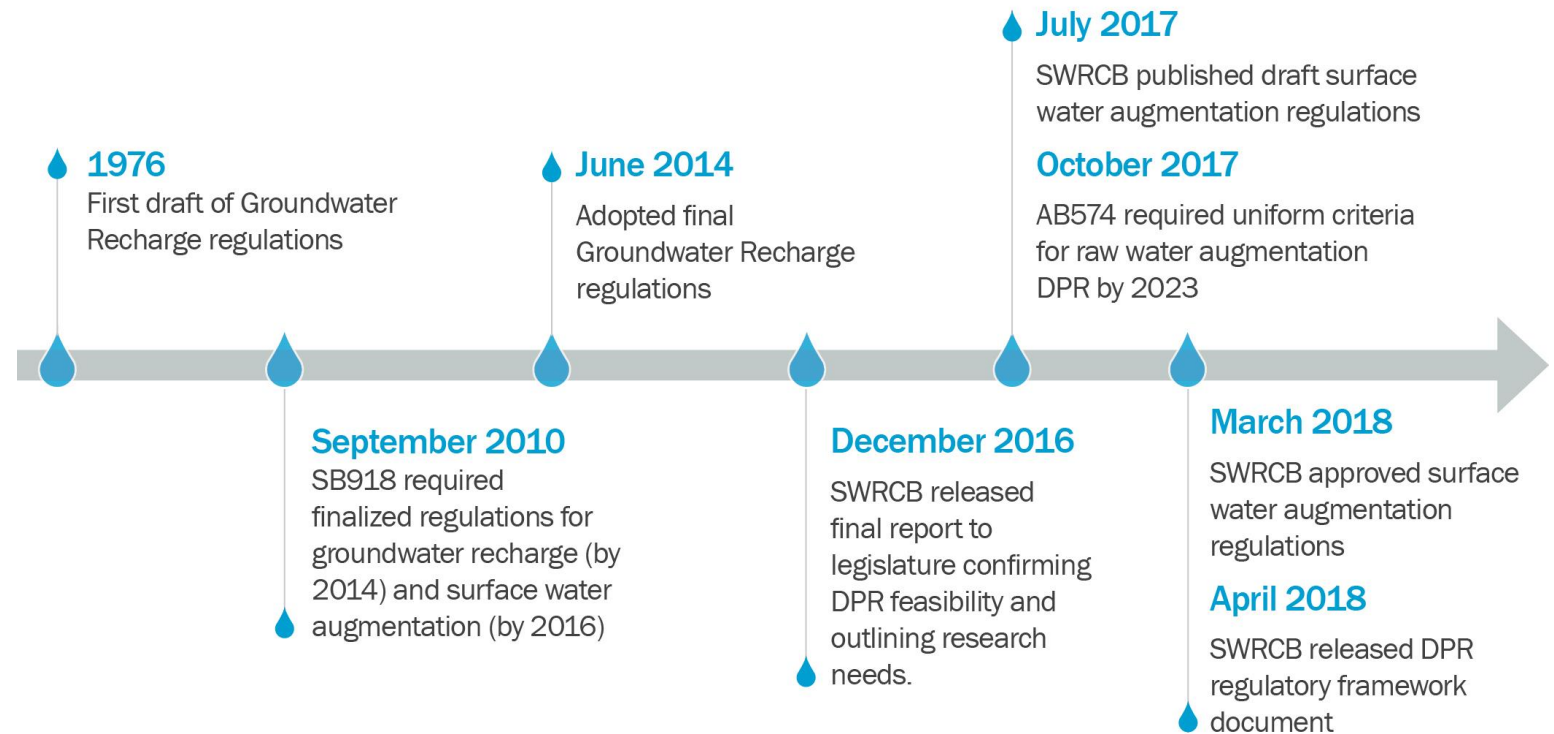
Community goals that motivated potable reuse:

- **Reduce reliance on imported water.** The City of San Diego currently imports 85% of its water, which can be vulnerable to external forces (climate change, catastrophic events, increases in cost). Reducing reliance on imported water and increasing local control are widely supported regional goals.
- **Increase drought resiliency.** Potable reuse relies on wastewater as a source, which is less influenced by unpredictable precipitation patterns than typical sources of supply.
- **Capitalize on economies of scale.** By building a centralized system to serve the San Diego region, the City can achieve cost benefits through economies of scale.
- **Reduce ocean discharge.** By recycling water through potable reuse, less water is lost through ocean discharge.



