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Public Perceptions of Urban Water Sustainability Transitions: A Multi-City Survey in the Western United States

ASU Decision Center for a Desert City
Arizona State University

Veronica Horvath, Ellie Rauh, Abigail Sullivan, Kelli Larson, and Dave White

Presentation Overview

1 Water and Climate in the Colorado River Basin
2 Theoretical Framework: Sustainability Transitions
3 Survey Research Methods
4 Study Findings
5 Discussion and Conclusions

Water and Climate in the Colorado River Basin

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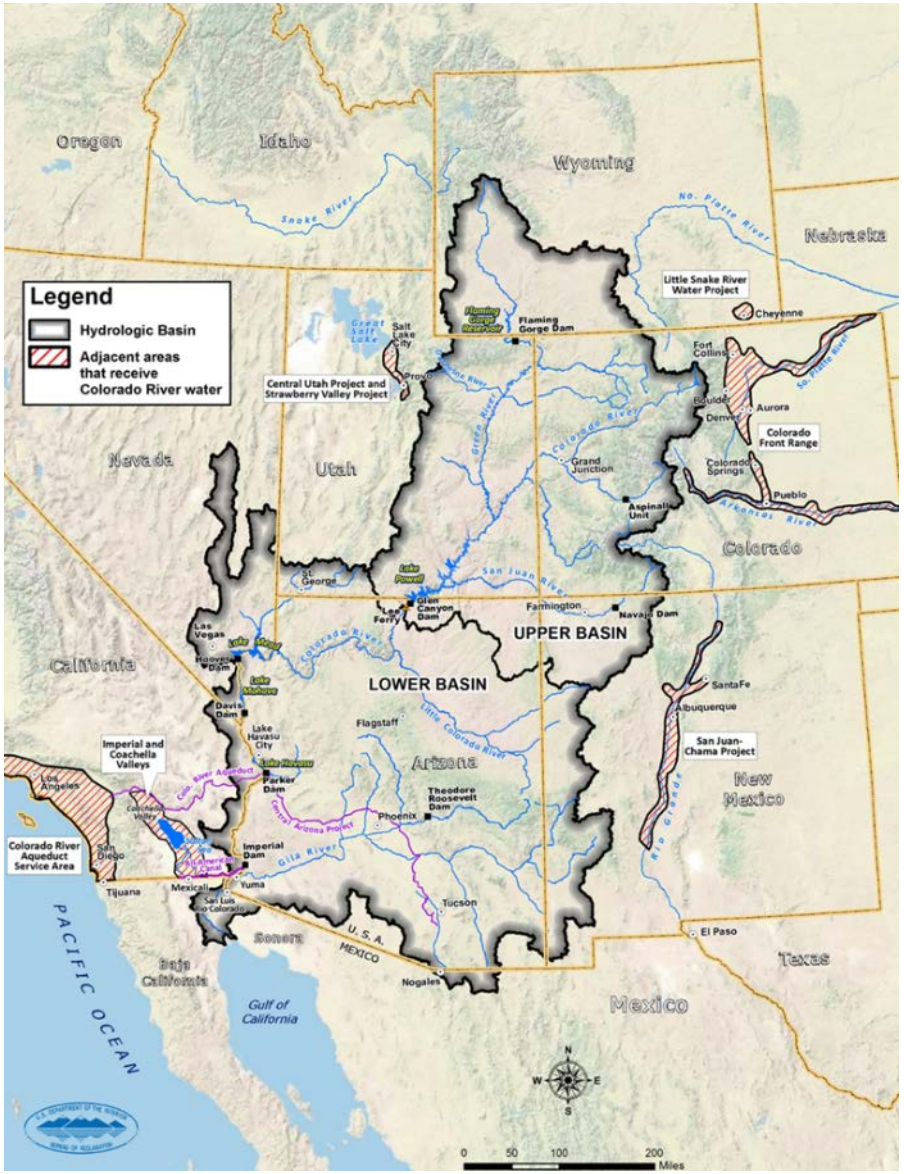

Colorado River Basin

- Supplies more than **1 in 10 Americans** with water for **municipal** use (~40 million)
- **Irrigation** for 22248 km^2
- Physical, economic, and cultural resource to ~**22 federally recognized Tribes**
- **Electrical** generating capacity (~4,200 MW)
- Linked to **9 National Park Service units** and **7 National Wildlife Refuges** (~$1 billion in tourism revenue)
- **Habitat** for a wide range of species, including threatened and endangered species

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https://www.doi.gov/water/owdi.cr.drought/en/

The Colorado River is one of the most over-allocated and heavily regulated transboundary river systems in the world

