

Governing California's Urban Water in the 21st Century

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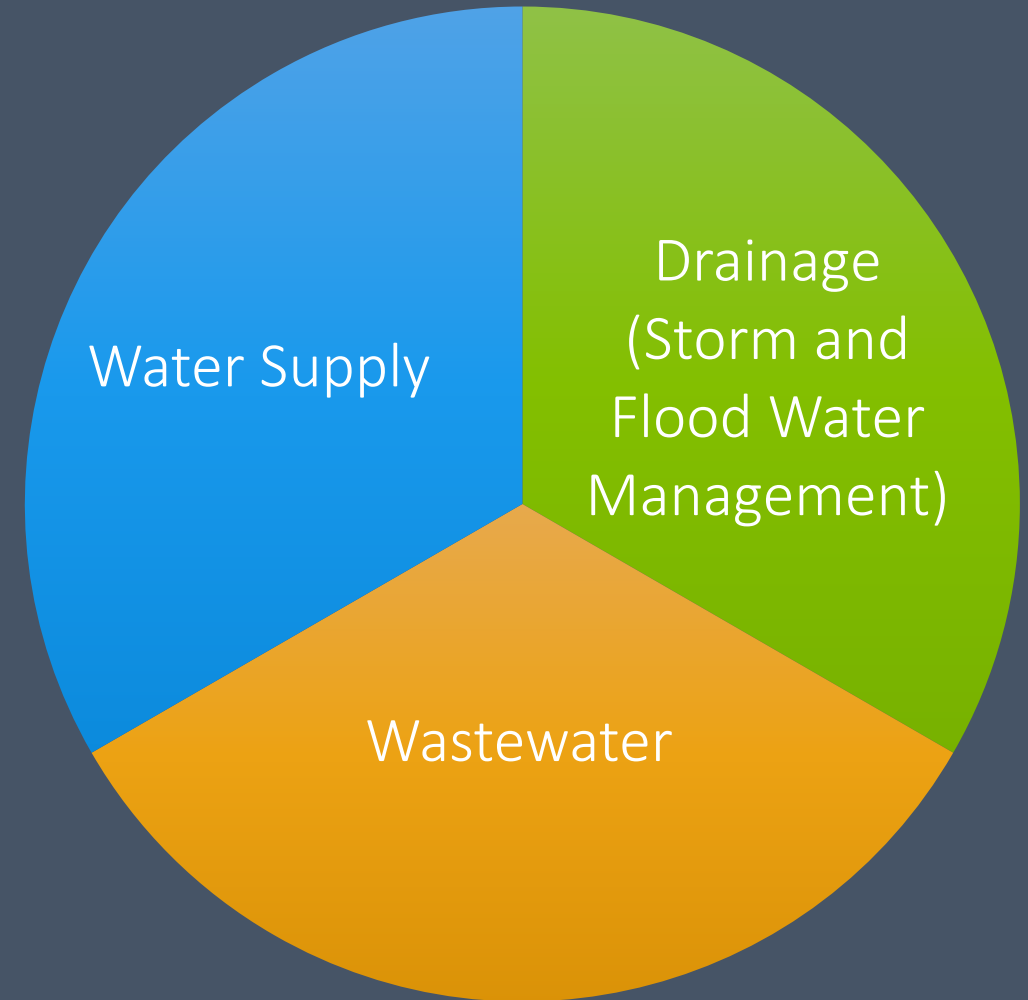
Stanford University

California Water Boards Science Symposium:
Adapting in the Face of Disruptive Landscape Change
June 20-21, 2018

Early 20th Century Urban Water Use Cycle

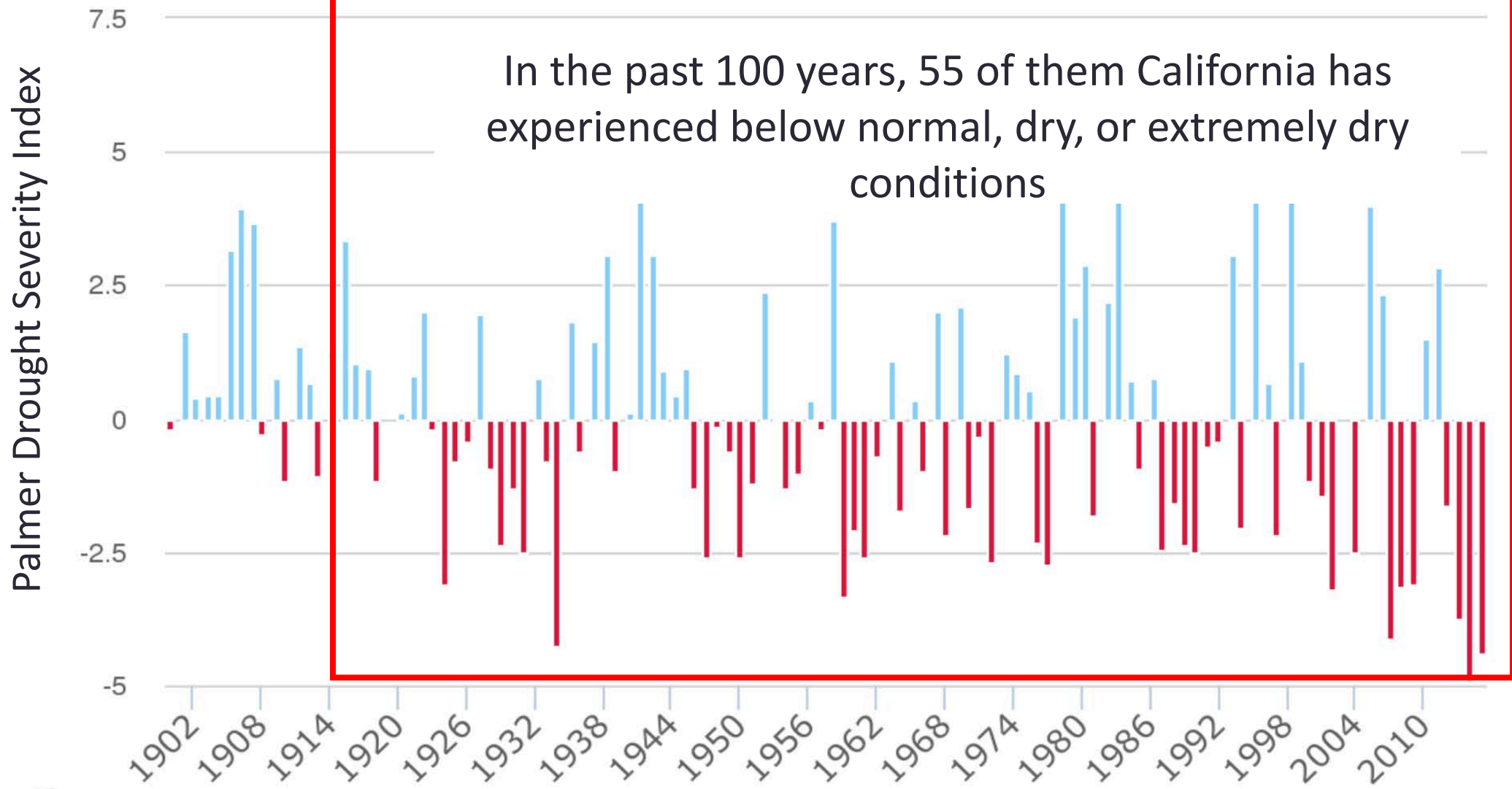
Principles of Urban Water Cycle:

