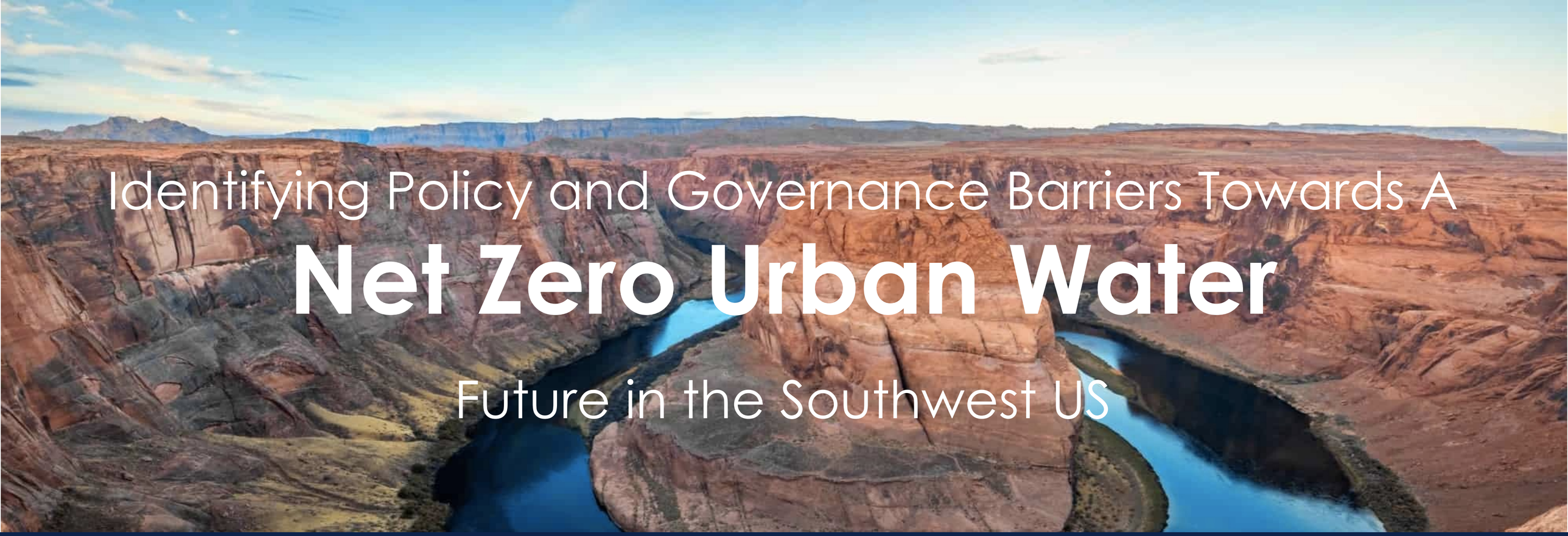

Identifying Policy and Governance Barriers Towards A **Net Zero Urban Water** Future in the Southwest US

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Collaborators:

- University of California Los Angeles (UCLA)
- University of New Mexico (UNM)
- Colorado State University (CSU)
- Colorado School of Mines (CSM)
- Tucson Water
- Denver Water
- Los Angeles Dept of Water and Power
- Albuquerque Bernalillo County Water Authority