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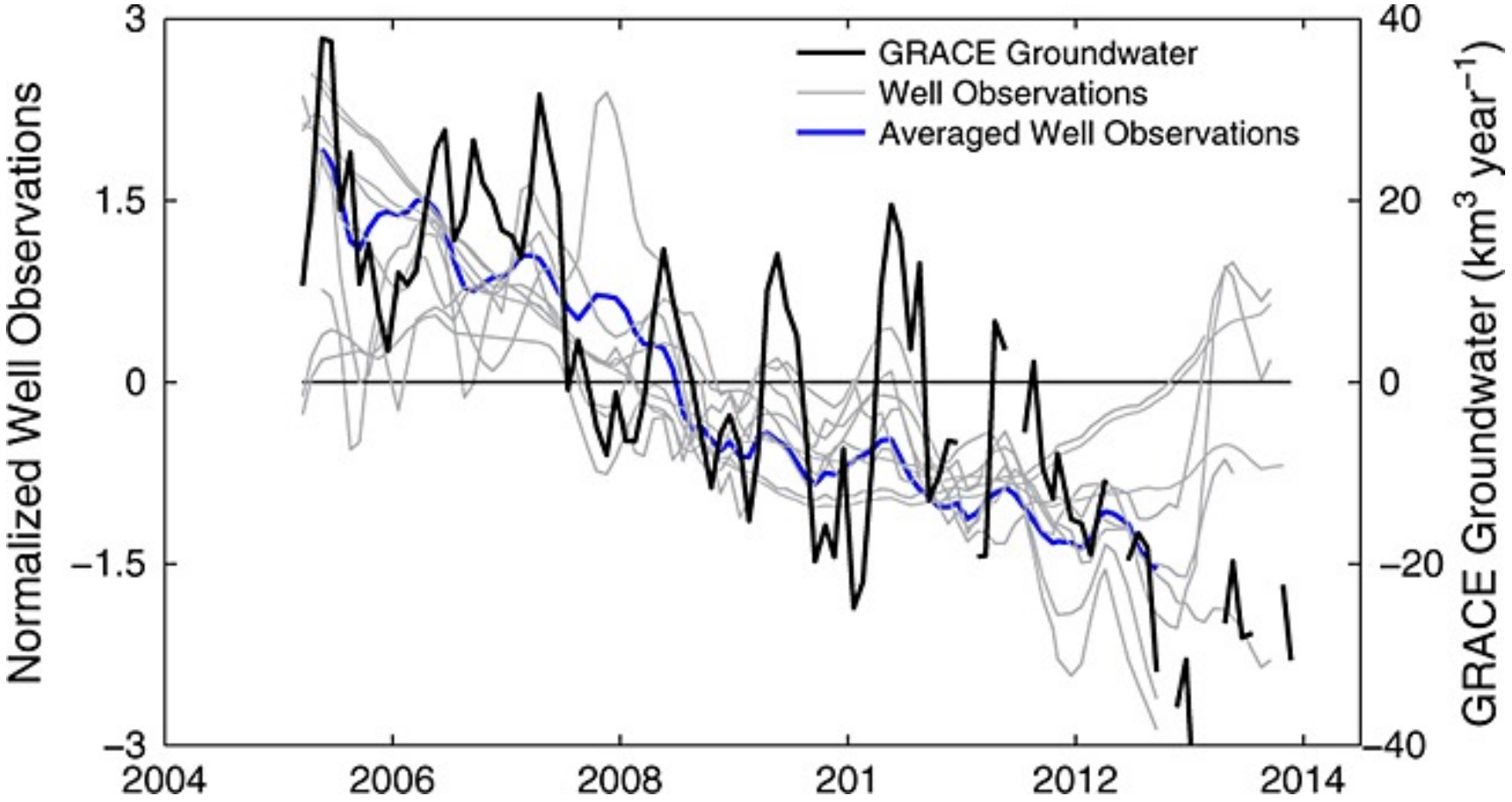
The present drought in the West is the among the most extreme in the last 1,200 years, affecting not only surface-water storage but also groundwater reserves



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Geophysical Research Letters
Volume 41, Issue 16, pages 5904-5911, 29 AUG 2014
DOI: 10.1002/2014GL061055

Water levels in the major Colorado River reservoirs are at historic lows

Theory of Urban Water Sustainability Transitions

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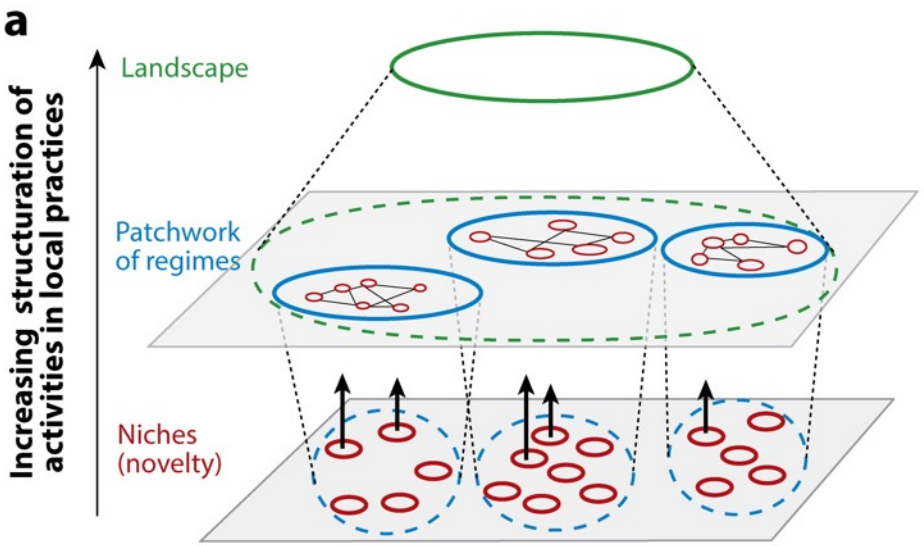
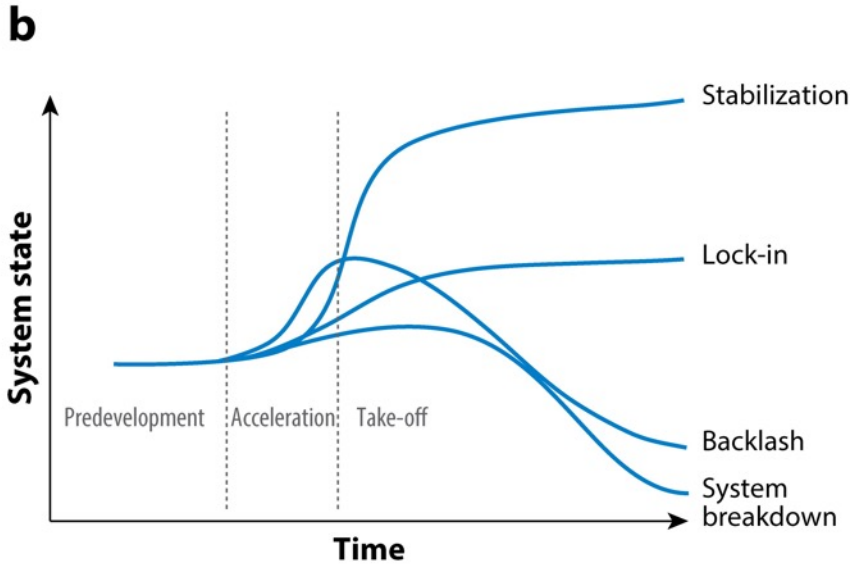
Transitions Theory

