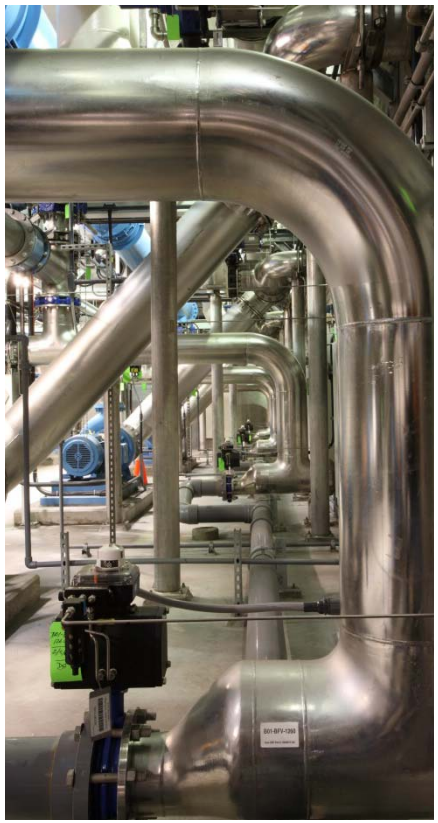
Financial, Environmental, and Social Factors of Water Reuse

State Water Resources Control Board
Water Reuse Research Needs Workshop
October 29, 2014



hallenge

Drought

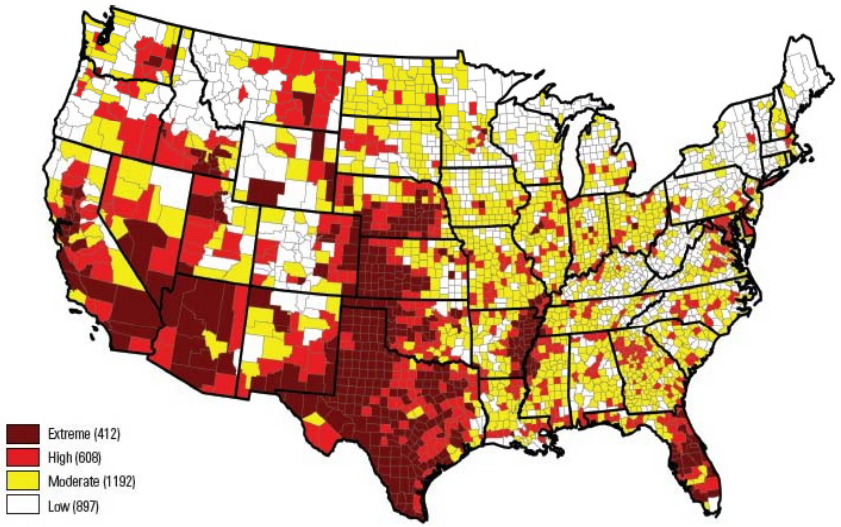
Climate change (uncertainty)

Population growth

ncreased municipal, industrial, and gricultural demand

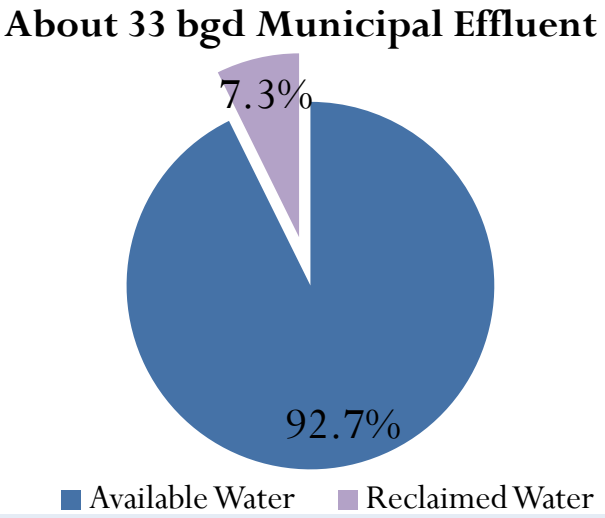
Dependence on single source of supply

TMDLs/Nutrient load caps



Opportunity for Reuse

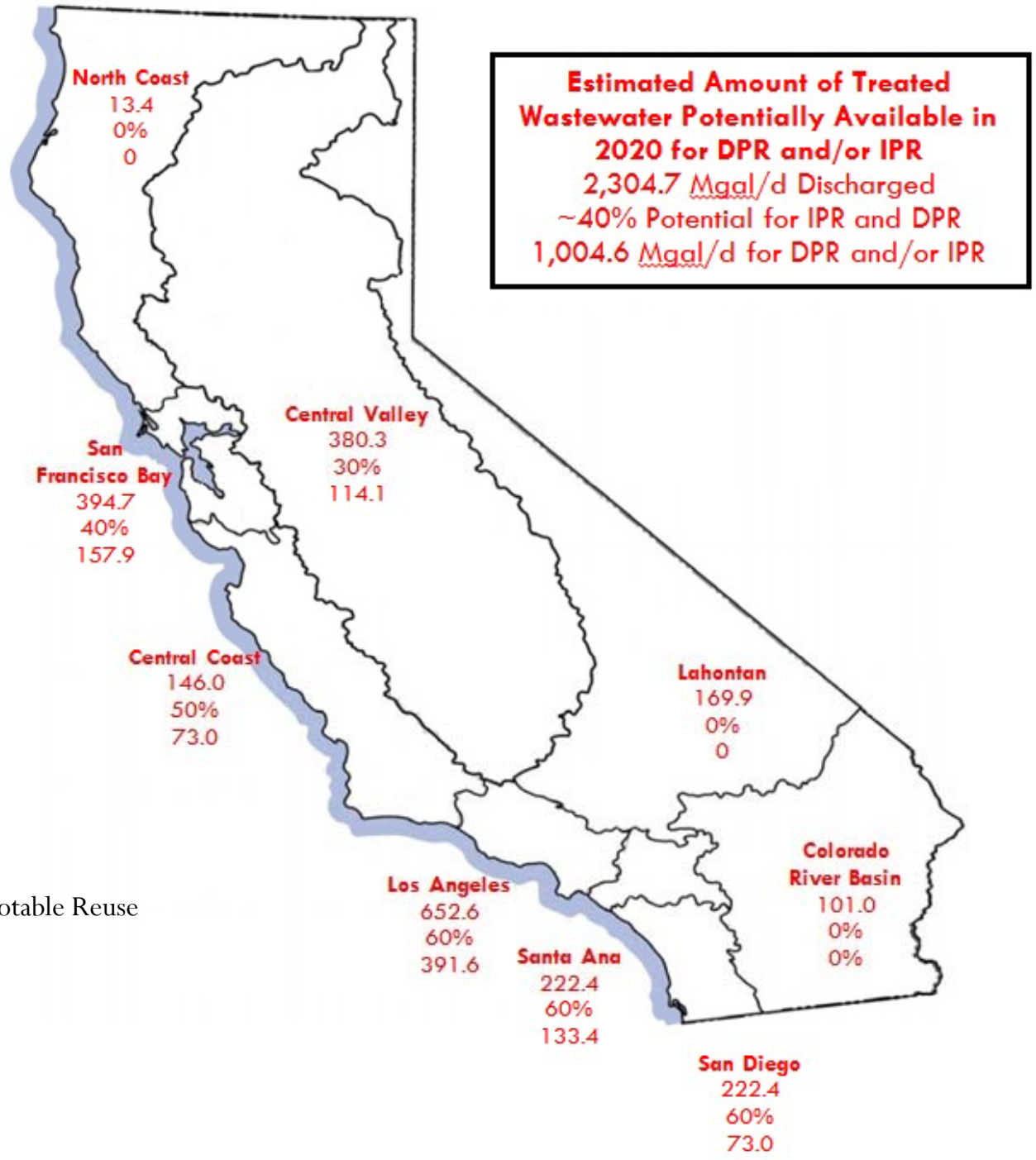
- The need has never been greater (record droughts Texas and California)
- Advancing Technologies
- Improving Public Perception
- Avoids costly import of water
- Provides local, climate-independent, sustainable supply