- Enable growth and economic development
- Build large scale centralized assets
- Deliver clean potable water
- Manage Wastewater
- Drain stormwater and floodwater
- Design a *once through system*
- Assume *abundance*
- Develop a *top-down governance structure*



History of Droughts in California

Source: West Wide Drought Tracker



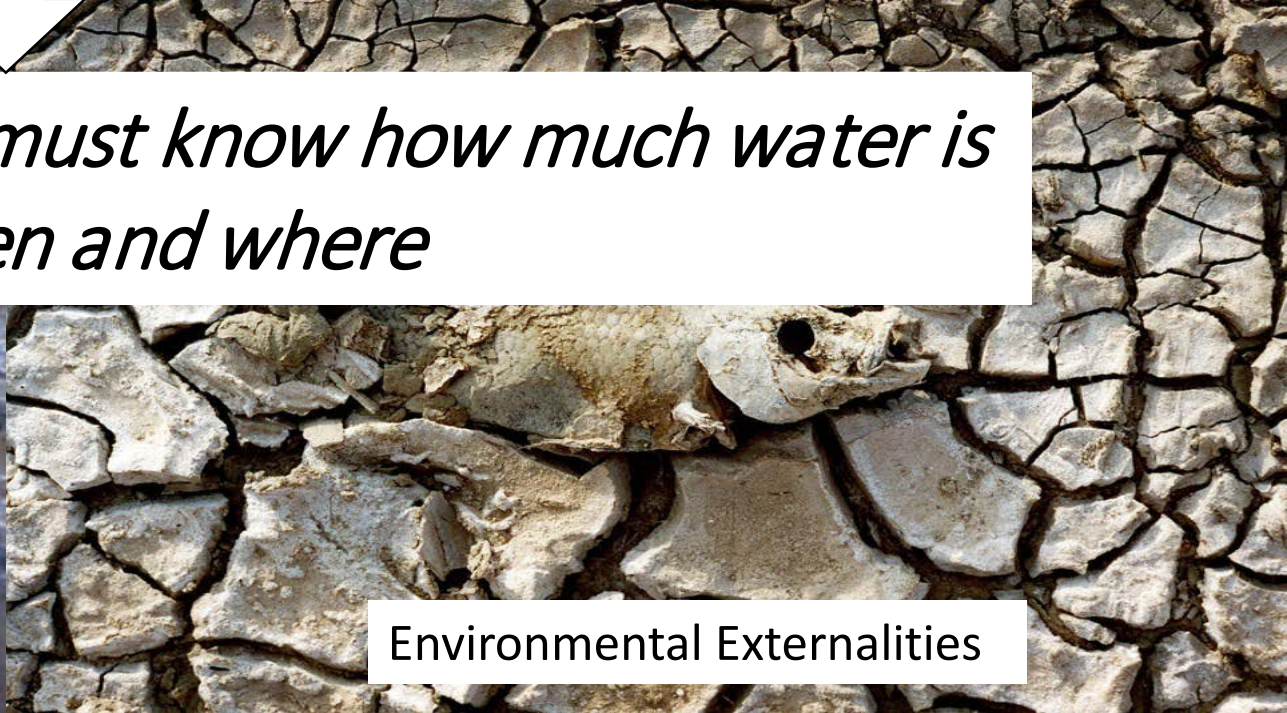



Climate Change



Urbanization

A changing urban water cycle requires new approaches to urban water management



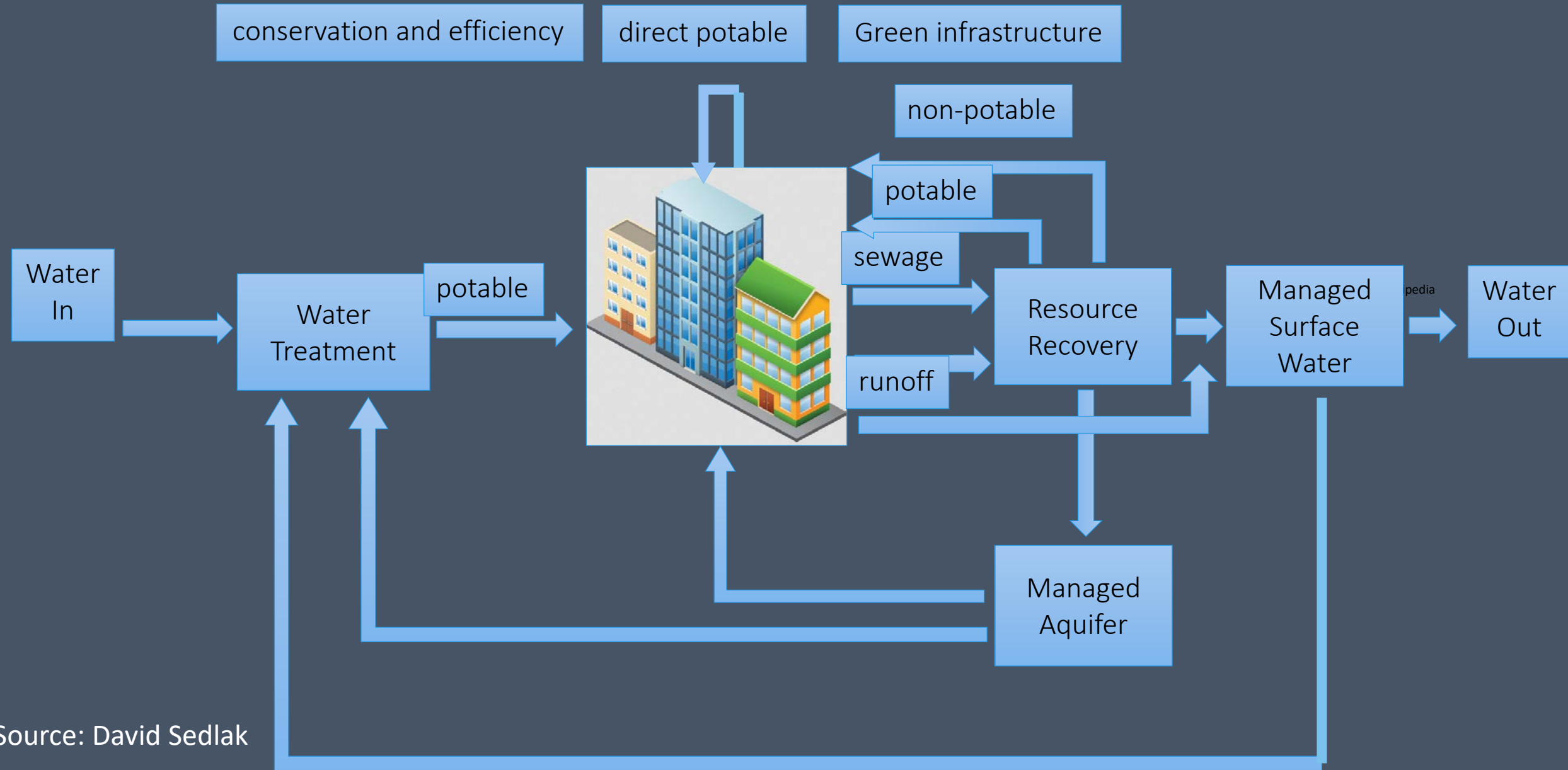
To reinvent our systems, we must know how much water is needed when and where

