

# Enhancing Regional Water Sustainability through Virtual Water Trading

---

Newsha Ajami

Director of Urban Water Policy

Senior Research Scholar

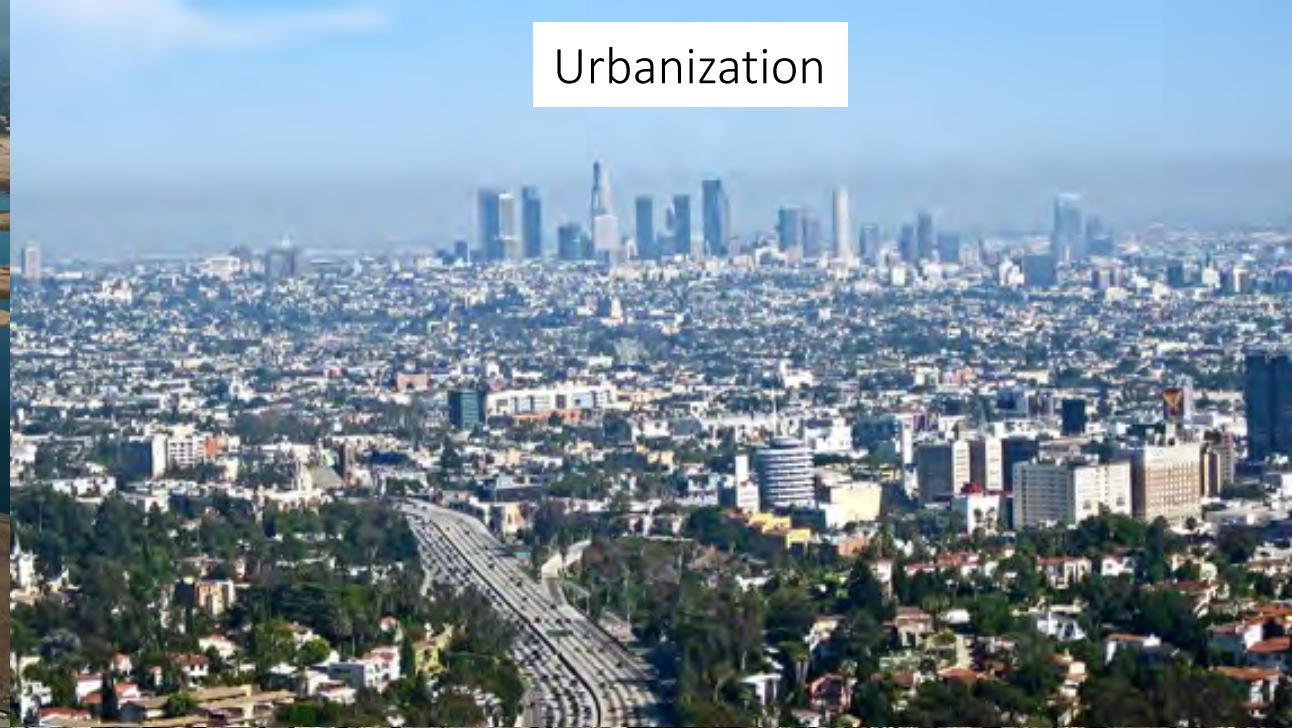
Stanford University



Climate Change



Urbanization



Aging Infrastructure



Environmental Externalities





Need for innovative management approaches and governance strategies to enable water sector's equitable and climate resilient transition

# The water sector could learn from other sectors that have successfully implemented change

Tax and subsidy (e.g. ecosystem services)



Baseline-and-credit  
(e.g. water quality)