ater Reuse Availability California

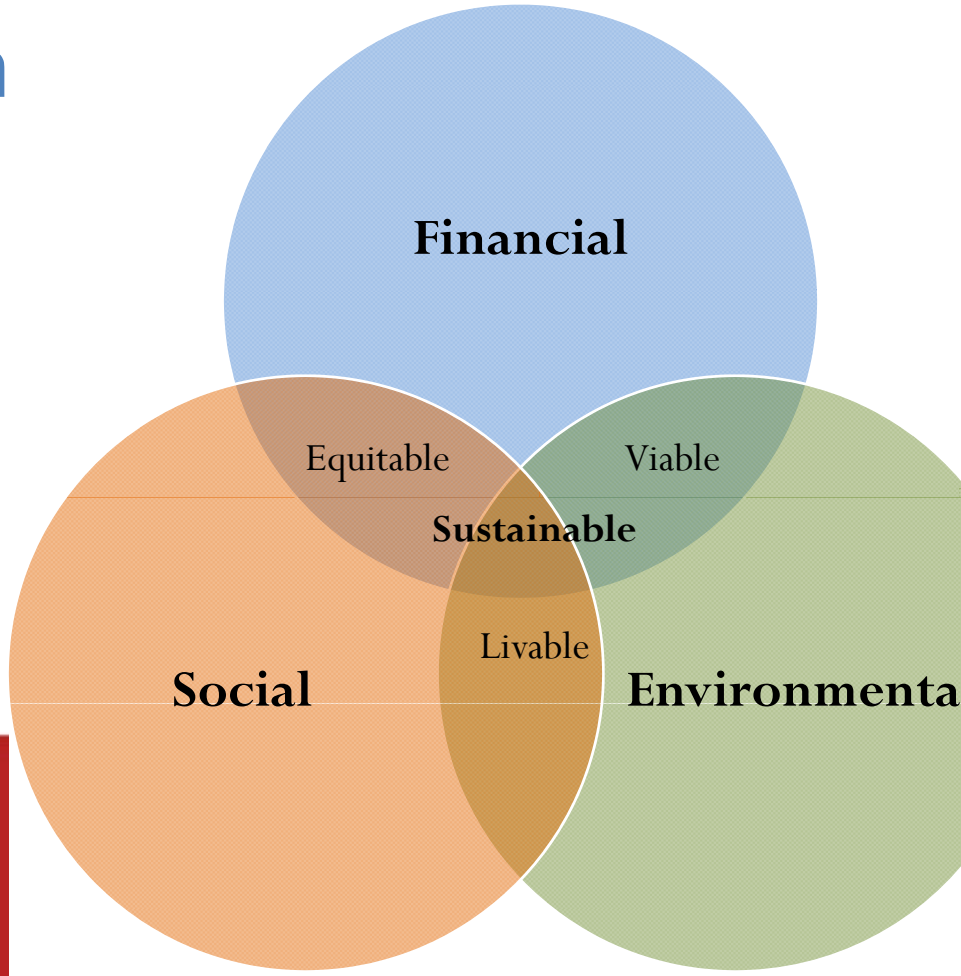
There is a considerable quantity of highly treated wastewater that is discharged to the ocean or to inland waterways. 1,000 Mgal/d is sufficient potable water to supply all municipal needs (including commercial and industrial uses) for over 8 million Californians, or roughly one-fifth of the state's projected population for 2020.

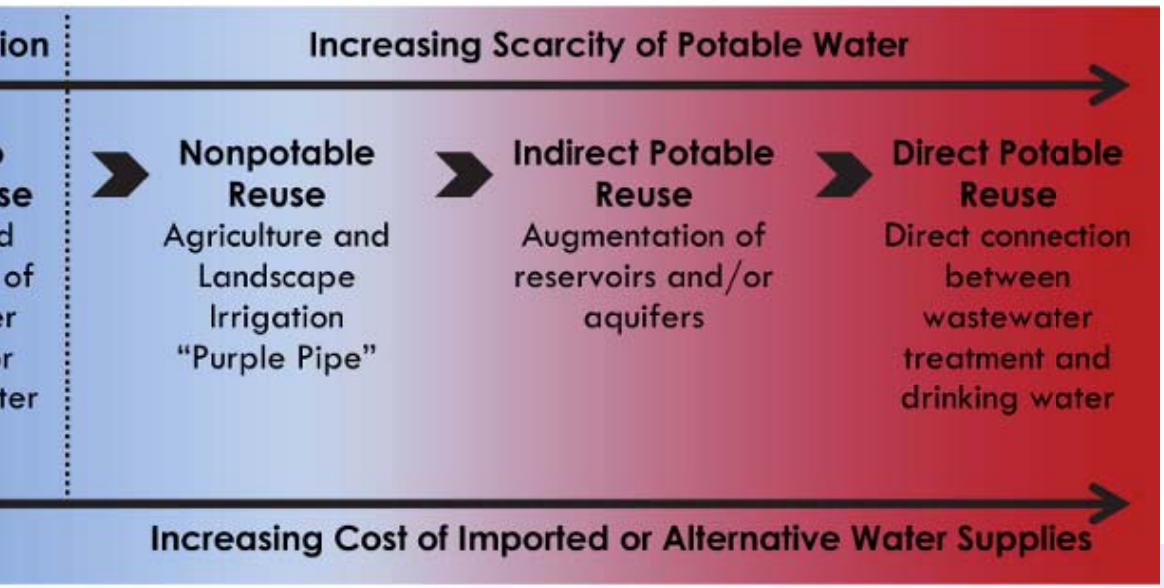
om WRRF-14-08 The Opportunities and Economics of Direct Potable Reuse