Supporting the development of potable reuse regulations through research

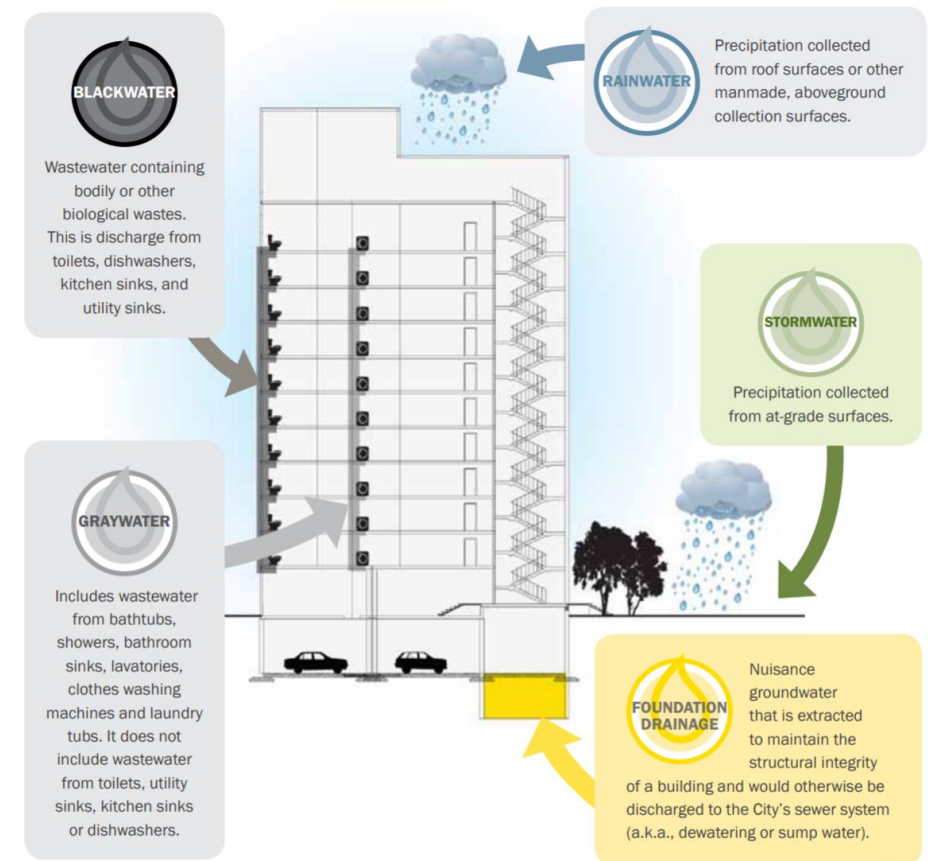
Regulations for various potable reuse strategies continue to develop in California, with groundwater recharge regulations adopted in June 2014 and surface water augmentation regulations approved in March 2018. To support the development of criteria for raw water augmentation, the State Water Board awarded a \$4.5 million grant to the Water Research Foundation to help fund targeted research on critical aspects of potable reuse implementation as recommended by the Division of Drinking Water's Expert Panel.



Integration of onsite reuse through a distributed systems approach

Onsite reuse is gaining momentum as a strategy that's implementable by building owners with support from their local utility. Utilities can either be reactionary or have the opportunity to participate, even provide leadership, in the integration of onsite systems through a regionally optimized approach.