- **Large-scale** changes in societal systems that emerge over a long period of time (**decades**)

- Emerged from innovation research, environmental studies, and sustainability sciences





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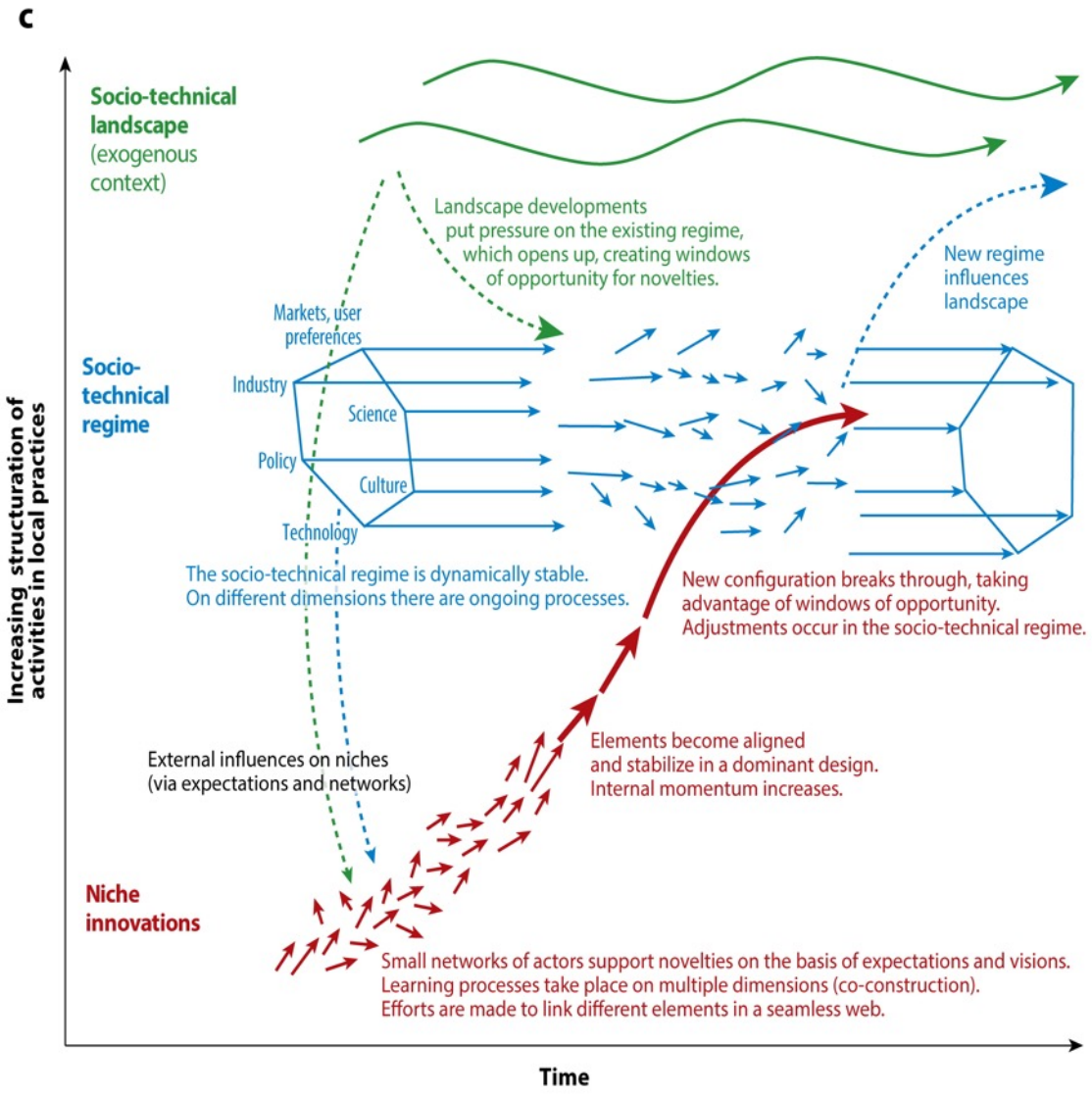
Loorbach D, et al. 2017.
Annu. Rev. Environ. Resour. 42:599–626

Transitions Theory

- Systematic approach to understanding and addressing grand societal challenges
- **Limited empirical work on the role of public perceptions in facilitating or constraining transitions**



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Prior Transitions Inform Future Transitions

sustainability

MDPI

Article

Towards Water Sensitive Cities in the Colorado River Basin: A Comparative Historical Analysis to Inform Future Urban Water Sustainability Transitions

Abigail Sullivan [1,*], Dave D. White [1,2], Kelli L. Larson [1,3,4] and Amber Wutich [1,5]

"Understanding the circumstances surrounding takeoff in past transitions is critical to learning how to catalyze and influence the breakthrough of future transitions"