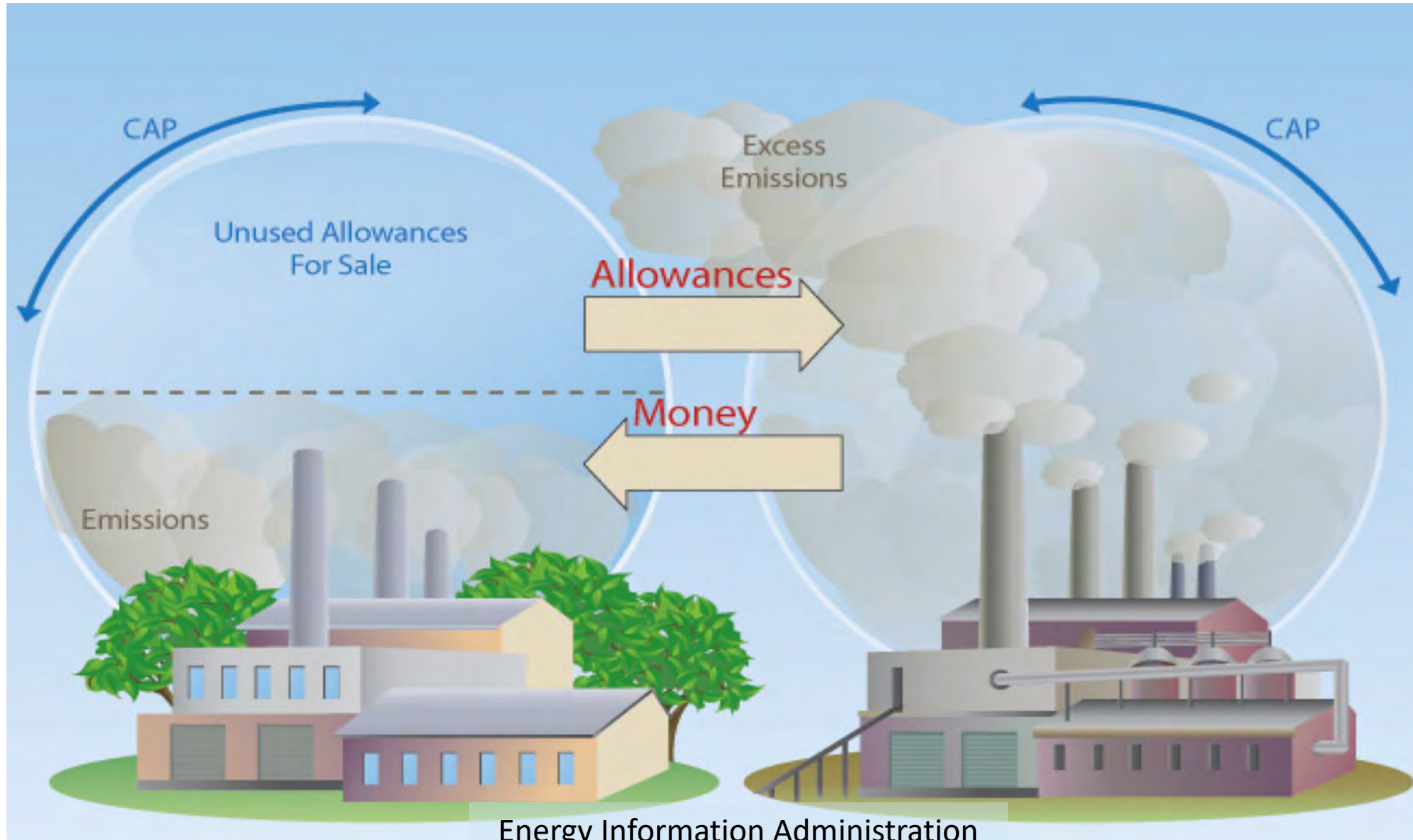


Portfolio standards (e.g. renewable energy)

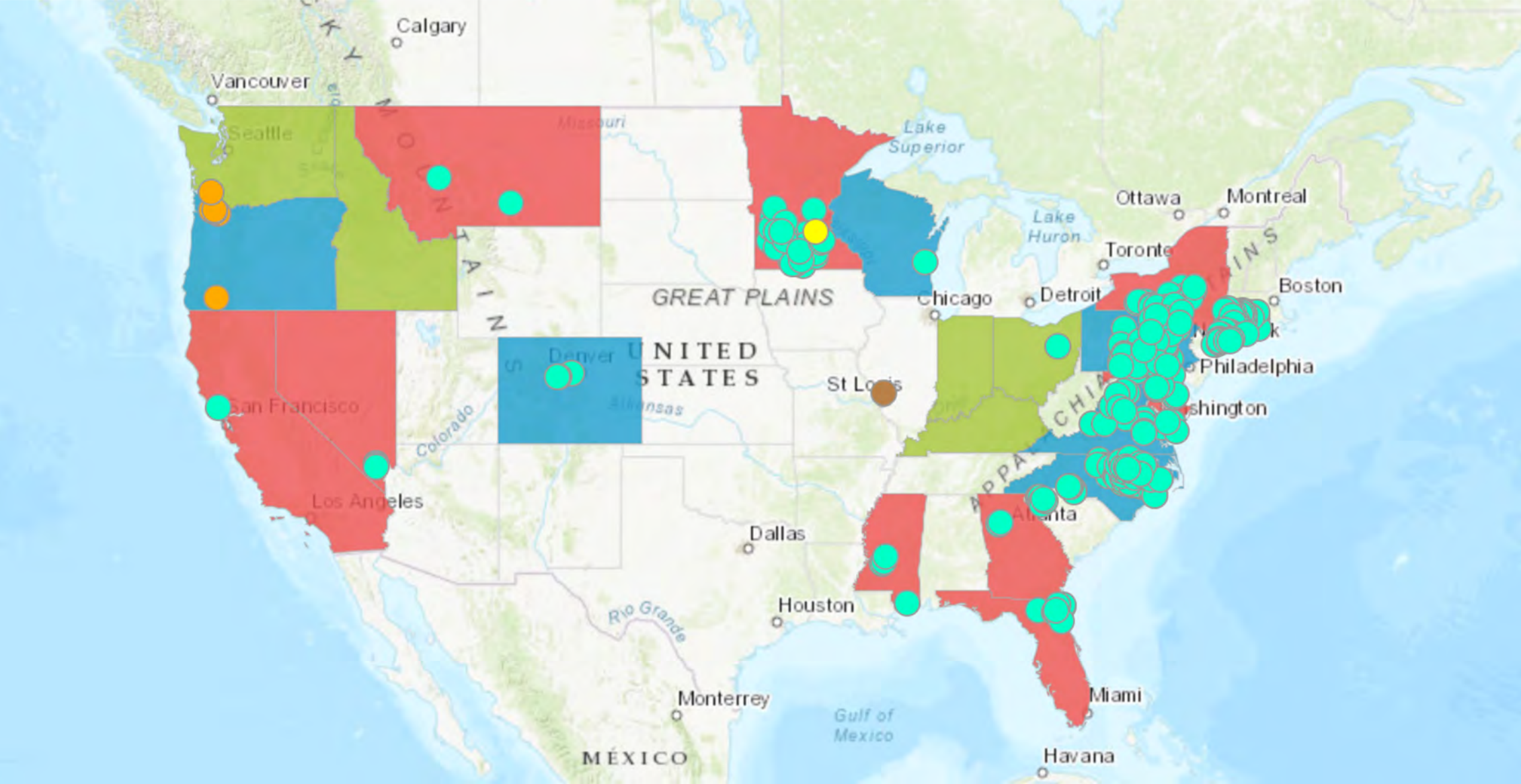
Cap and trade (e.g. carbon emissions)