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Colorado River Crisis

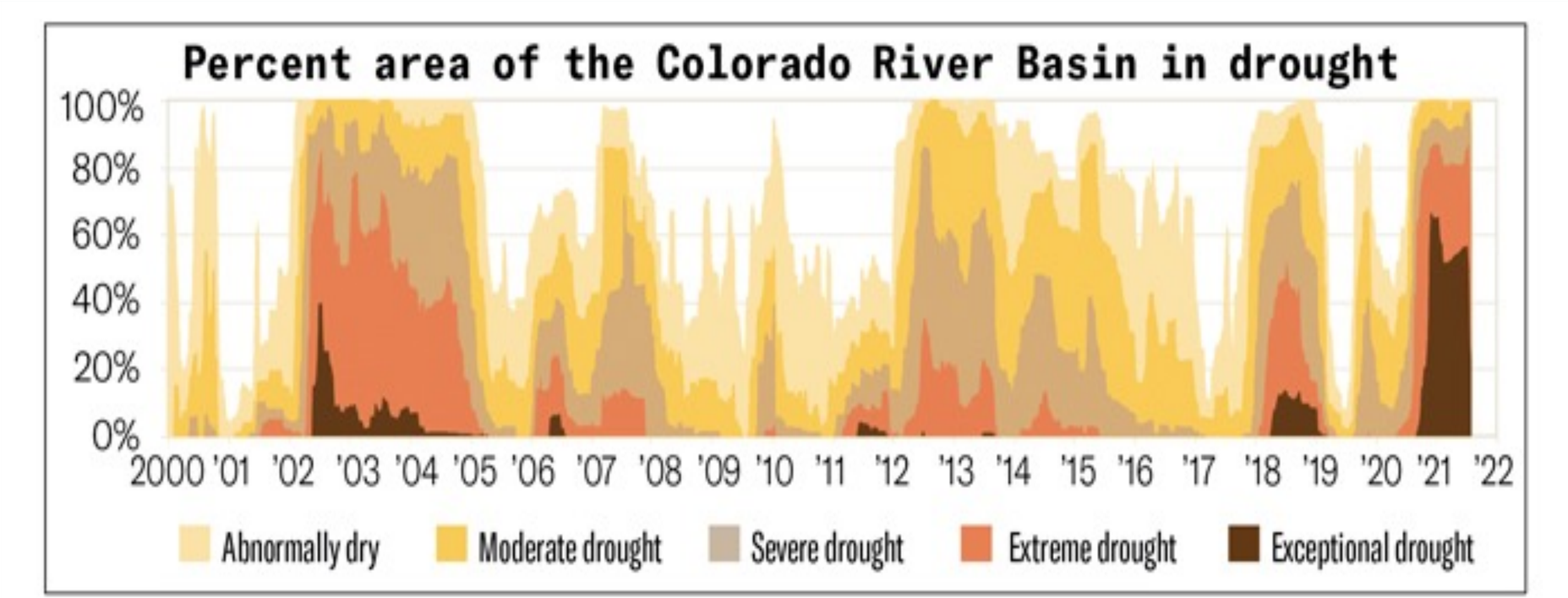

Figure 1. Colorado River Basin in Drought over the years

Source: High County News (https://www.hcn.org/issues/53.9/infographic-drought-the-incredible-shrinking-colorado-river)

CAUSES

- Climate change
- Over allocation of water
- 'Law of River'- water laws, policies, compact obligations

IMPACTS

- Dead pool in Lakes
- Large water cuts imposed by Reclamation
- Threatening supply to 40 million people

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Net Zero Urban Water (NZUW) Approach For Water Self-Sufficient Cities

- *"NZUW meets the needs of a given community with a locally available and sustainable water supply, without detriment to interconnected systems" .*
- Integrative approach with progressive targets.
- Quantitative framework .
- Adapts to challenges across Natural, Built and Social Systems.