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Research Questions

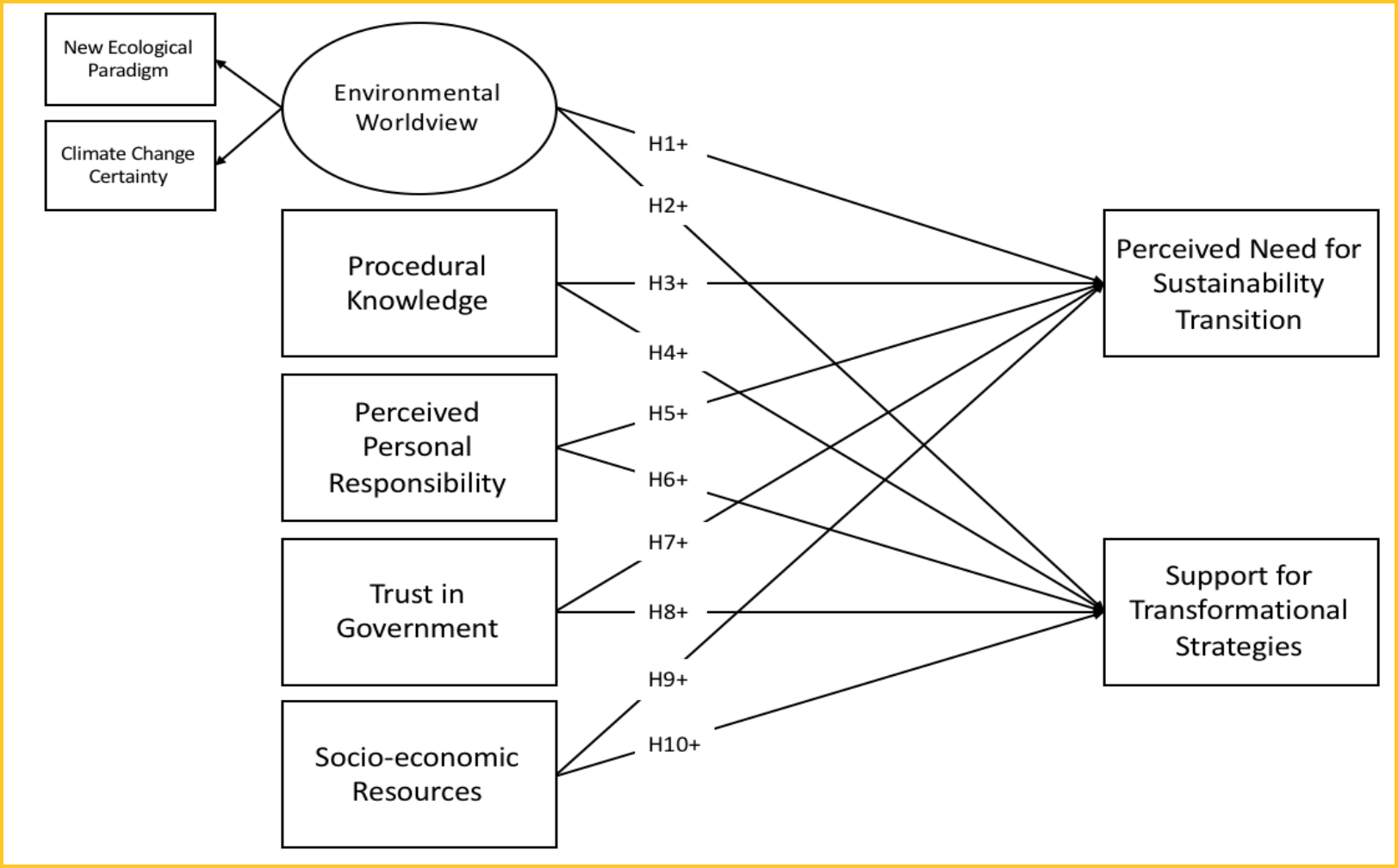
1. How do **public perceptions** of the need for water sustainability transitions and **public support** for transformational water management strategies vary across three US cities dependent on water from the Colorado River: Phoenix, Arizona; Las Vegas, Nevada; and Denver, Colorado?

Research Questions

2. How do **attitudinal factors and socio-economic resources** affect public perceptions of the need for water sustainability transitions and public support for transformational water management strategies?

3. How does the theoretical model **vary across the three cities**?

Independent Dependent



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Western Urban Water Survey

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Study Sites

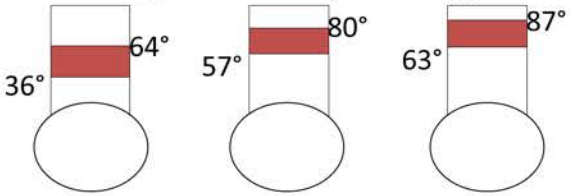
Study Site Comparison

Metropolitan Statistical Area Population (M)

2.9M | 2.2M | 4.7M

Median Household Income

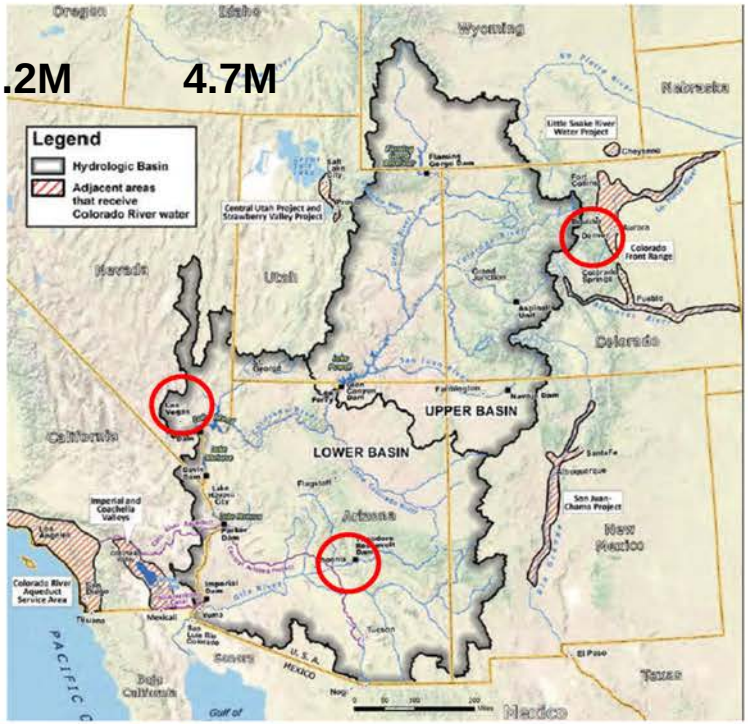
Average Annual Temperature (F)