Triple Bottom Line Approach

- Methodology for identifying and quantifying the full financial, environmental, and social costs and benefits of a water supply option
- Ultimate goal of selecting the water supply option based on a Fit-for-Purpose model

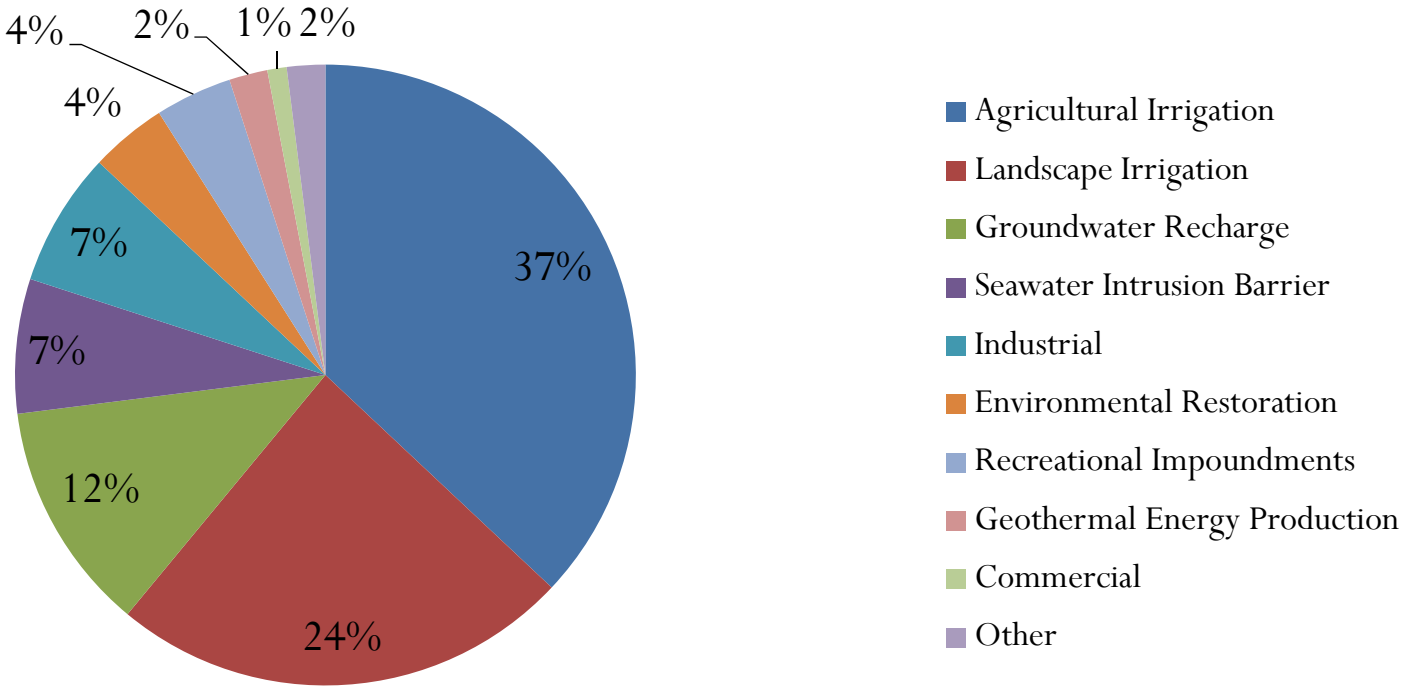




Fit-for-Purpose Model

Goal of matching the level of treatment to its intended use without expending unnecessary funds, energy, greenhouse gas (GHG) emissions and other pollutants, while minimizing other environmental and social costs.

Reclaimed Water Use in California



Adapted from WRRF-10-01 Fit for Purpose Water: The Cost of Overtreating Reclaimed Water

Each end-use of water has its own specific quality needs. When practical, water should only be treated to that specific level to avoid unnecessary expenses.

-for-Purpose – Potential for Overtreatment

Ranking (relative amount of eclaimed water used annually)	Reclaimed Water Use Category	Potable or Nonpotable Reuse?	Treatment Typically Required beyond Seconda Treatment to Meet Regulations
Highest	Landscape irrigation	Nonpotable	Tertiary filtration and disinfect
	Agricultural irrigation of fodder crops and processed food crops	Nonpotable	None
	Potable reuse	Potable	Advanced treatment through multiple barriers
	Industrial cooling	Nonpotable	Tertiary filtration and disinfect
	Irrigation of food crops eaten raw	Nonpotable	Tertiary filtration and disinfect
Lowest	Other	Nonpotable	Varies

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t-for-Purpose – Potential for Overtreatment

Nonpotable Reuse Overtreatment:

Tertiary filtration and disinfection is a common requirement, and because numerous technologies are available for implementation, significant opportunity exists for overtreatment

			ent through multiple barriers
	Industrial cooling	Nonpotable	Tertiary filtration and disinfect
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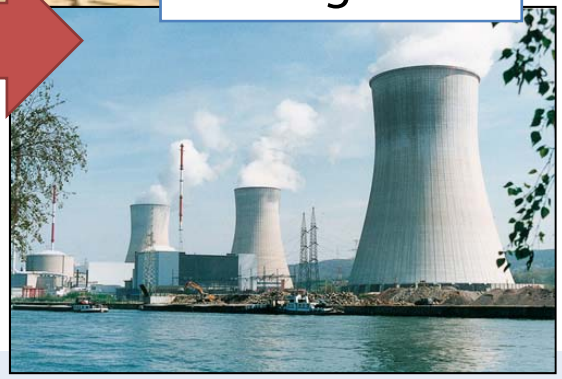
Basin's Designer Waters

ary Water

Landscape Irrigation

ified Water

Cooling tower



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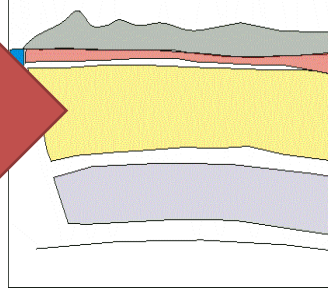
Barrier Wate