Aging Infrastructure

Environmental Externalities

The Paradigm Shift

21st Century Urban Water Use Cycle



Distributed Water Solutions

- Flexibility
- Resiliency
- Reliability





Centralized

Decentralized

Hybrid Infrastructure

Paradigm Shift in the Water Sector

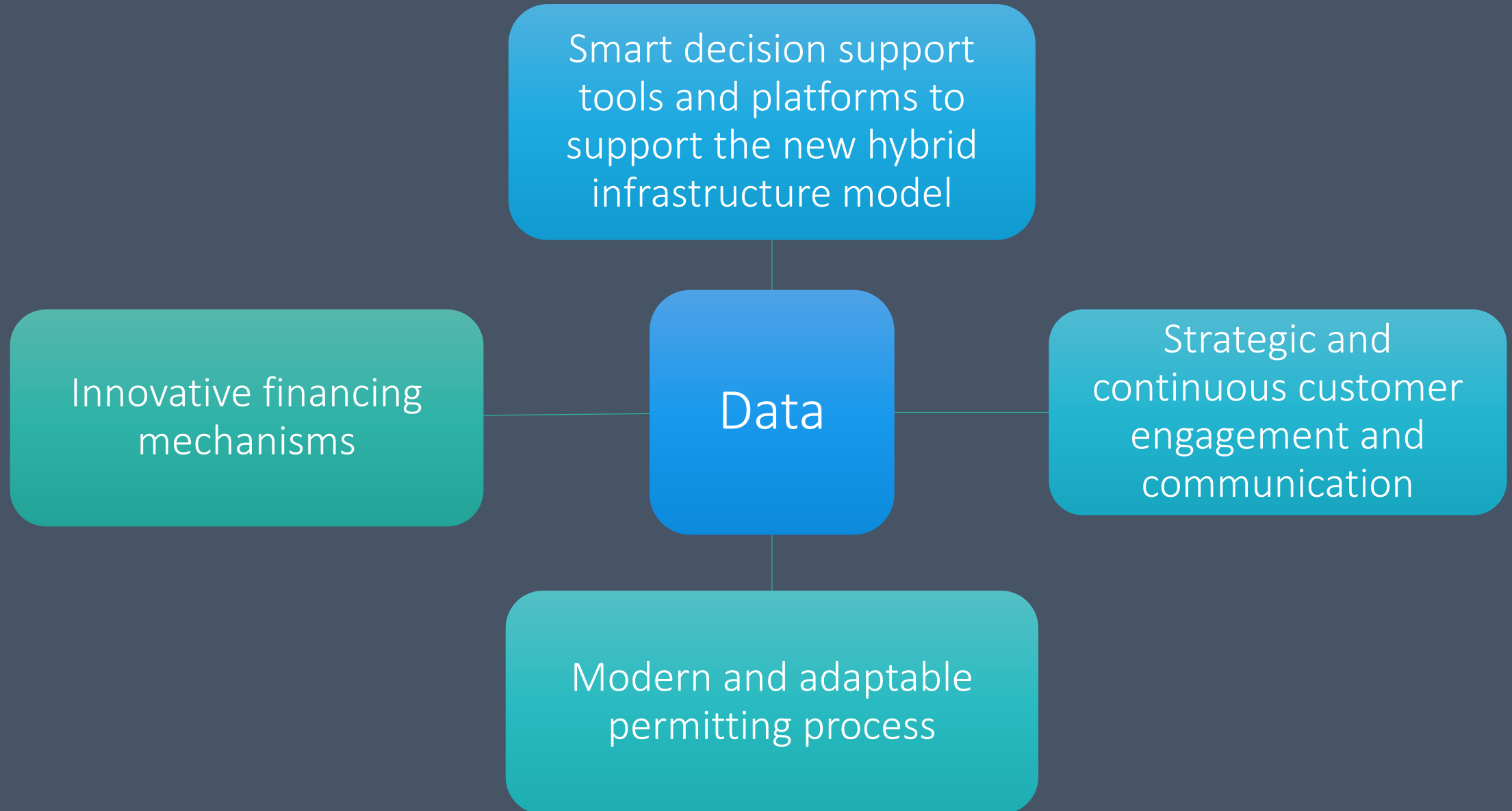
Diversify supply portfolios and incorporate innovative solutions

Traditional top-down management strategies are no longer appropriate

Customer behavior is changing, end-users are playing a more vital role

Role of utilities is shifting both within the water sector and with their customers

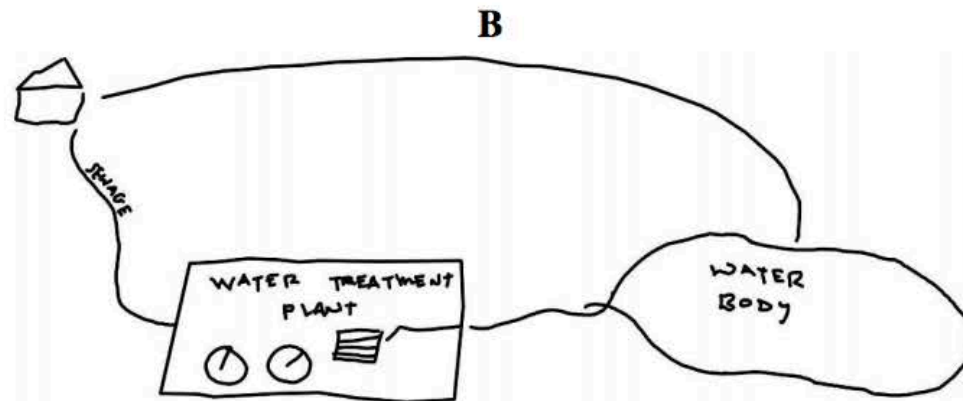
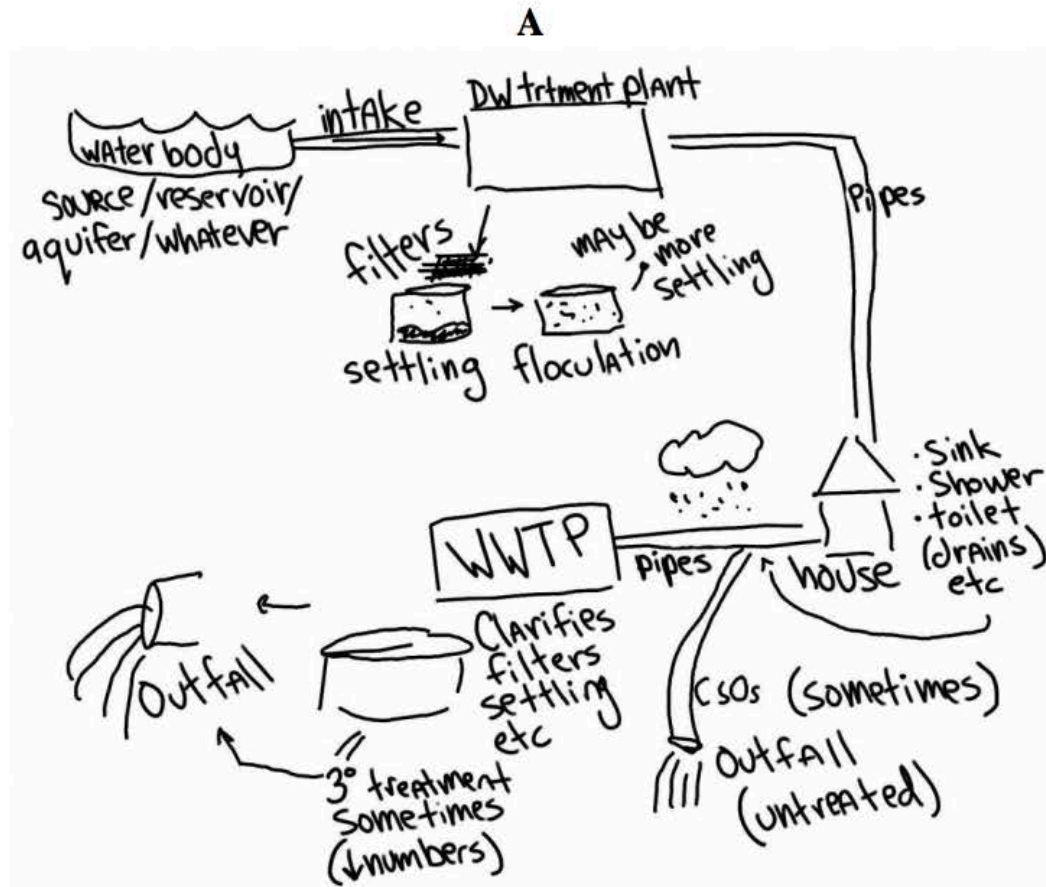
A New Governance Regime for the Evolving Urban Water Infrastructure