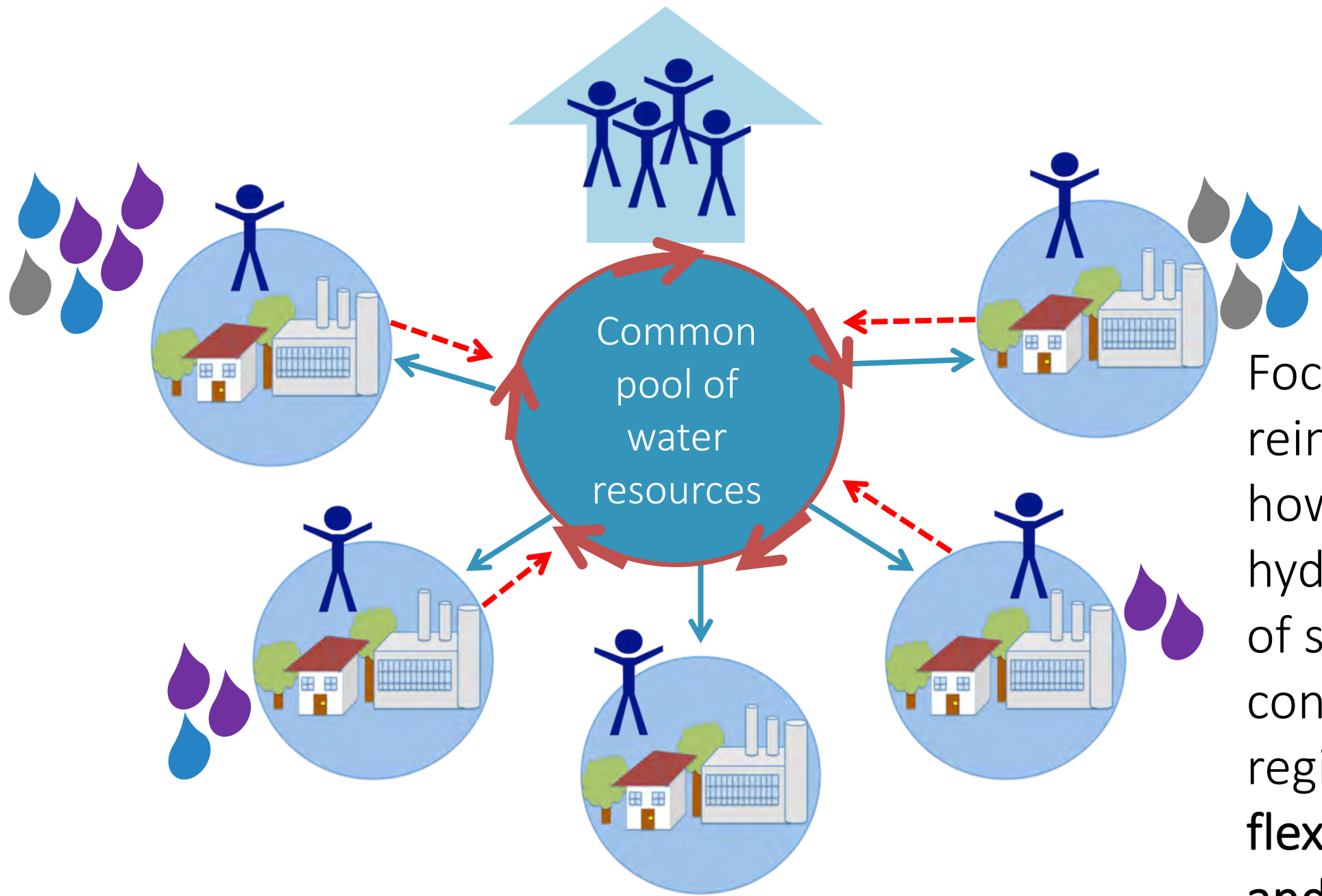


# Acid rain cap and trade model



# Water quality trading

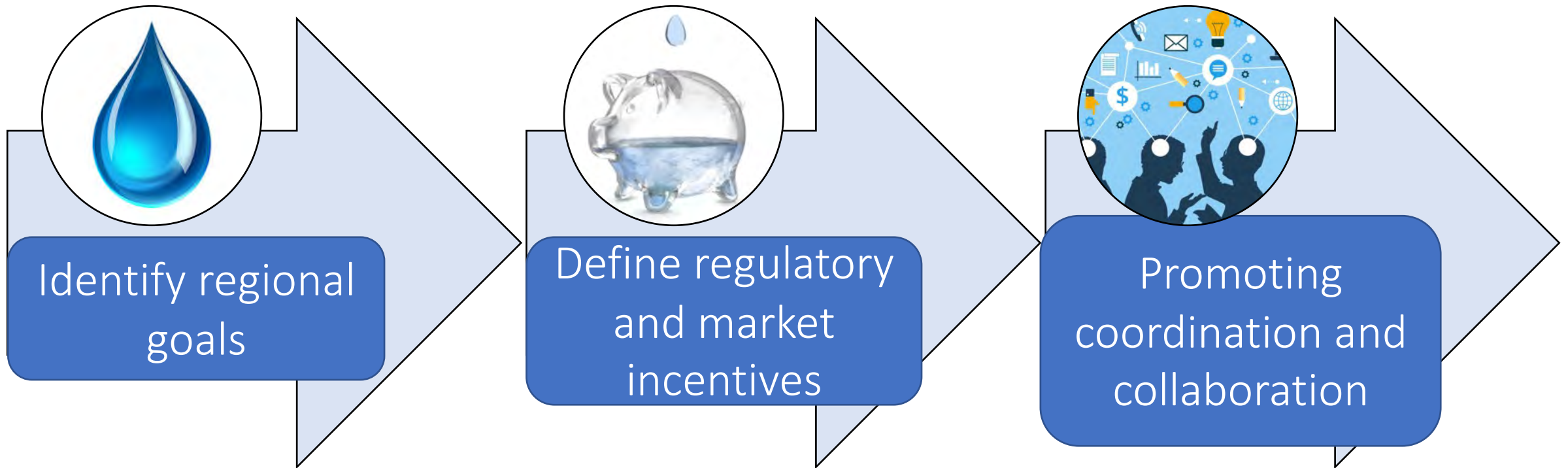




Focus on bottom-up reinvention and how the local socio-hydrologic realities of service areas can contribute to regional- scale flexibility, resilience, and reliability.