Reverse Osmosis: Barrier Water

4

Low Pressure

Reverse Osmosis: Single Pass

5

High Pressure Boi

RO: Double Pass

Financial Factors Impacting Reuse

- Capital Construction Costs
- Design Costs
- Operations and Maintenance
- Energy Usage
- Waste and residuals disposal

Costs are highly location specific

Cost Overview of Reuse and other Supply Alternatives

Supply Option	Cost ($/AF)
Direct Potable Reuse	$820-$2,000
Indirect Potable Reuse	$820-$2,000
Sea Water Desalination	$1,500-$2330
Brackish Groundwater Desalination	$930-$1290
Imported Water (e.g. State Water Project)	$850-$1,300
Non-Potable Reuse	$310-$1960
Water Use Efficiency, Conservation, and Use Restrictions	$465-$980

Adapted from WRRF-14-08 The Opportunities and Economics of Direct Potable Reuse

Secondary Financial Benefits

- Ensure Fit-for-purpose approach: the right water for the right application
  - Non-potable reuse using purple pipe
  - IPR, DPR
- Price of Reliability should be considered
- Put off need to expand potable water system
- Reuse is a predictable cost for planning purposes

Environmental Factors Impacting Reuse

Factor	Potential Impact
Reduce Wastewater Discharges	Water reuse has the potential to greatly reduce or eliminate wastewater discharges with an impact on pollution and nutrient loading in streams and rivers; reduced flow could be negative however
Brine Disposal	Some reuse applications result in large amounts of brine that must be disposed
GHG Emissions	Largely dependent on the energy intensity of the water supply option
Beneficial End use	Often improves water quality of receiving body (e.g. surface or groundwater)
Water Diversions	Reuse has the potential to reduce water imports from one region to another to help preserve local environments.
Climate Change Resiliency	Reuse can provide a *local* and *climate resilient* source of water capable of being used for a variety of purposes

Exact environmental impacts are largely dependent on the type water reuse activity and its attendant energy requirements as well as specific location

Energy Management & GHG Reduction

WRRF-CEC partnership with 5 projects that identify opportunities to reduce energy demand covering three areas:

1. Opportunities for new water sources in the energy industry
2. Optimizing water reuse and desalination systems
3. Using water reuse and desalination to prepare for climate change

WERF and WRF have knowledge areas on this topic

- WERF: 38 completed and 9 ongoing projects
  - Example: Energy Balance and Reduction Opportunities, Case Studies of Energy-Neutral Wastewater Facilities and Triple Bottom Line (TBL) Research Planning Support (ENER1C12)
- WRF: 32 projects & 3 case studies
  - Example: Toolbox for Water Utility Energy and Greenhouse Gas Emission Management-4224

Social Factors Impacting Reuse

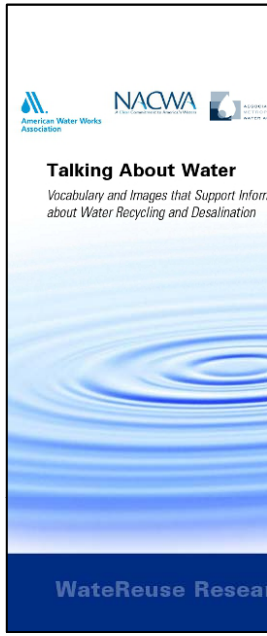
Factor	Potential Impact
Water Supply Reliability	Reuse can reduce the dependence on outside sources for water thereby creating greater certainty of future supplies
Local Economic Impact	Reliable water supplies can stimulate the local economy providing businesses with the assurance of water supplies for manufacturing or other activities
Sustainability 'prestige'	Businesses with sustainability goals are appealing to customers/public
Aesthetics	Recycled water can irrigate parks and other recreational facilities (lakes, fountains)
Quality of Life and Public Health	Environmental impacts from reuse or other water supply activities can influence public health. Additionally, increased recreational space is a quality of life issue

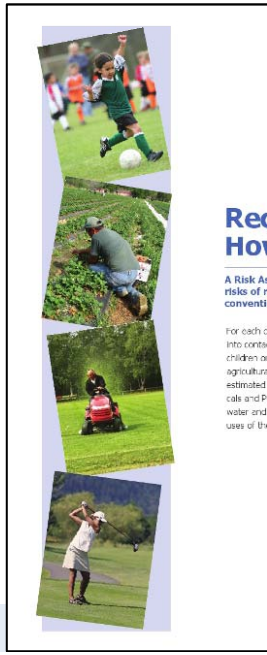
Public Perception

Public Perception – lessons learned through research

Why? An uninformed public can delay or even cancel a water reuse project

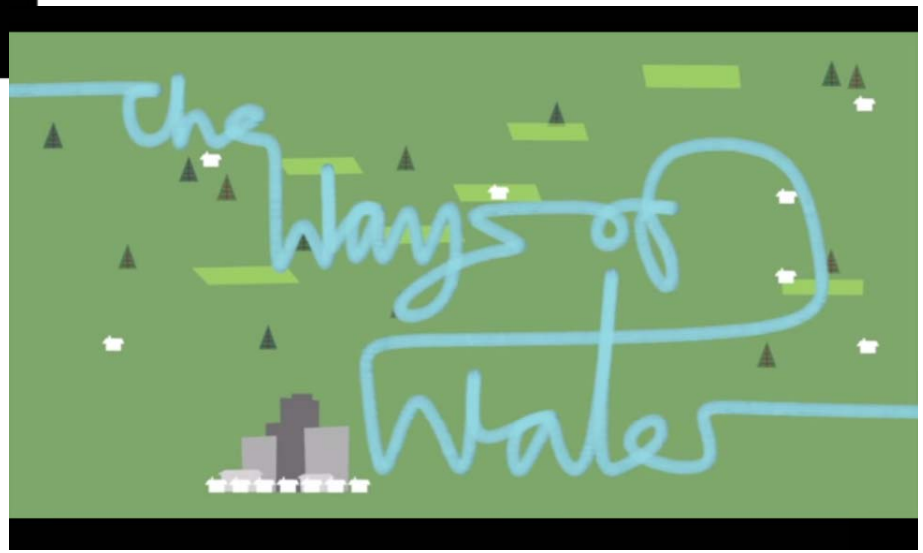
- The images and words used to communicate with the public can affect their acceptance of water reclamation and desalination projects
  - Interactive, web-based, visual glossary to help the water community communicate with the public (WRRF-07-03)
- Put risk in perspective
  - Outreach materials to explain it could take anywhere from a few years to many millions of years of exposure to non-potable recycled water to reach the same exposure to PPCPs that we get in a single day through routine activities (WRRF-09-07)
- Proactive communication
  - Context and Core Messages for CECs (WRF 4457)
- Public Acceptance Clearinghouse of Information (WRRF-12-08)