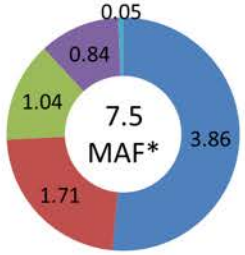
Average Annual Precipitation – Rainfall (in.)

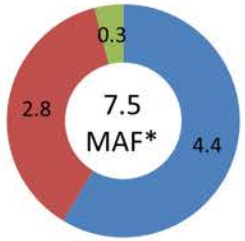
Denver | Las Vegas | Phoenix

Colorado River Basin



States of the basin & their water allocations





*Million Acre Feet per Year
Upper Basin allotments established by the Upper Colorado River Basin Compact if 1948.
Lower Basin allotments established as part of the Boulder Canyon Project in 1928

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Survey Research Design

- Random sample of 1000 addresses each in PHX, DEN, and LVA MSAs
- Four page English-language questionnaire administered Jan 8-Feb 21, 2018
- Four wave administration with initial mailing + $2 pre-incentive, follow-up postcard, and two additional full mailings

MSA including city of..	Completed Surveys	Response Rate
Denver, CO	253	27%
Phoenix, AZ	309	33%
Las Vegas, NV	224	24%
Total	786	28%

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Survey Constructs

- Need for sustainability transitions
- Support for transformational strategies
- Environmental worldview
- Procedural knowledge
- Perceived social responsibility
- Trust in government
- Socio-demographics

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Respondent Profile

Overall, the sample was:

- Evenly split between male and female
- Older, more educated, and less racially and ethnically diverse than the general population per US Census data
- Consider when interpreting results

Western Water Study

1. These first questions are about water management in your town or city. There are no right or wrong answers. We would just like to know your opinion.

In the next 30 years, in <u>your</u> town or city, how much does the water resource management need to <u>change</u> to make sure that …

	Not at all	A little	Somewhat	Quite a bit	A great deal
a. …all residents have access to safe drinking water?	○	○	○	○	○
b. …all residents have enough water for living purposes?	○	○	○	○	○
c. …there is enough water for the environment?	○	○	○	○	○
d. …there is sufficient water for a thriving economy?	○	○	○	○	○

2. Thinking about water management for your town or city, to what extent would you support or oppose…

	Strongly oppose	Somewhat oppose	Neutral	Somewhat support	Strongly support
a. …residents, such as yourself, working with local water managers to make decisions?	○	○	○	○	○
b. …your town or city using resources that might impact you, such as tax revenue, to invest in technology to deliver water using 100% renewable energy?	○	○	○	○	○
c. …residents, such as yourself, and businesses gathering and storing rainwater to irrigate landscaping?	○	○	○	○	○
d. …wastewater being treated to meet drinking water quality standards and delivered directly to residents such as yourself?	○	○	○	○	○
e. …using only existing water sources in your area without importing or getting new supplies?	○	○	○	○	○
f. …everyone in your town or city, including you, contributing to reducing overall water usage by 25%?	○	○	○	○	○

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Study Findings

Overall, residents perceive that water resource management *needs to change "somewhat" to "quite a bit"* over the next 30 years, to ensure equitable, adequate, safe water to support a thriving economy and healthy environment.