Onsite systems can help support a utility's goals, if planned as part of a regional strategy (e.g., relieve stress on a system that's reaching capacity). Incorporating onsite systems requires regional coordination, planning, and subject matter expertise.

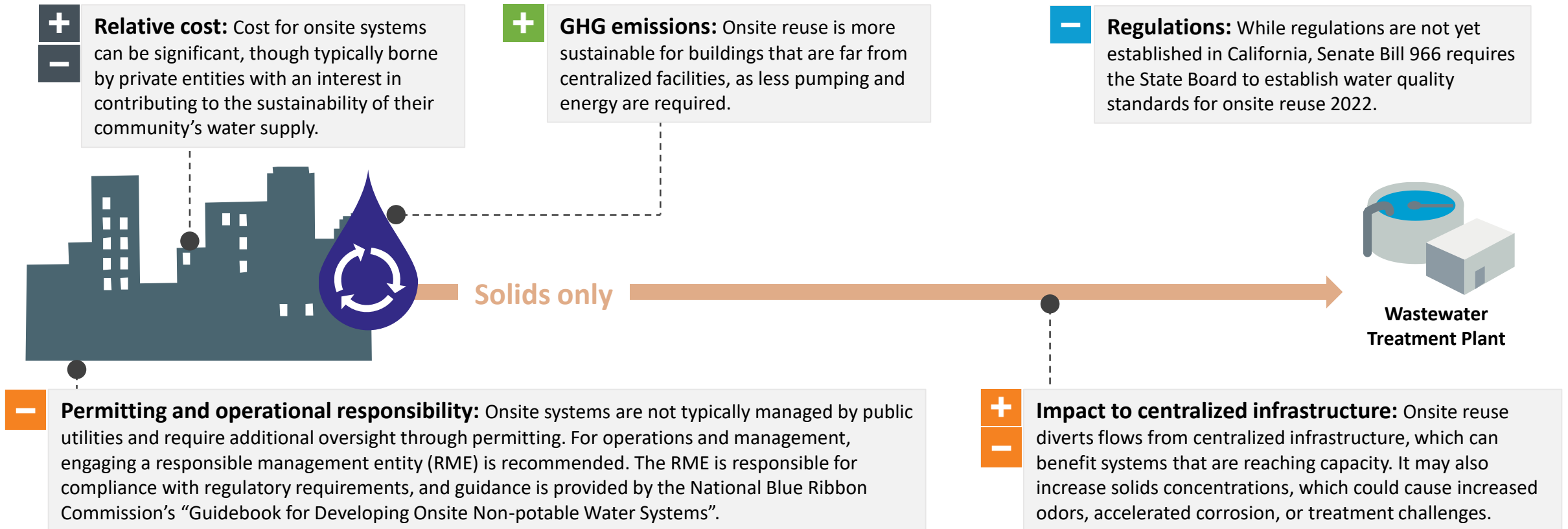


Source: SFPUC 2012, Onsite non-potable water use



Key considerations for onsite reuse

Onsite reuse is implementable by building owners with support from their local utility. It provides the building owners, and their community, with a sense of environmental stewardship and serves as one of the strategies to gain environmental credits through rating programs like LEED.



SB 966: Establishing water quality standards for onsite reuse by 2022

On September 28, 2018, Governor Brown signed into law SB 966, California's first onsite non-potable reuse legislation. SB 966 requires that the State Water Resources Control Board ("State Water Board") issue comprehensive regulations, including risk-based water quality standards, by December 1, 2022 to help local jurisdictions implement onsite water reuse. SB 966 also requires the Department of Housing to develop and propose any necessary corresponding building standards to support the State Water Board standards by December 1, 2023. Furthermore, onsite systems cannot be installed or operated unless permitted by a local oversight program.