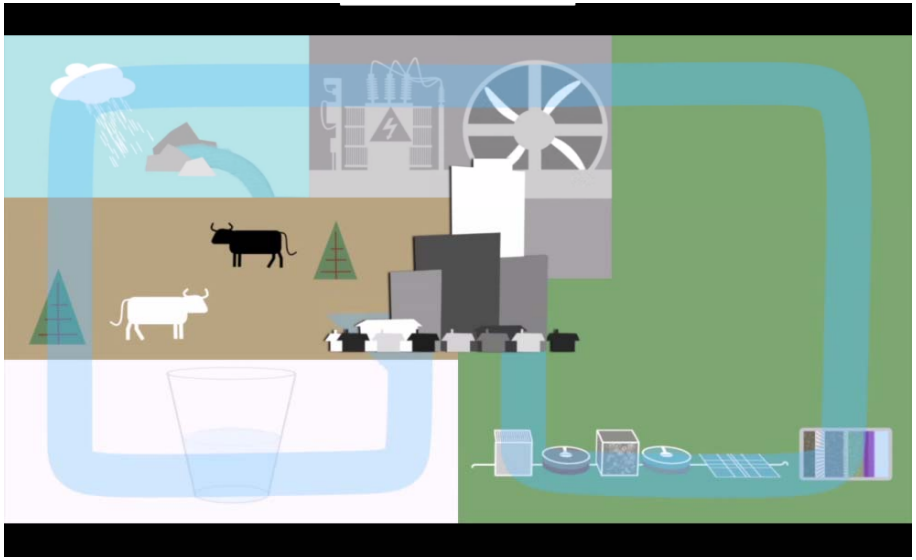




Public Perception – lessons learned through research

- Approaching and presenting reclaimed water in the context of the urban water cycle and with explanation of the fact that essentially all water on earth has been used before increases acceptance of drinking water reuse
  - Videos *Downstream* (WRRF-09-01) and *The Ways of Water* (WRRF-12-06) are available on athirstyplanet.com and YouTube





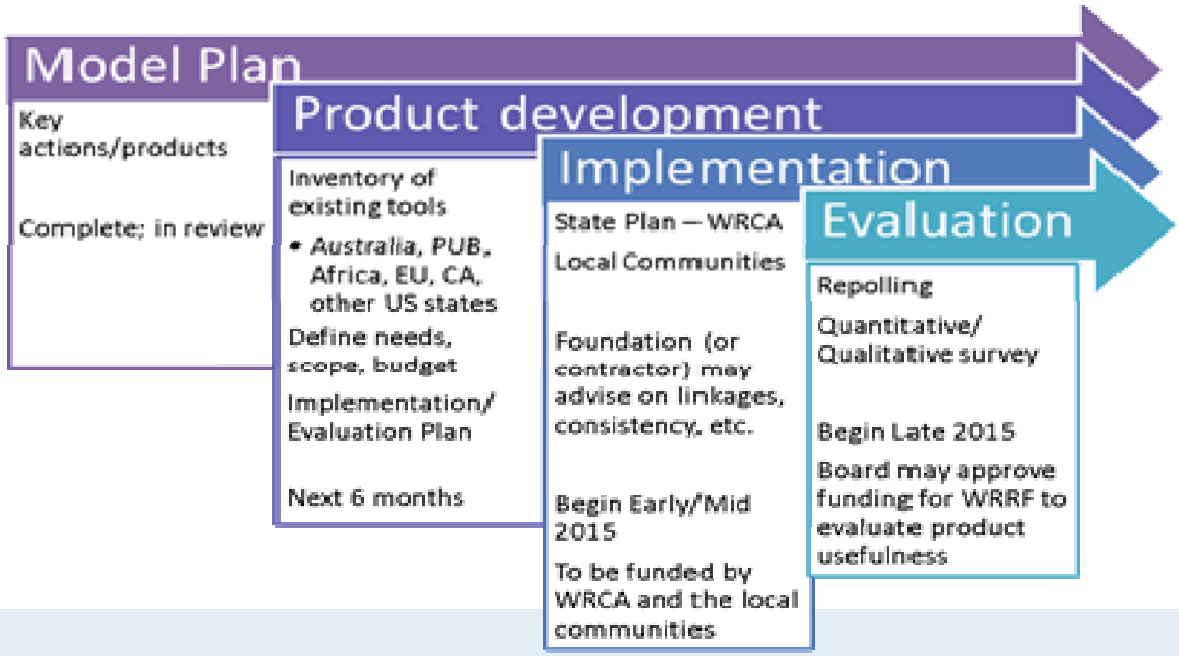
Public Perception – lessons learned through research

Model Public Communication Plan for Advancing DPR Acceptance, WRRF-13-02 (Mark Millan, Data Instincts)

- Using surveys and interviews, researchers investigated the general level of awareness of DPR and worked to understand how groups/audiences currently perceive DPR to identify what is needed to address their concerns (reliability, safety assurances).
- Model communication plans for San Diego and Santa Clara and statewide (CA) will be available in November