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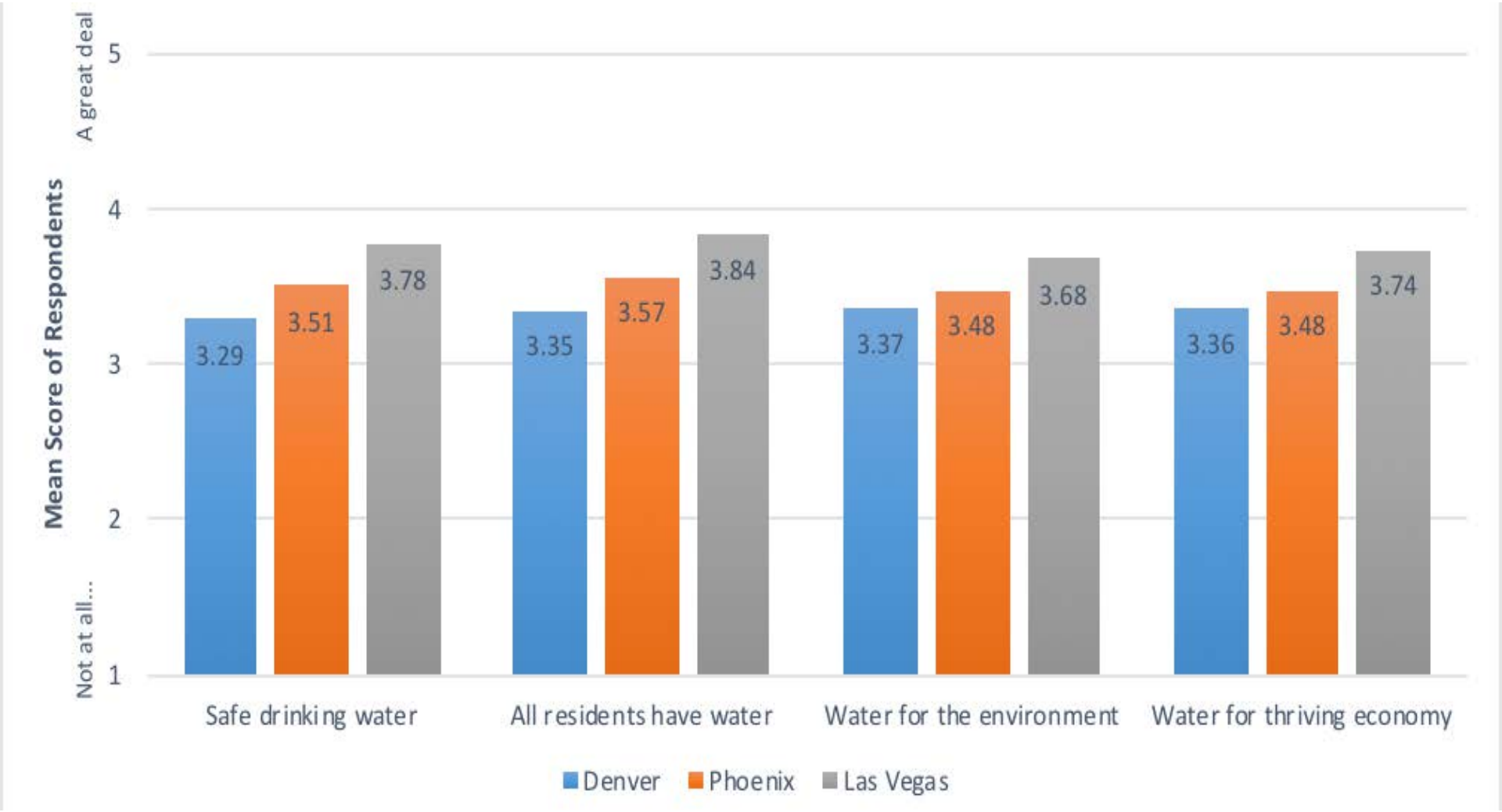
Perceived Need for Transitions



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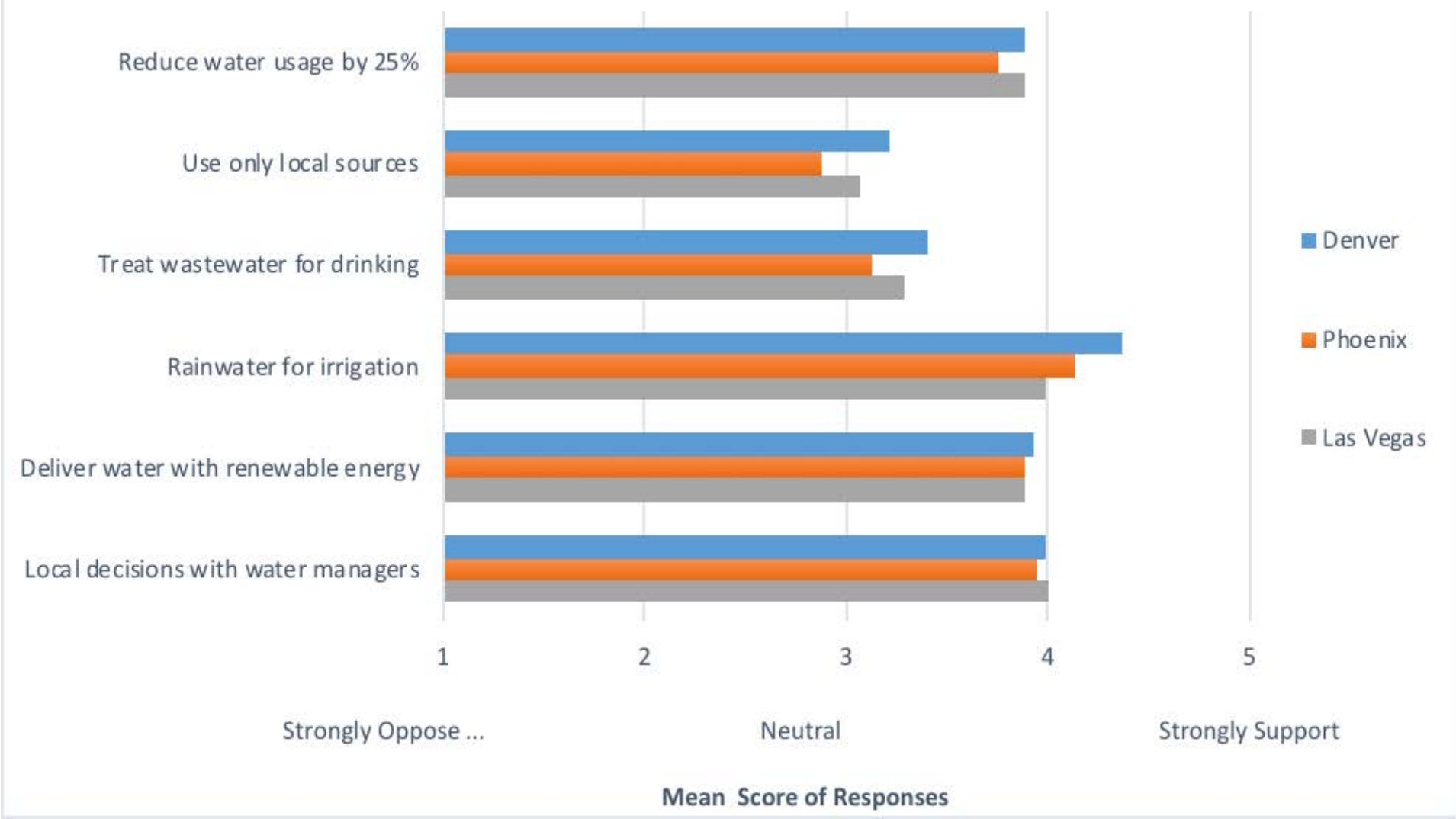
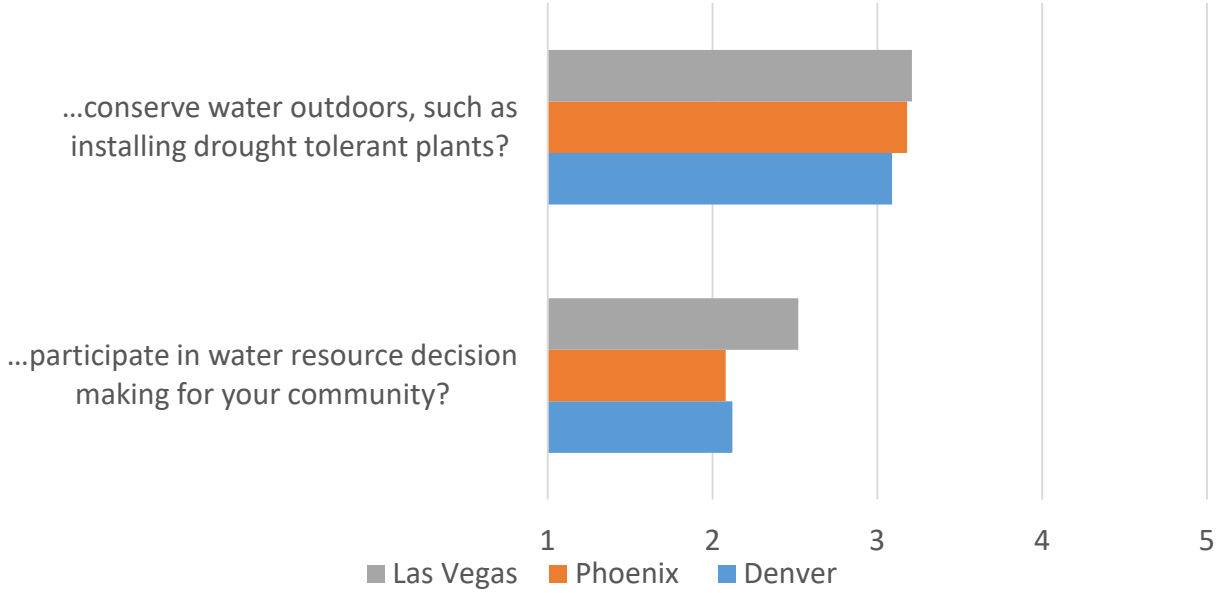
Support for Transformational Strategies