# Designing an effective policy framework to increase regional resiliency





A high-speed photograph of a blue water splash against a light blue background. The water is captured in mid-air, forming a large, rounded, and textured shape. A white rectangular box is superimposed over the center of the splash, containing the text "Study approach".

# Study approach

# How could utilities **coordinate** their efforts to **diversify** their water supplies?



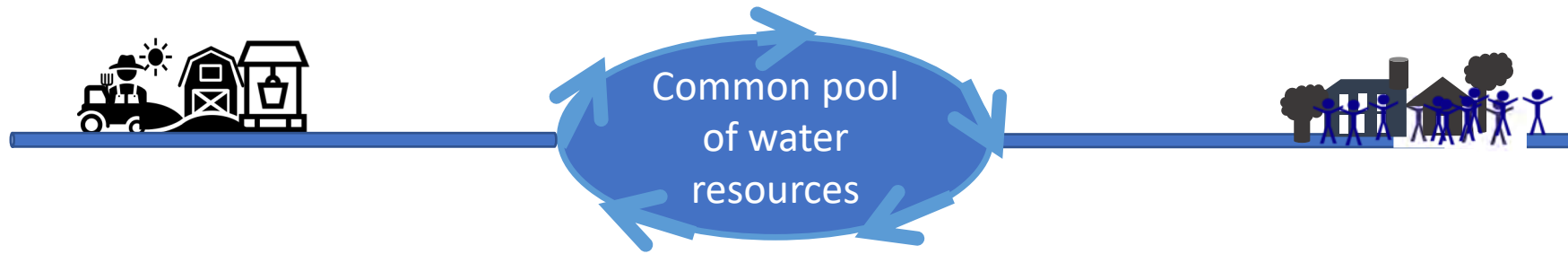
Define policy design

Create a model of  
utilities'/stakeholders  
decision-making dynamics  
to test the design policy