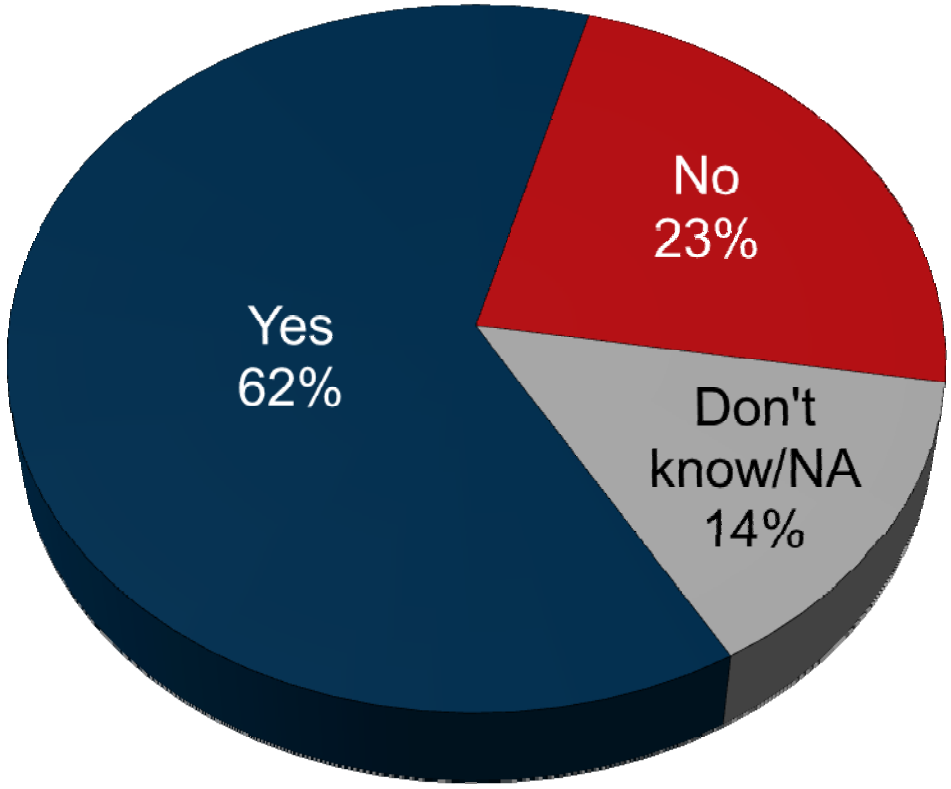
Phase II is underway

(workshop on November 18)



Voters are confident that it is *possible* to treat recycled water to drinking water quality standards....

Do you believe that it is possible to further treat recycled water used for irrigation to make the water pure and safe for drinking?



Q10.

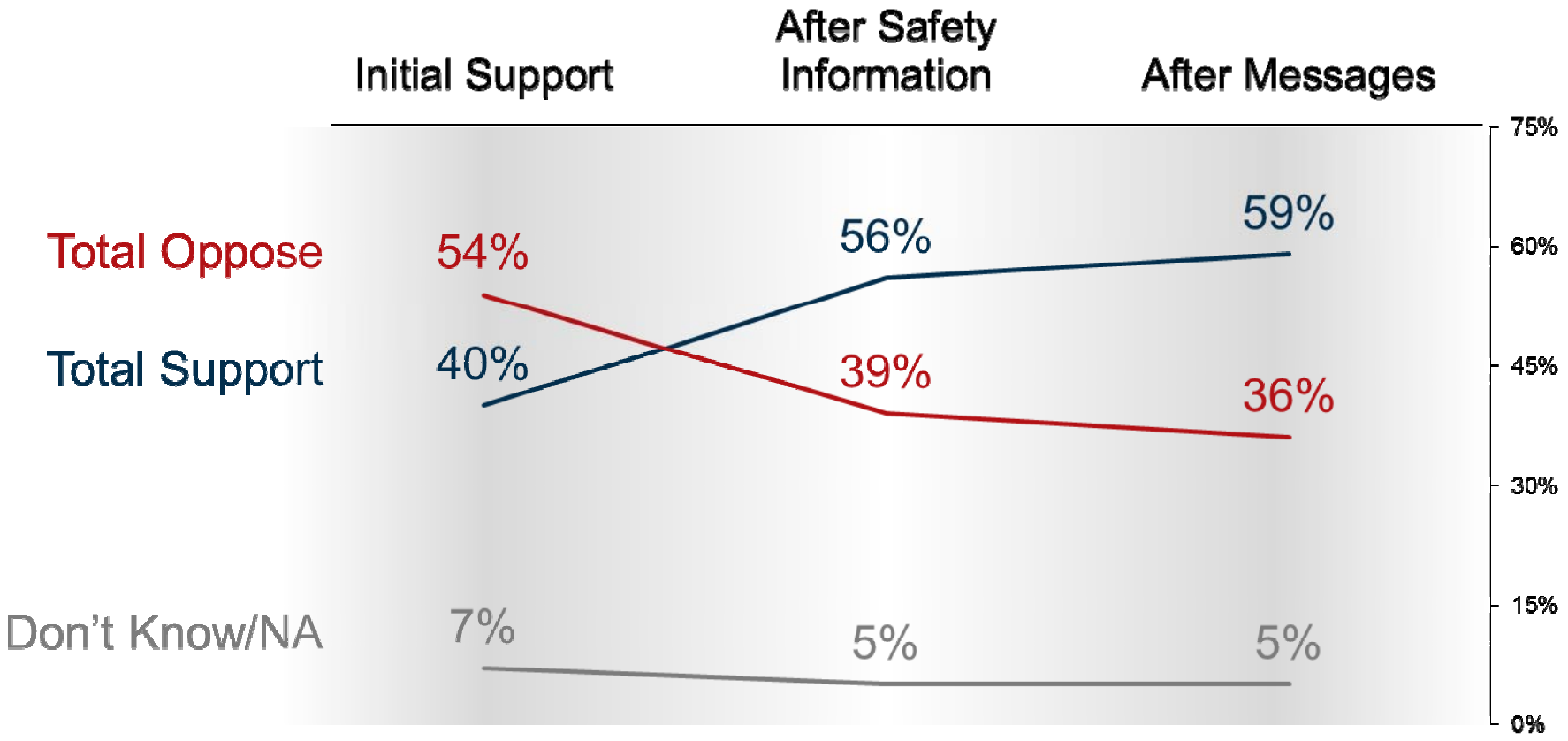
Focus group participants preferred "purified water" or "certified water" as descriptors.

(Participants Allowed to Select Up to Three From List)

DPR Names	Sunnyvale	San Diego	Total
Purified Water	13	14	***27***
Certified Water	10	12	***22***
Advanced Treated Water	6	5	***11***
Renewed Water	3	4	***7***
Recycled Drinking Water	3	3	***6***
Refreshed Water	4	1	***5***
New Water	1	2	***3***
Supplemented Natural Water	2	1	***3***
Cyclical Water	0	1	***1***
Blended Drinking Water	1	0	***1***
Reused Potable Water	0	1	***1***
Reclaimed Water	0	1	***1***
Reused Water	1	0	***1***
Renovated Water	0	1	***1***
Rescued Water	0	0	***0***

Though they are initially opposed, voters quickly become more comfortable with direct potable reuse after information about safety.