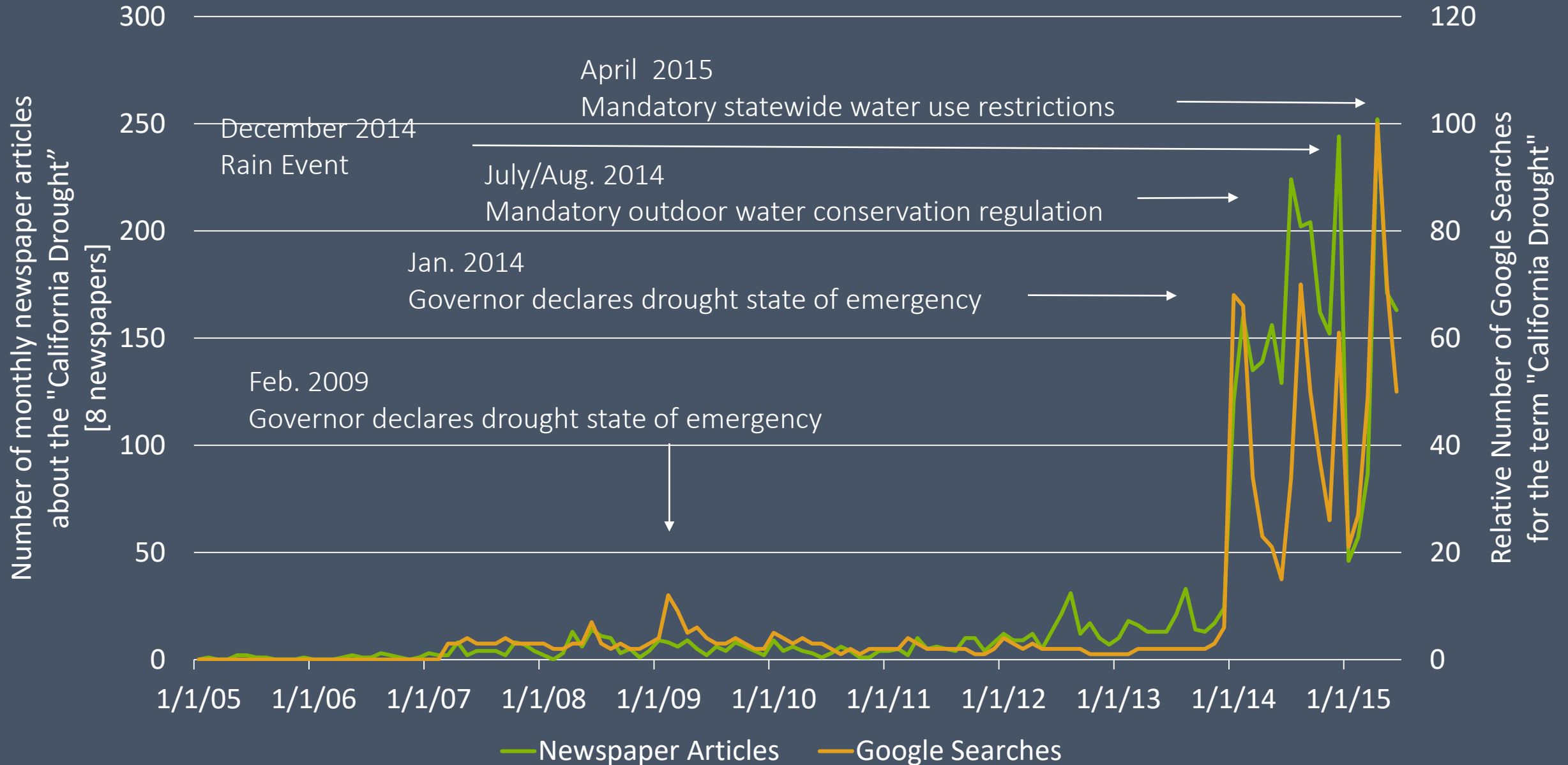


Communication

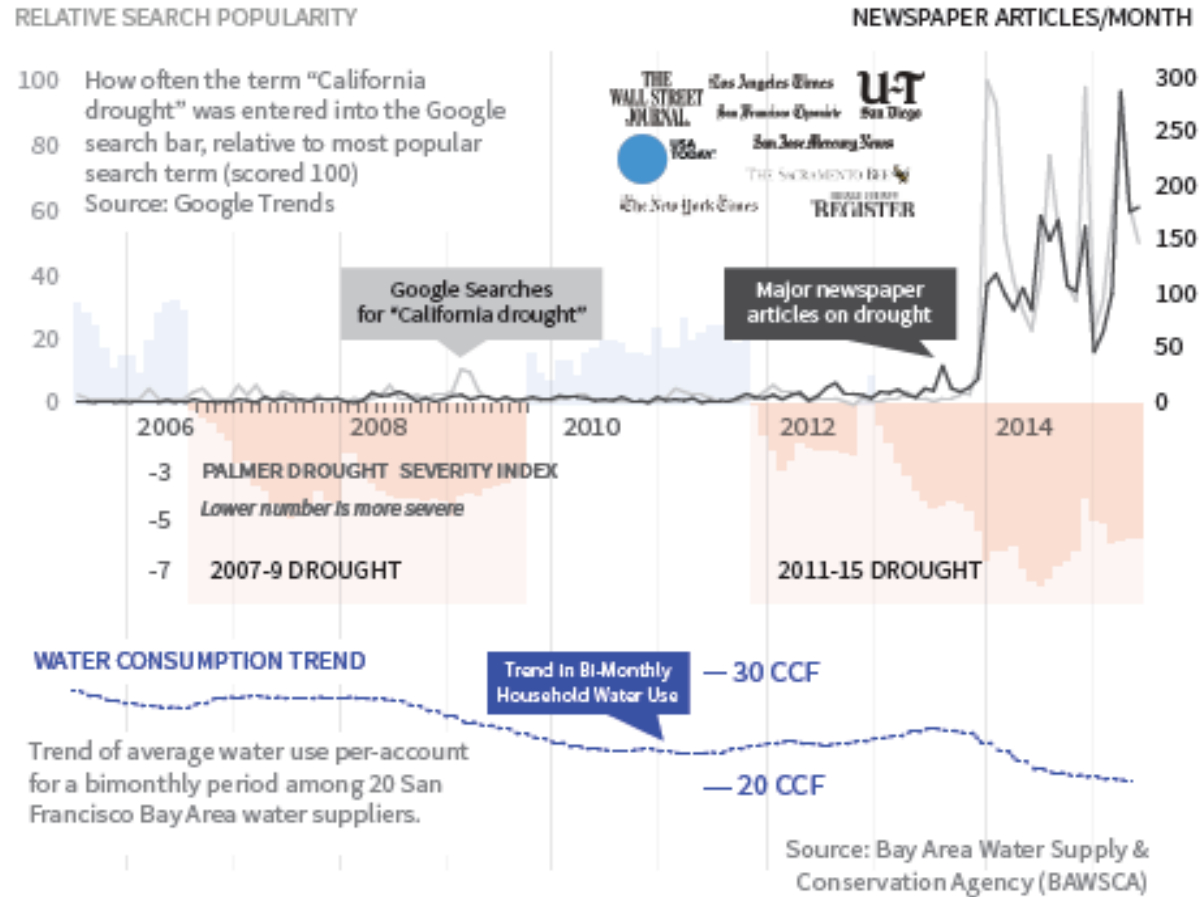
Perceptions of Water Systems



News Media Coverage and Public Interest



Looking at Two Droughts, Models Suggest That News Media Coverage Is a Driver of Water Conservation



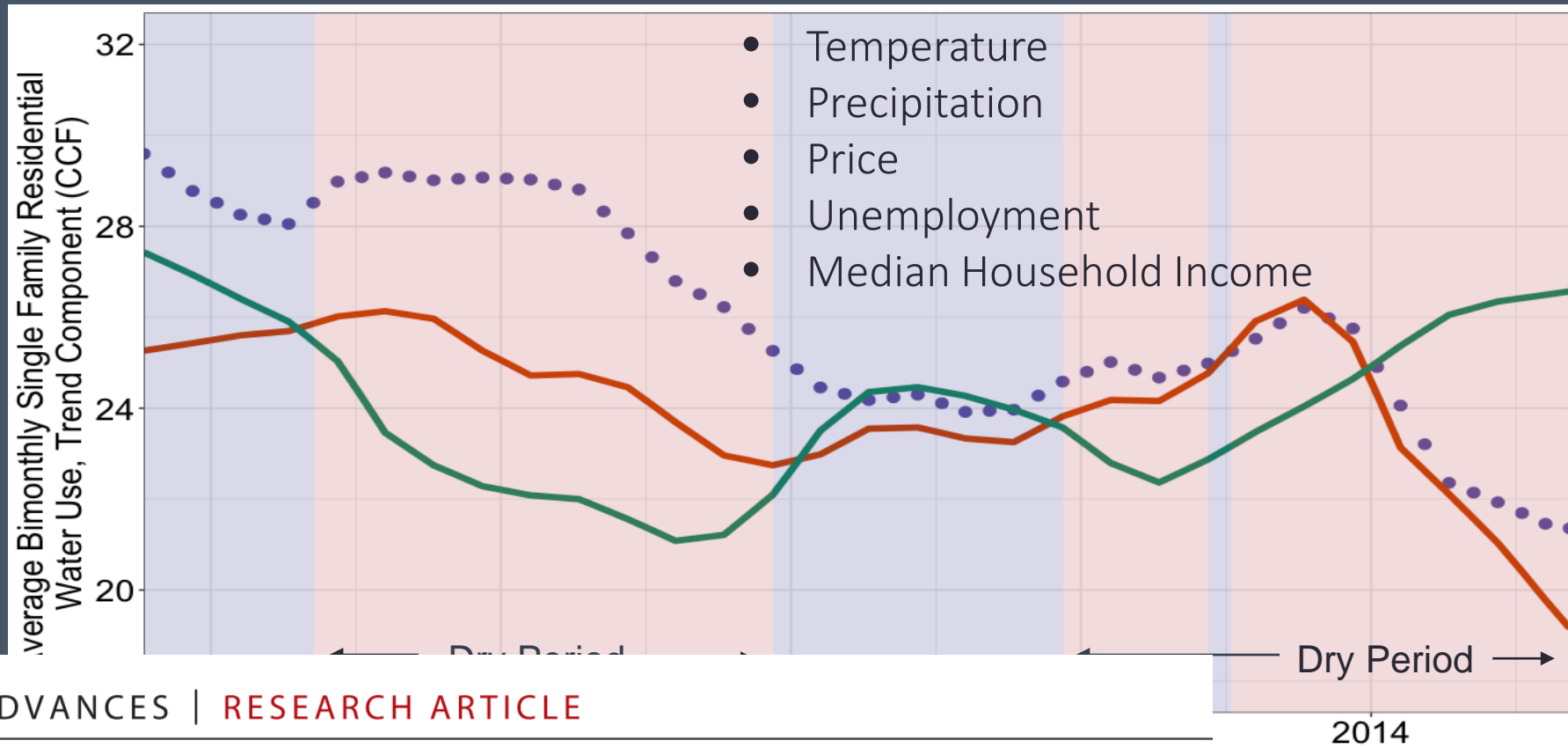
OTHER VARIABLES IN THE MODELS, NOT SHOWN

- Temperature
- Precipitation
- Median household Income
- Water Price
- Unemployment Rate