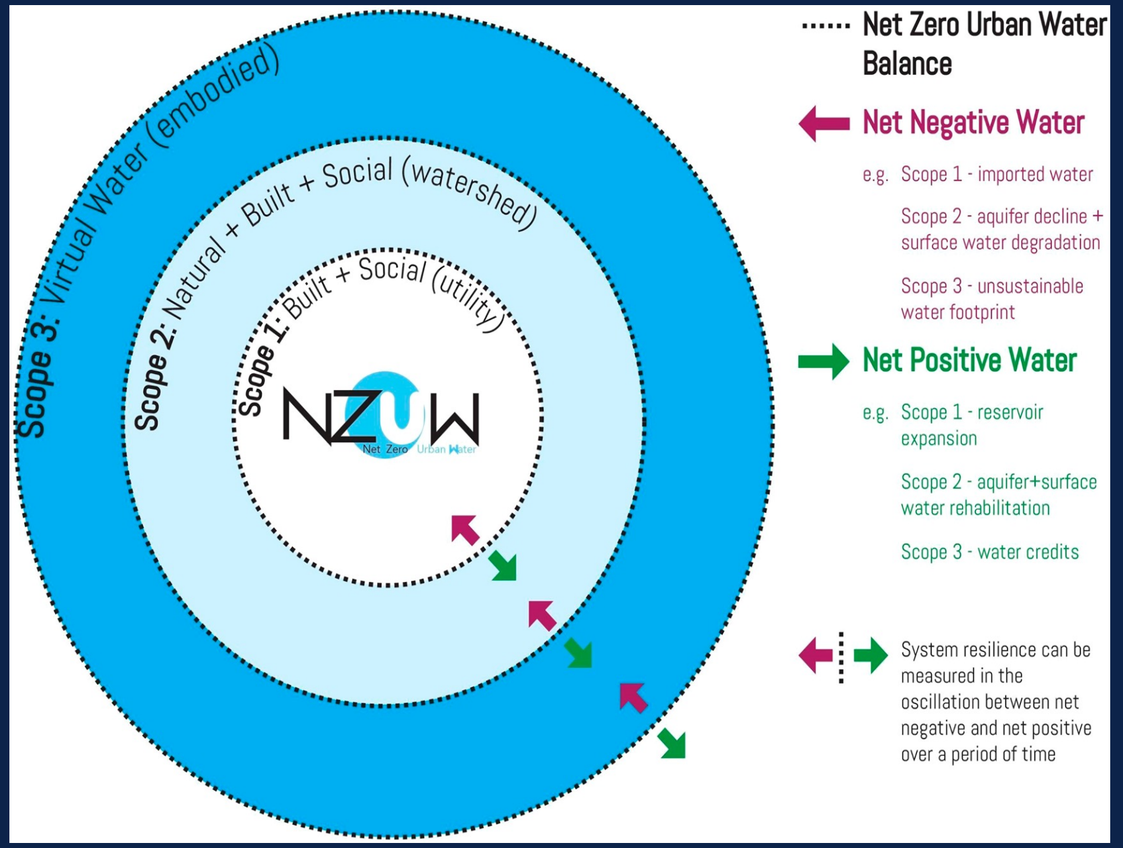

Figure 2. NZUW is a progressive target across three scopes and natural, built and social Systems (Crosson,2020).

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Case Study Cities

Figure 3. Map of Colorado River Basin (USGS)

	Albuquerque	Denver	Los Angeles	Tucson
Population	0.56 millions	0.72 million	3.9 million	0.54 millions
Area	189 sq. miles	154 sq. miles	502 sq. miles	241 sq. miles
Annual Rainfall	9.5 inches (Jun - Sept)	15 inches (Mar-Sept)	15 inches (Nov-April)	10.5 inches (Jun - Sept)
Imported Water Source	**Colorado River** via the San Juan Chama Project	**Colorado River**	LA Aqueduct, State Water Project, **Colorado River**	**Colorado River** via Central Arizona Project
Annual water use	27 billion gallons (Water Authority)	30 billion gallons (Denver Water)	160 billion gallons (LADWP)	28 billion gallons (Tucson Water)
% Imported water	**80%**	**46%**	**89%**	**84%**
% Dependence on Colorado river	80%	**46%**	6%	**84%**
Per Capita water use	128 gpcd	150 gpcd	112 gpcd	80 gpcd

Table 1. Characteristics of the case study cities

5 Key Areas of Policy and Governance Challenges

1. Incorporating and accounting for diversified water sources and sinks

- Rainwater
- Greywater
- Stormwater
- Reclaimed Water → Challenge: Direct Potable Reuse (treatment, public acceptance)
- Surface and groundwater

2. Planning, design and operations

- Integrated Decision-support tools
- Understanding Climate Change Impacts

3. Monitoring and enforcement of new policies

- Cost of monitoring efforts
- Precise and comprehensive metering
  (Automated metering, real-time monitoring, remote sensing)

4. Coordination between multiple agencies and sectors

- Local, state and national agencies
- Water supply, wastewater and stormwater agencies

5. Addressing equity and justice in the NZUW transition

- Ensure consistent water quality, and affordability
- Equitable Investments in New Systems, Green Infrastructure

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Policy Challenges To Transition To NZUW Future

Tucson

- **Accounting for diverse water sources.**
- **Funding** for expansion of **water infrastructure.**

Los Angeles

- **High outdoor water use** due to non-native plants.
- **88 different water agencies**.
- **Rigid water pricing policies.**

Denver

- **Strict water rights laws and enforcement**.
- Challenge for policies on **alternative water use.**

Albuquerque

- **Non-metered private wells**.
- **Return flow requirements**.
- **Water rights** need to be acquired.

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Policy Needs

- **Consistent implementation and monitoring** of diversified water sources.
- **Expand water accounting system** for new sources.
- **Increase investment** in demand reductions.
- **Increase collaboration** between water agencies
- **Establish progressive water pricing**: Change Prop 26 to allow lowering water prices.
- **Enable accounting for water**.
- **Integrate augmentation plans** to enable use of alternative water sources
- **Meter private wells**.
- Make **Aquifer Storage and Recovery** projects **easier to implement, and cheaper**.

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Conclusion

- Over 40 million people rely on Colorado River, which is facing a severe crisis.
- *A NZUW approach allows the transition of cities toward sustainable water futures by meeting its water needs using local and sustainable supply sources, without detriment to interconnected systems*.
- Policy and governance barriers exist in NZUW implementation, across natural, built and social systems.

References

- Crosson, C., Achilli, A., Zuniga-Teran, A. A., Mack, E. A., Albrecht, T., Shrestha, P., ... & Scott, C. A. (2020). Net zero urban water from concept to applications: Integrating natural, built, and social systems for responsive and adaptive solutions. *ACS ES&T Water*, *1*(3), 518-529.