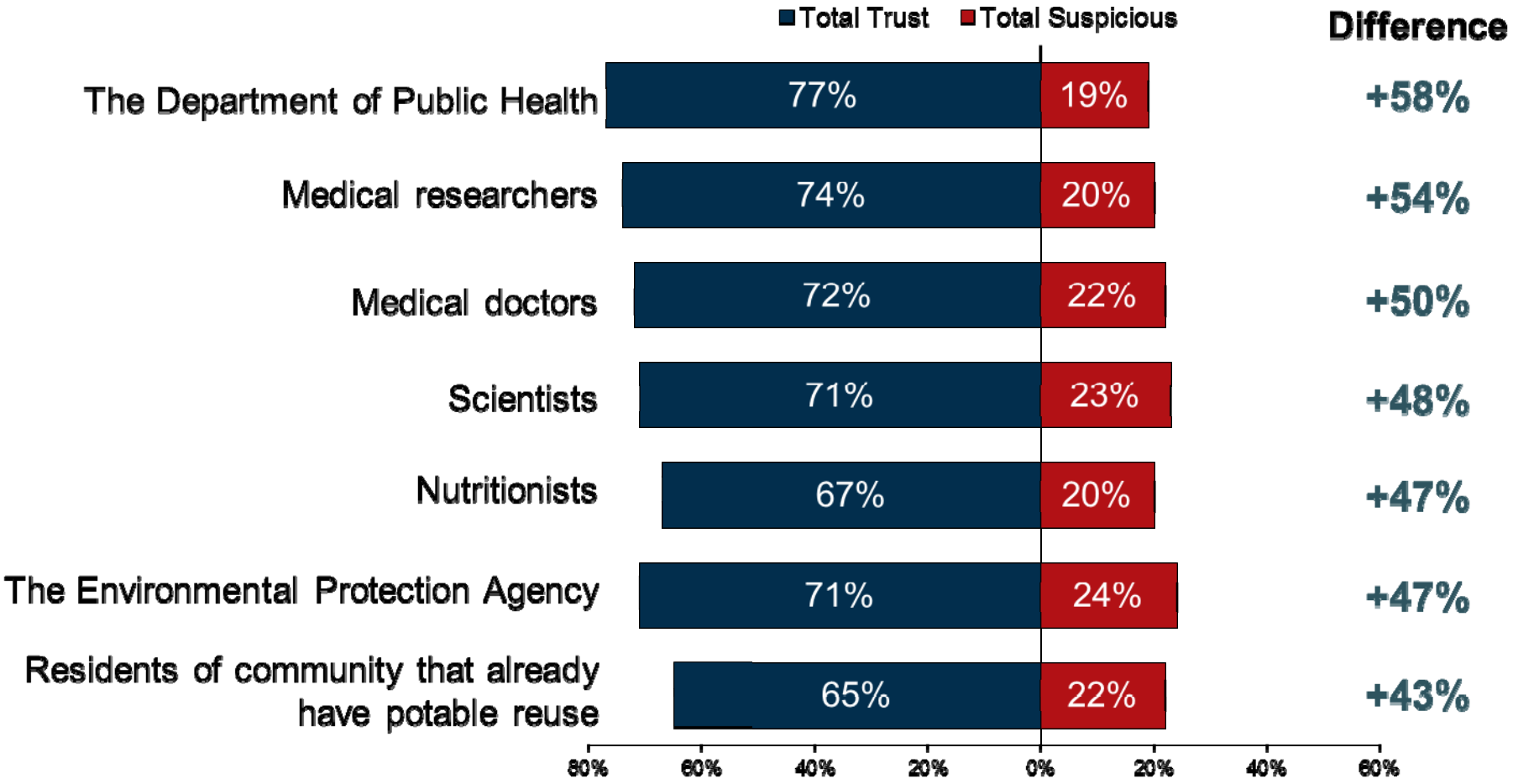
Do you support or oppose direct reuse of recycled water in your community for all household purposes, including drinking?



Q13 Total/Q18/Q20.

Top messengers are generally those with scientific expertise.

I am going to read you a list of people and organizations that may provide information about recycled water. Please tell me if you would generally trust that person's or organization's opinion on this issue, or if you would be suspicious of it.