Analyze policy outcomes  
under various scenarios



# Tradable credits for an equitable water future: Water Diversification Standard (WDS)

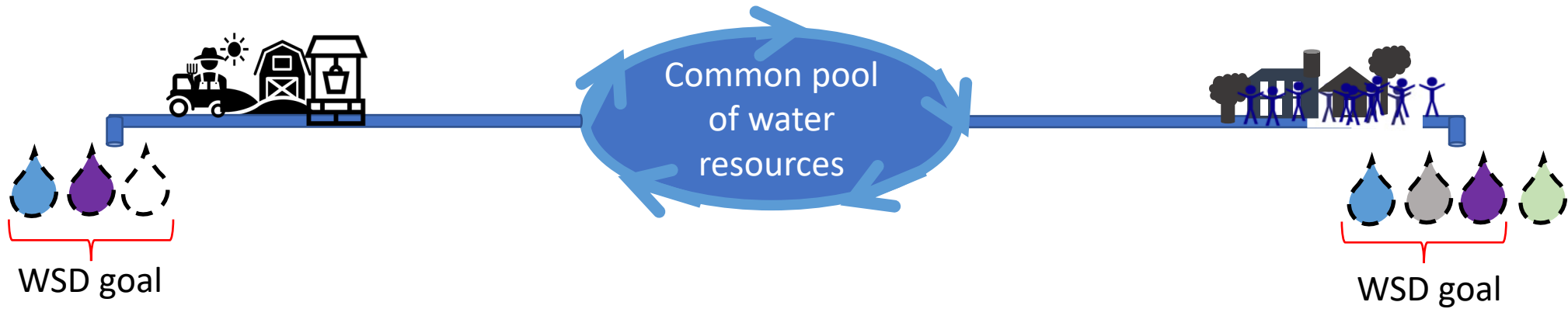


# Tradable credits for an equitable water future: Water Diversification Standard (WDS)

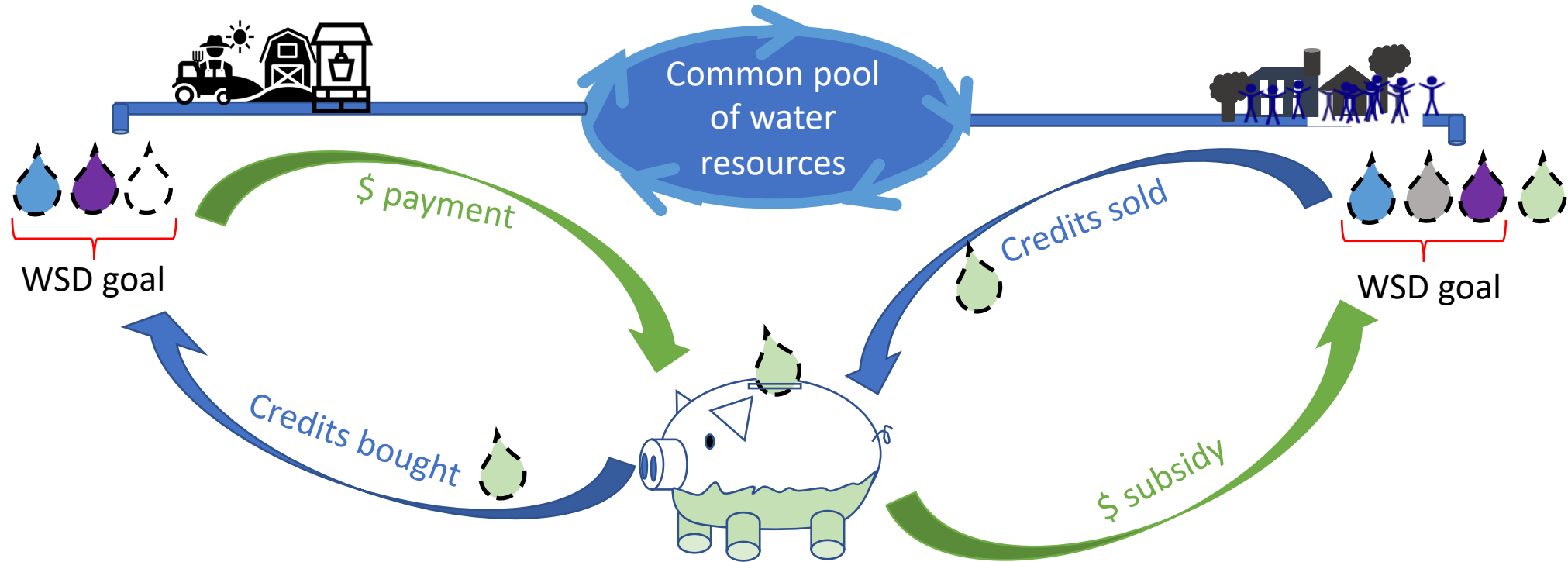




# Tradable credits for an equitable water future: Water Diversification Standard (WDS)



# Tradable credits for an equitable water future: Water Diversification Standard (WDS)



e.g. a groundwater basin or a river



- The virtual credit trading model provide a way to invest in local solution by those who have the capacity to do more but do not have the financial resources.
- For example, major stakeholders/beneficiaries in the region can indirectly invest in water reuse, sanitation, well deepening, or other solutions for the underprivileged members of the community, while achieving regional WDS.
- Operated effectively, this can ultimately improve access and equity across the region while reducing reliance on the common source of water such as groundwater.



# Case study



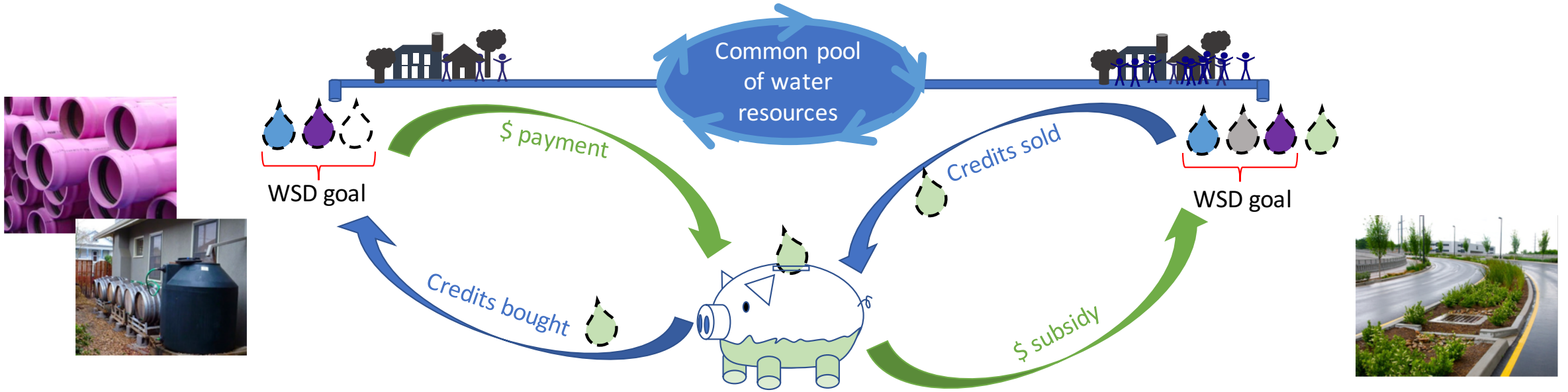
# Sonoma County water Agency

9 water utilities  
600,000 residents  
60% dependent on  
Russian River (local)