Procedural Knowledge by City

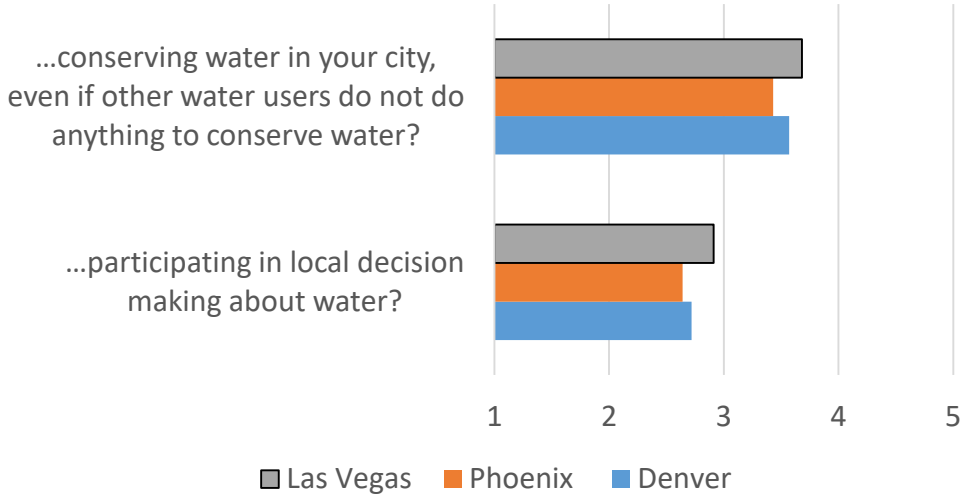
How much would you say you know about how to…
5 point scale ranging from *Nothing at all* to *a great deal*



All three cities expressed limited procedural knowledge

Personal Responsibility by City

How much personal responsibility do you feel for…
5 point scale ranging from: *None* to *a great deal*



Moderate degrees of personal responsibility in each city

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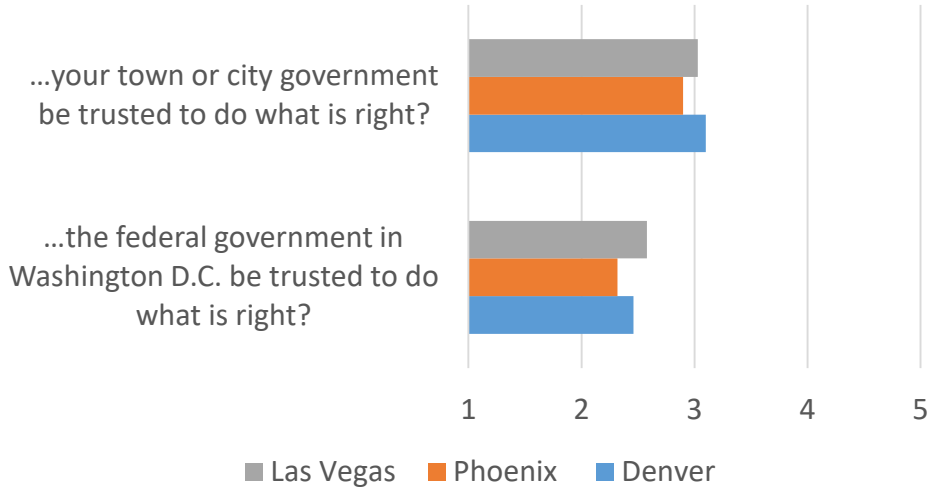
Trust in Government by City