Research Paper: K. J. Quesnel, N. K. Ajami, Changes in water consumption linked to heavy news media coverage of extreme climatic events. *Sci. Adv.* 3, e1700784 (2017).

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A counterfactual scenario shows that media has a significant impact:



SCIENCE ADVANCES | RESEARCH ARTICLE

ENVIRONMENTAL STUDIES

Changes in water consumption linked to heavy news media coverage of extreme climatic events

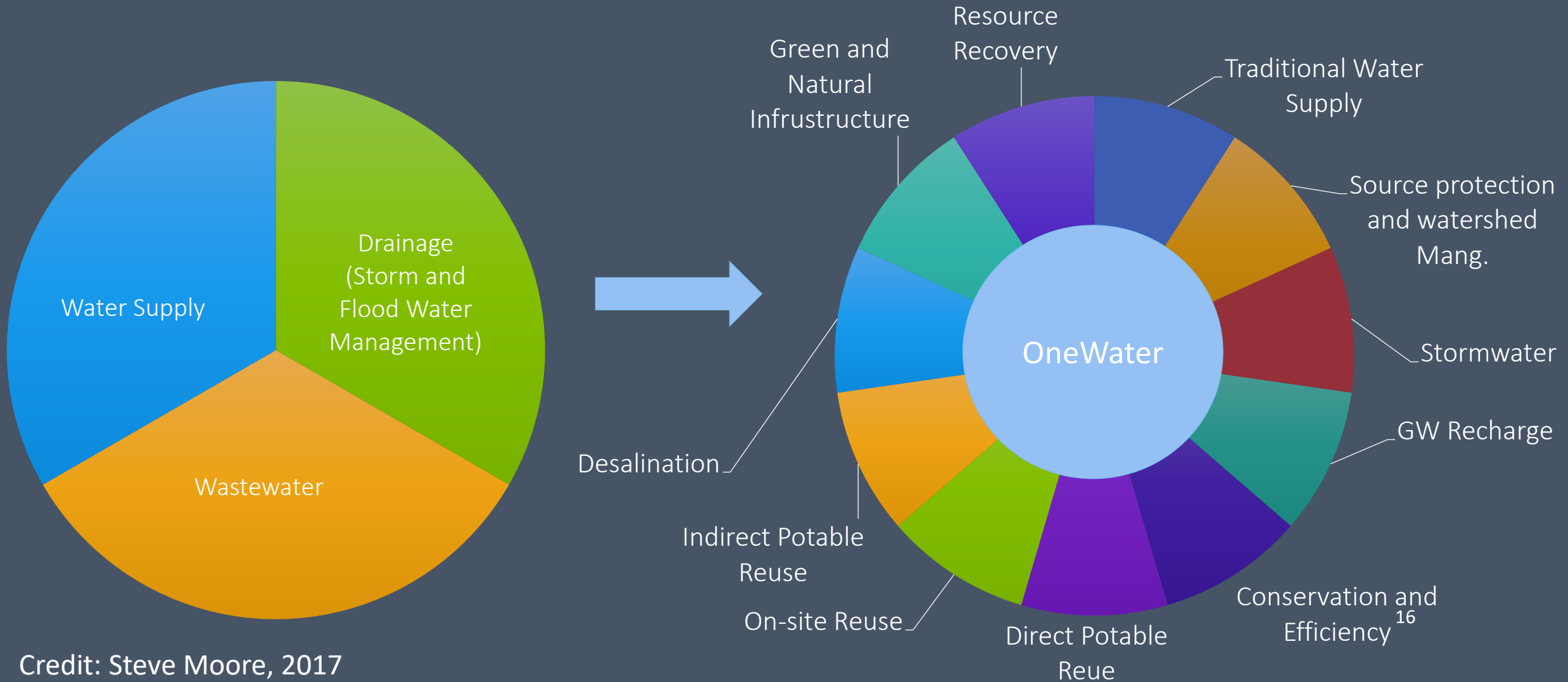
Kimberly J. Quesnel^{1,2} and Newsha K. Ajami^{2,3*}