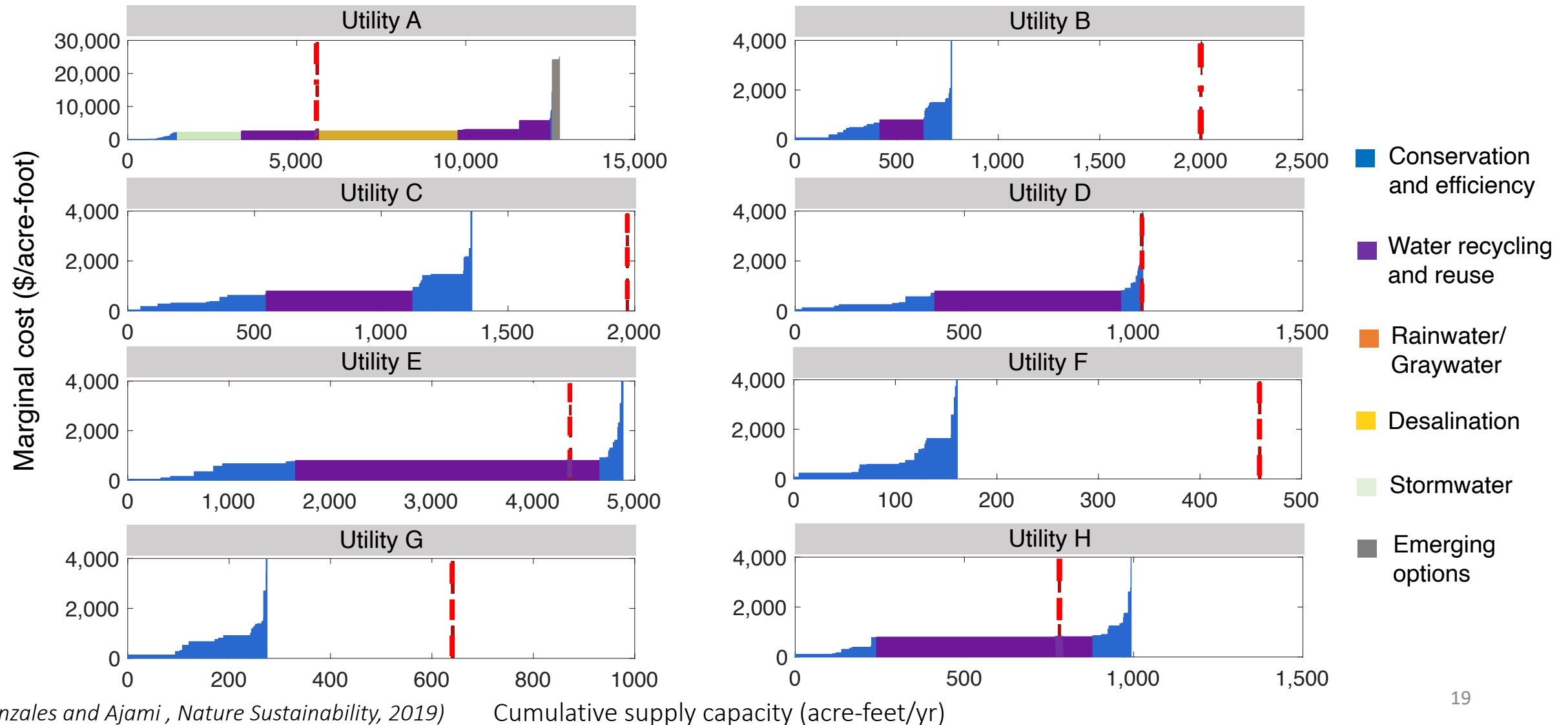
*If the region collectively defined the need to diversify their water supplies and reduce reliance on their common source (GW and Russian River), how could utilities coordinate their efforts to achieve this goal?*

Regional Target: 25% diversification goal by 2040 to reduce reliance on groundwater basin



e.g. a groundwater basin or a river

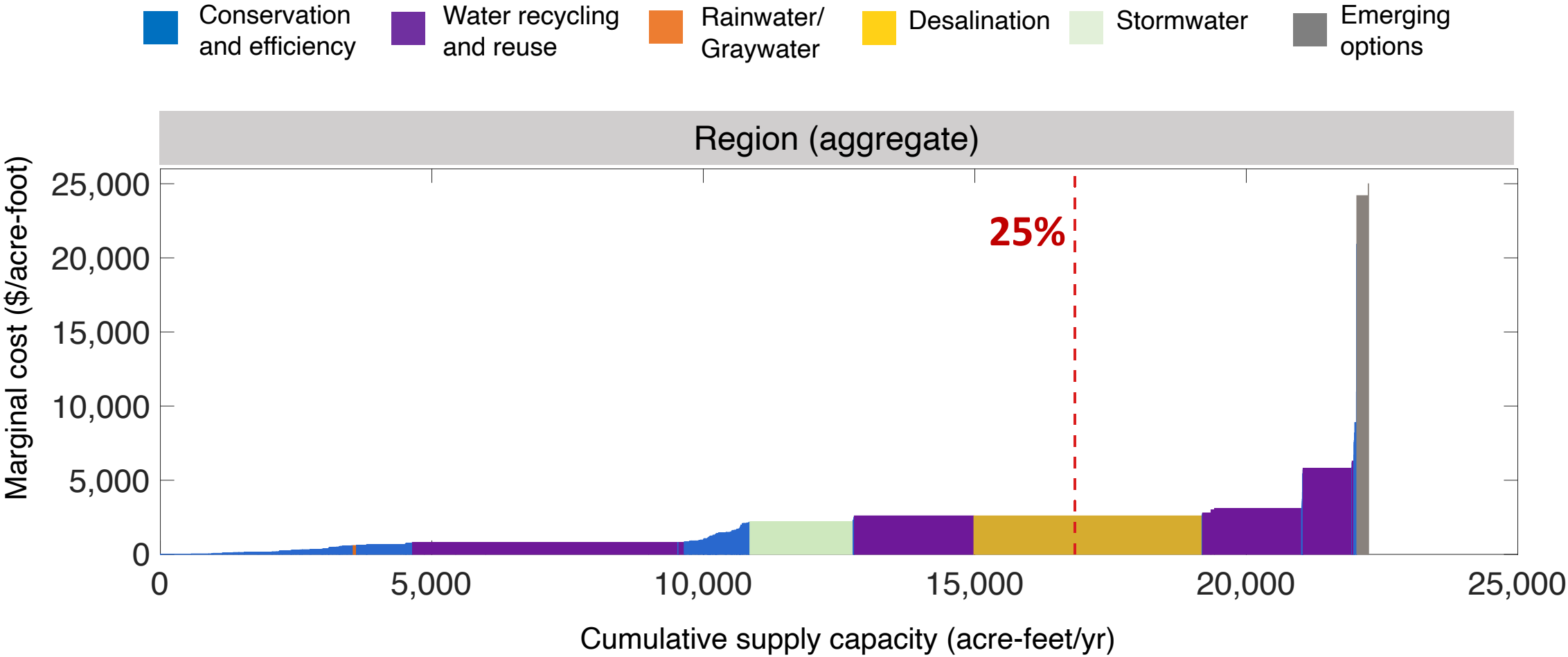
# Not all utilities have the same capacity to introduce diverse water solutions cost-effectively