Leveraging onsite reuse to support development in areas without a centralized system



View from the Ecovillage at Currumbin
(Source: Shiftchange, 2015)

The Ecovillage at Currumbin, Australia

The Ecovillage at Currumbin is a sustainable, decentralized community located in Queensland, Australia. It is home to approximately 400 residents and has a market, community center, and café on site. It is “off-the-grid” for water, using household tanks for potable water and capturing and treating wastewater for toilet flushing and yard usage.

Motivators for onsite reuse:

- **Lack of centralized infrastructure, which made onsite reuse more cost effective.** There was no existing wastewater treatment facility or conveyance in the development area, which was a major driver to establishing an onsite capture and reuse system
- **Goal to create the world’s most ecologically sustainable development.** The private developer wanted to support the principles of sustainability and subsequently generate higher real estate values



Summary of favorable conditions for various water reuse strategies



Non-potable reuse	Potable reuse	Onsite reuse
<ul style="list-style-type: none">• Large, consistent demand for recycled water• Customers in close proximity of centralized facility or existing distribution system• Recycled water needed to support community development and growth	<ul style="list-style-type: none">• Community goal to expand locally controlled potable water supplies• Desire for sustainable groundwater management and mitigation of land subsidence• Access to cost-effective means for concentrate management• Prior investments in advanced water treatment within the system	<ul style="list-style-type: none">• Recycled water demand in dense urban environments or challenging topography• Existing water or wastewater systems close to capacity• Planned growth or new development in areas where expansion of water or wastewater infrastructure would be cost prohibitive

Note that this is not intended to be a comprehensive list, but rather as a starting point for utilities and their communities.



Expanding LEED credits to reflect all sustainable reuse options

Environmental accreditation can motivate sustainable businesses practices associated with water management. A building, neighborhood, or community can employ multiple strategies to increase their water efficiency. Many developers opt for onsite reuse to achieve green building certification through rating systems like LEED. However, LEED offers water efficiency credits for using any type of alternative water source, including centralized reuse, and further clarification of the rating criteria will improve awareness of this opportunity.

Rewarding whichever combination of reuse strategies makes the most sense from a holistic, regional perspective aligns with the distributed systems approach and would enable development of fit-for-community solutions through partnerships between businesses and utilities.

The City of San Diego has identified a combination of centralized NPR and potable reuse as their “fit-for-community” reuse portfolio. The City has invested in **Pure Water San Diego**, a potable reuse program that will serve the entire City. Businesses within the community can contribute source water by continuing to discharge into the centralized system, rather than building onsite systems. Rewarding businesses that contribute in this way can better enable these partnerships for the betterment of the community.



Working together to advance fit-for-community reuse

Utilities, businesses, and policy makers can optimize water reuse opportunities to provide sustainable and reliable water supplies.

Actions for utilities leading efforts to optimize water supply reliability:

- ✓ Evaluate centralized and onsite reuse opportunities through a distributed systems approach
- ✓ Invest in planning staff and processes that understand the role and complexity of onsite reuse and recognize that meaningful expansion of onsite reuse may require changes in local codes and ordinances
- ✓ Engage policy makers and public health officials to explore barriers and incentives



Working together to advance fit-for-community reuse, continued...

Actions for businesses looking to incorporate water sustainability into their culture:

- ✓ Align with urban water agencies to invest in regional strategies that reflect the interconnectedness of our water systems and optimize a community's available wastewater
- ✓ When contemplating onsite systems, team with a responsible management entity with experience in long-term operations

Actions for policy makers:

- ✓ Maintain flexibility at the local level. Any legislation or codes related to water reuse should enable implementation of the reuse strategy that best fits local community needs



Water reuse is evolving and the industry (utilities, stakeholders, and regulators) will have to evolve with it

As water reuse continues to evolve, the distributed systems approach will be increasingly important for evaluating the various options available. This work aims to empower utilities to take charge and inform partners on what form an optimized distributed system might take to enhance sustainability in their region.

For more information, visit www.cuwa.org.