media



Governance

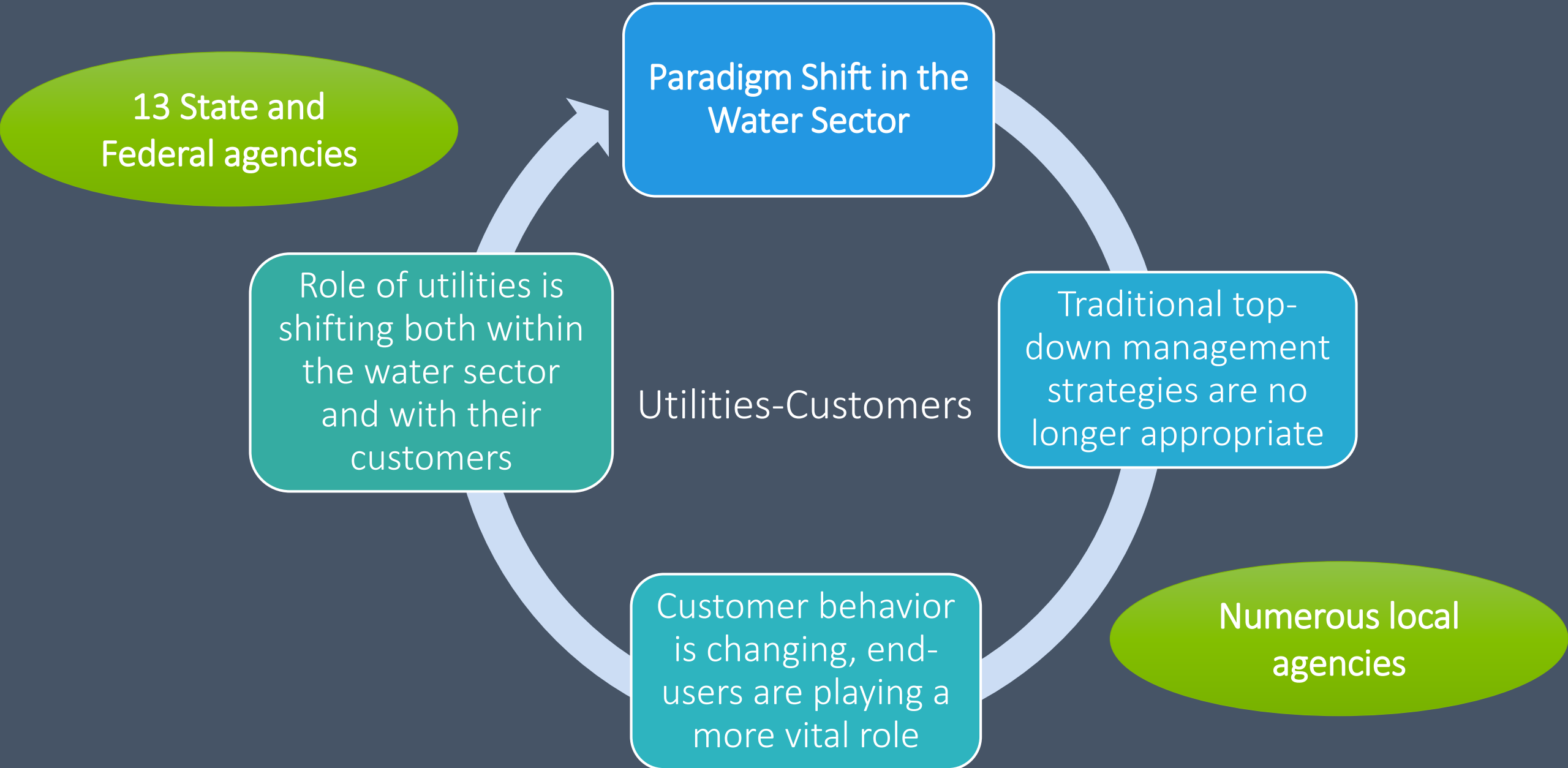
Regulatory and Institutional Fragmentation