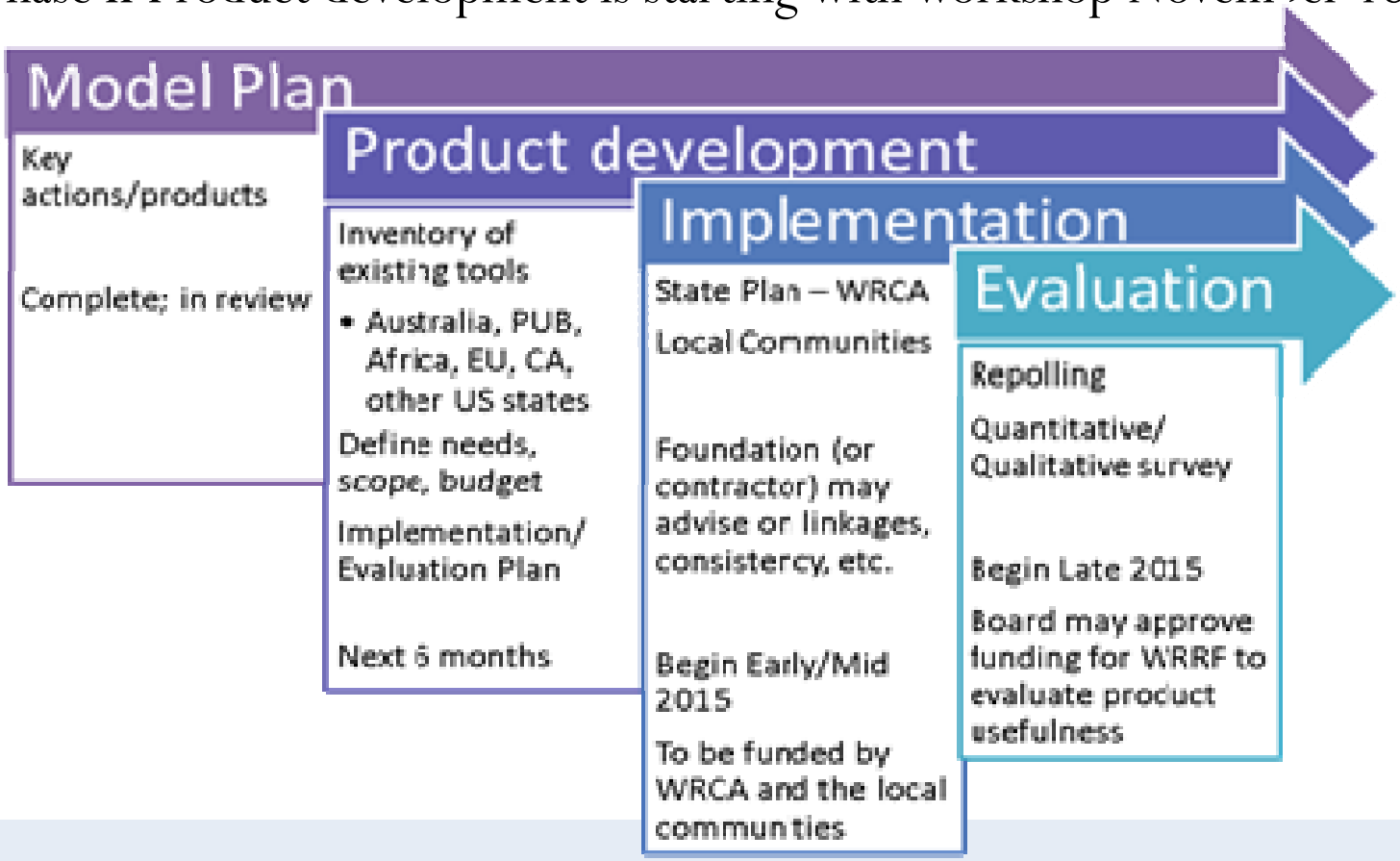
Q22. ^Not Part of Split Sample

Research Needs

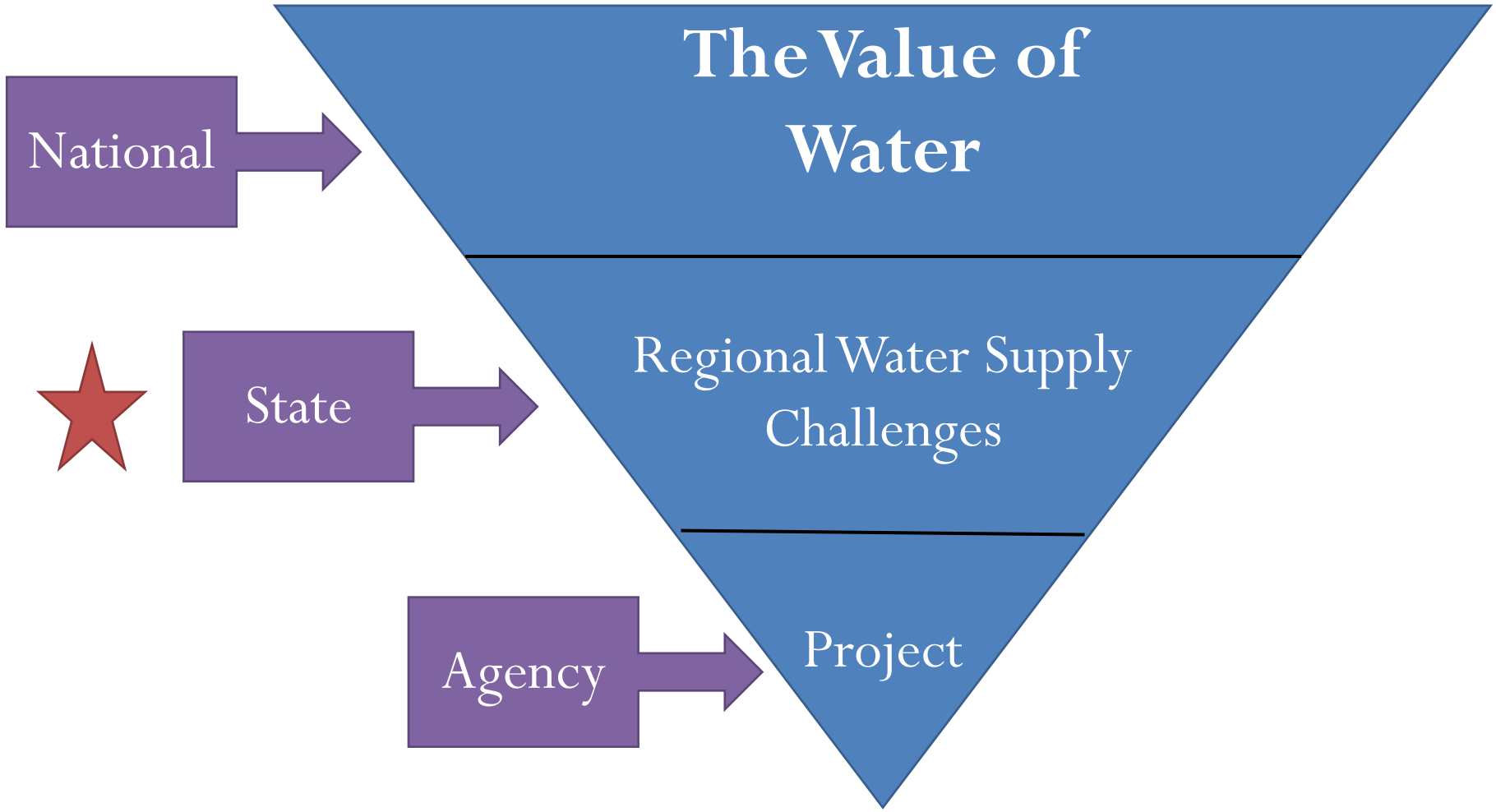
Public Perception

Communication strategy on local and state level to better engage all stakeholders

- WRRF-13-02 provides this framework in California
- Phase II Product development is starting with workshop November 18



Water Education Campaign



Triple Bottom Line Research Needs

- Full evaluation to quantify (place a *dollar value* on) the non-monetary *environmental* and *social impacts* of water reuse compared to traditional sources of water.
- Full accounting of *energy use* and *GHG emissions* associated with water reuse, along with traditional water sources.
- *Low-energy treatment options* to decrease the cost and carbon footprint of water reuse.
- Integrating the need for *climate change adaptation* into a water reuse strategy.

ank you!

uestions?