# The region as a whole could achieve diversification goals

*Example goal: Introduce 25% alternative water supplies (by volume) into the regional portfolio*

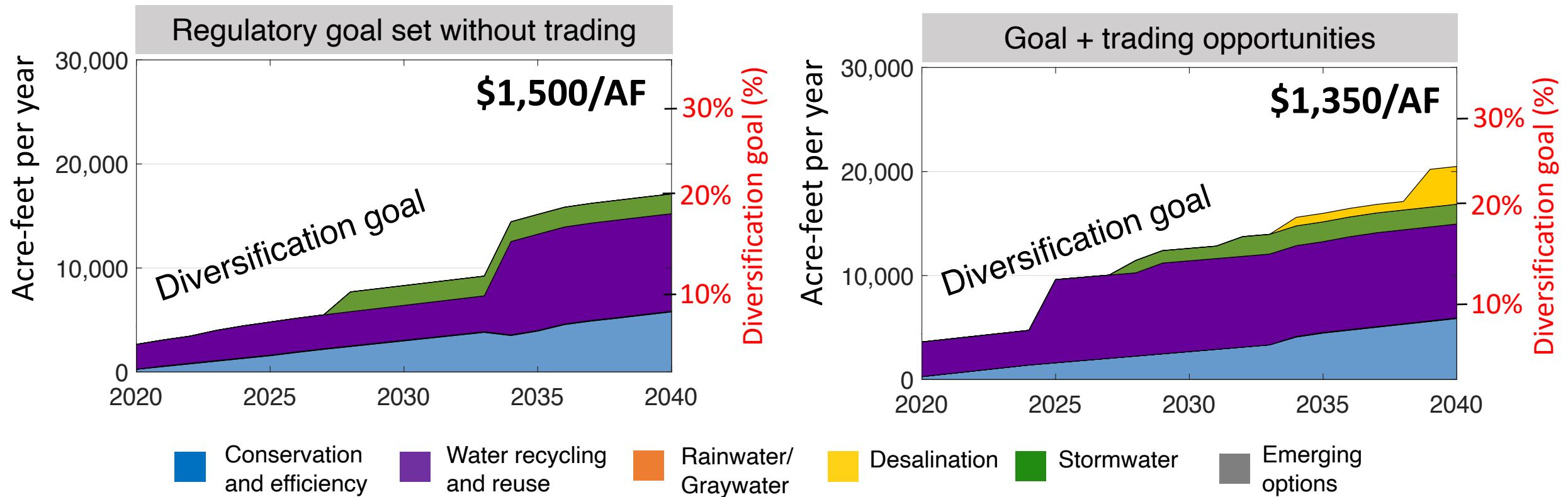


(Gonzales and Ajami, Nature Sustainability, 2019)

# Can trading help support enhance supply diversification efforts?

Yes, trading of diversification credits is more effective than inflexible regulations

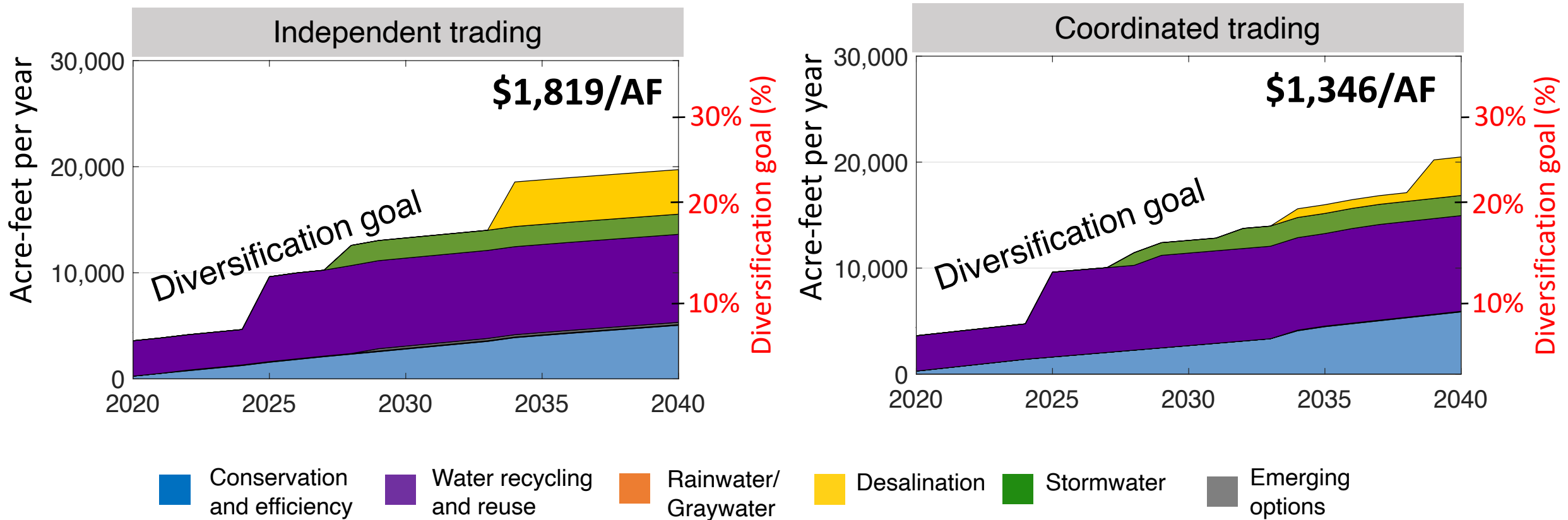
*Example goal: Introduce 25% of alternative water supplies (by volume = 21,000 AFY) into the regional portfolio by 2040*