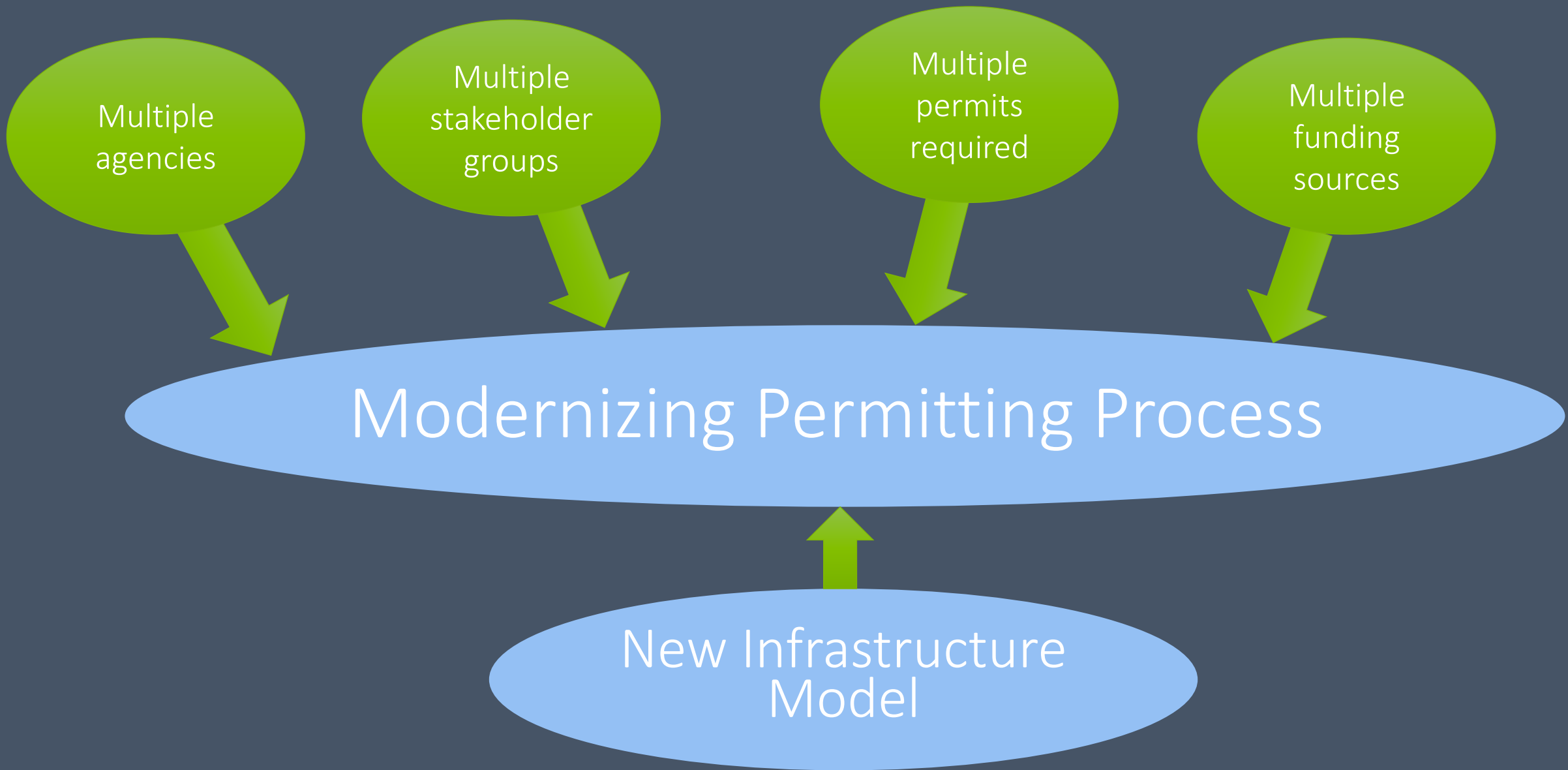


Credit: Steve Moore, 2017



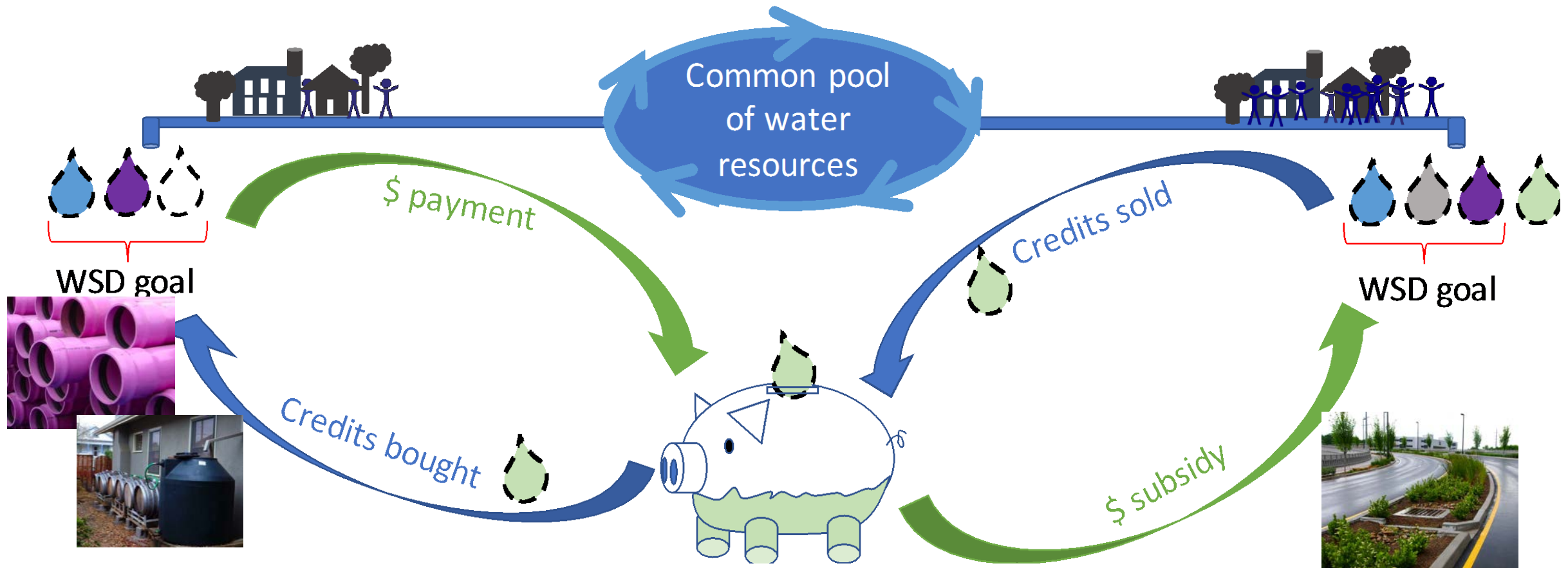
How is top-down fragmented management working for you?





Smart water trading platforms

- To enable regional collaboration and partnership to meet Conservation or Water Supply Diversification targets:





Finance



Regional Partnership and cross sectors co-operation

Regional Water Portfolio Diversification



Increase access to capital



Increase regional resiliency

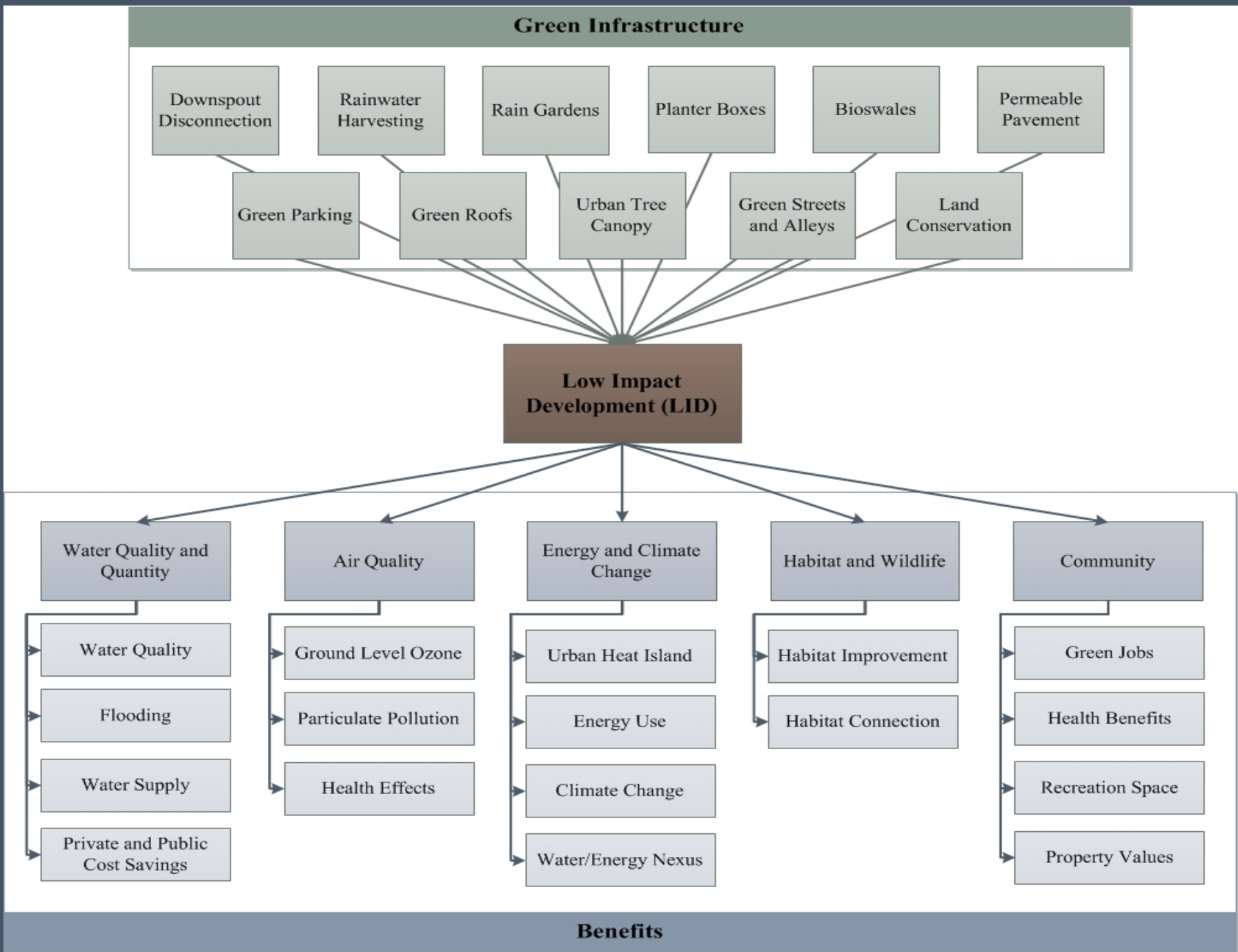
Reduce risk



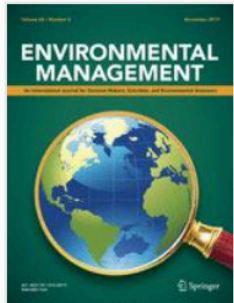
Green Infrastructure



Gordon, Quesnel, Abs, and Ajami, 2018. "A Case-Study Based Conceptual Model for Multi-Sector Green Infrastructure Performance Assessment", Journal of Environmental Management.



Crowdsourcing and Peer to Peer Learning Platforms: Living Map of Innovative Financing



[Environmental Management](#)

November 2017, Volume 60, [Issue 5](#), pp 867–881 | [Cite as](#)

Accelerating the Integration of Distributed Water Solutions: A Conceptual Financing Model from the Electricity Sector

Authors

[Authors and affiliations](#)

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Living Map of Innovative Water Financing Mechanisms in the United States

by Newsha Ajami (newsha@stanford.edu), Thomas Ng, Kim Quesnel, and Robin Abs



RiverSmart Program (Washington, D.C.)

Financing Mechanisms:

- Incentives
- Rebates
- Grants
- End-user Fees

Over the past decade, District’s Department of Energy & Environment (DOEE) implemented a suite of programs to reduce stormwater runoff from polluting Chesapeake Bay and the city’s waterways. Together, the programs



RiverSmart Program
(Washington, D.C.)



Stormwater Retention
Credits Trading Program



Green Bond
(San Francisco, CA)



Reverse Auction
(Cincinnati, Ohio)



Green City, Clean Waters
(Philadelphia, PA)



Environmental Impact Bond
(Washington, D.C.)



Forest Resilience Bond
(Western US)



Property / Ener

We still have a long way to go!

SMART CITY IN A BOX

SJ has developed a set of apps based on the four pillars of a Smart City - Sustainability, Efficiency, People and Security. These apps can be used independently or in conjunction with other apps for a seamless monitoring and management.

SUSTAINABILITY



ENERGY MANAGEMENT
Gathering energy usage data through meters in buildings to advise clients how to mitigate the energy usage.



WATER MANAGEMENT
Detect water quality by using camera analytics to examine marine life in water.



CLIMATE CHANGE AND FLOOD MODELLING
Tool that allow users to model flooding and climate change, particularly in cities that are in a conceptual stage.



SMART LIGHTING
Sensors and controllers in light fittings that allow light to dim if no presence is detected, saving energy and expenditure.

EFFICIENCY



PREDICTIVE LIFT MAINTENANCE
Enables the analysis of data received from sensors installed in lifts to predict breakdowns.



TRAFFIC MONITORING
Cameras with video analytics installed at highways to detect traffic jams, accidents and other traffic misconduct.

PEOPLE



ITOWN
A mobile app allowing users to conveniently take pictures of defects and submit feedback to city councils.



SMART HOME
A system that can control both locally and remotely, the air-con and lighting curtain of home.



ELDERLY MONITORING
Installation of sensors in homes to detect the well-being of elderly persons and their movements.



SMART TOILET
Sensors that detect if the toilet is wet or has run out of toilet paper, enabling the deployment of cleaners based on need rather than scheduled cleaning.



FIRE & SMOKE DETECTION
Cameras and video analytics that detect fire and smoke.



FACIAL RECOGNITION
Cameras and laptops with stored data used to identify blacklisted individuals.

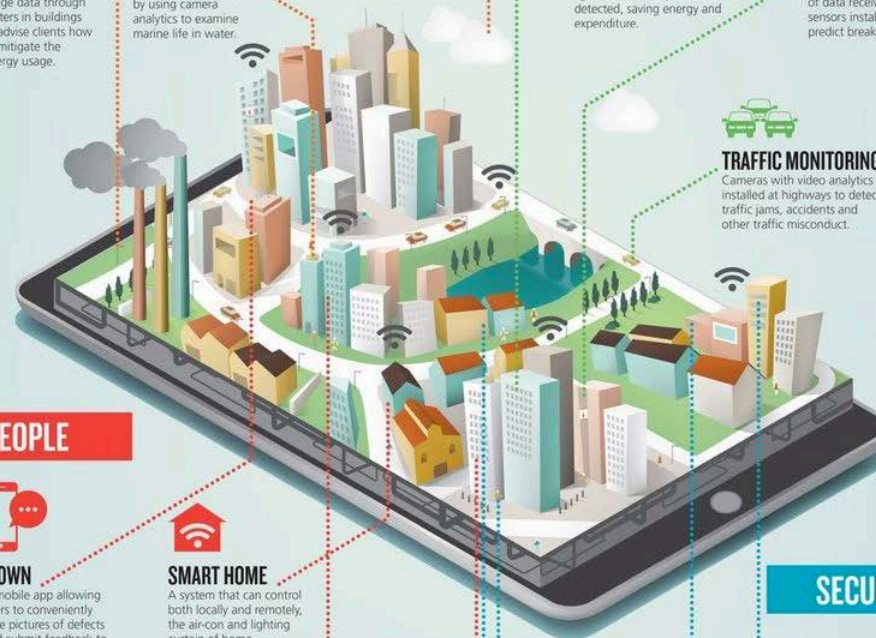
SECURITY



SMART CCTV
Usage of cameras and video analytics to facilitate people-counting, illegal intrusion, objects left unattended and vehicle plate recognition.



BEHAVIOUR ANALYTICS
Cameras that detect persons who may be drowning in a pool.



Data and Smart Systems

Engage end-users and customers in more active way (revisit top-down water supply management)

Develop smart decision support tools and platforms to support the new hybrid infrastructure model

Overcome fragmentation and modernize permitting process

Enact policies and economic forces to drive change (Portfolio standards, demand-side management and pricing)

Establish more innovative funding solution (Green banks, impact investment, on-bill financing and net-metering)

"Thousands have lived without love, not one without water."

W. H. Auden

Thank you

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