# Does it matter whether stakeholders are sharing information?

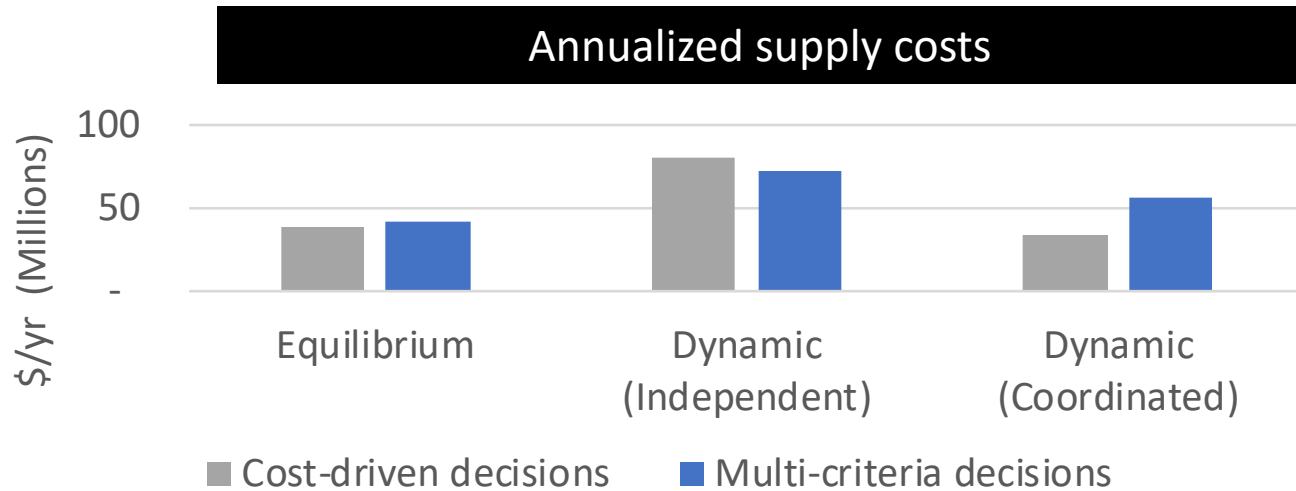
Coordination leads to cost-savings and more effective planning than independent decisions

*Example goal: Introduce 25% of alternative water supplies (by volume = 21,000 AFY) into the regional portfolio by 2040*

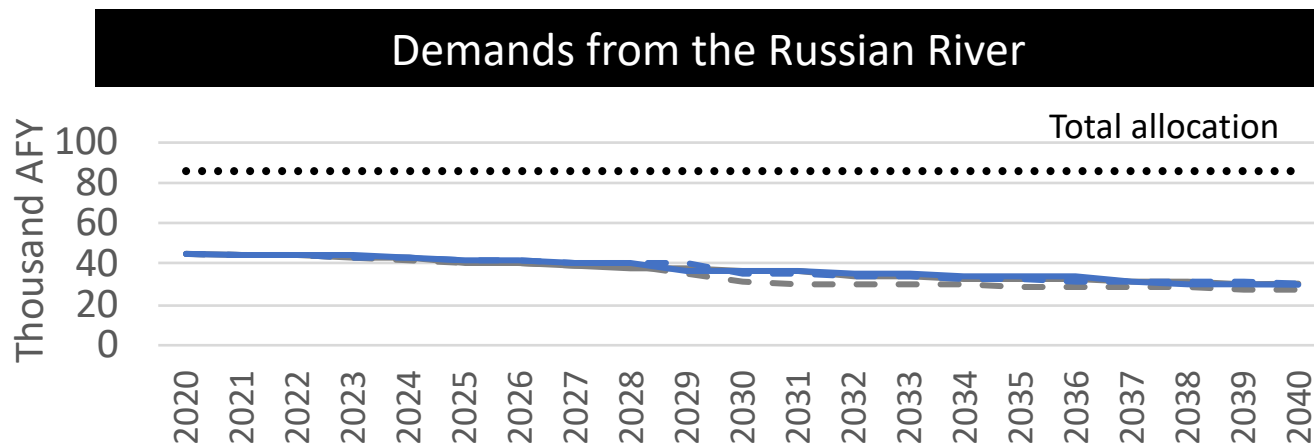




# Effect of decision making dynamics



✓ Coordinating the implementation of projects leads to reduced costs that more closely resemble those expected from economic theory.



✓ Regardless of decision dynamics, supply diversification policy leads to reduced demands from existing supply sources.

# Expected benefits of a trading scheme



Financial accessibility for smaller projects



Equal access to resources for small service providers who may not otherwise have the institutional or financial capacity to pursue alternative projects



Enhanced regional collaboration to implement the most beneficial and cost-effective projects



Empowering bottom-up reinvention

# The key to success for these instruments includes:

- Regional caps;
- Limited credits;
- Flexibility to develop local solutions;
- A credit banking option (e.g. the common pool of water);
- An active monitoring system to inform the process and to enhance trust and transparency; and
- A penalty or fine that would guarantee action by all the beneficiaries.



# Questions?

Newsha Ajami ([newsha@stanford.edu](mailto:newsha@stanford.edu))