In your opinion, how often can…

5 point scale ranging from: *Never* to *Extremely often*



Moderate degrees of trust seen in each city

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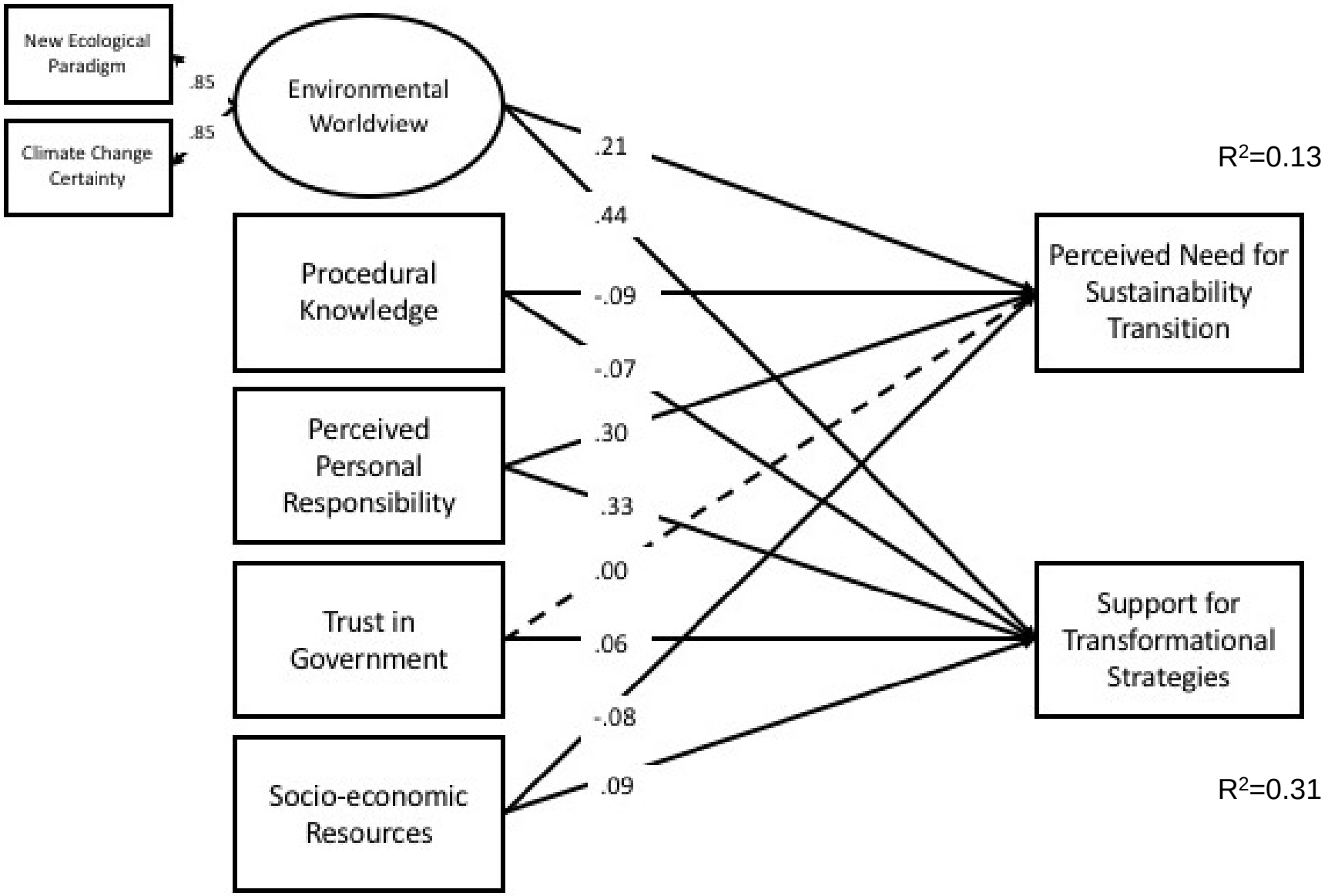
Variable	Denver		Phoenix		Las Vegas			
	Mean	SD	Mean	SD	Mean	SD	F (df)	Sig.
Sustainability Transition	3.34	1.14	3.51	1.02	3.76	1.00	8.80 (755)	<.001
Transformational Strategies	3.80	0.61	3.62	0.67	3.69	0.64	4.82 (759)	.007
NEP	3.96	0.89	3.83	0.88	3.97	0.85	2.36 (767)	.095
Personal Knowledge	2.60	0.96	2.63	0.94	2.86	1.05	5.05 (780)	.007
Perceived Personal Responsibility	3.13	0.89	3.03	0.91	3.30	0.94	5.15 (773)	.004
Trust in Government	2.78	0.72	2.61	0.71	2.81	0.74	5.89 (767)	.003
Climate Change Certainty	3.53	1.27	3.33	1.23	3.60	1.14	3.62 (775)	.027
Socio-economic Resources	0.17	0.81	0.03	0.86	-0.20	0.87	10.63 (691)	<.001



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While residents of all three cities perceive some need for water sustainability transitions,

Las Vegas residents' scores are statistically higher than residents in Phoenix and Denver.

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While residents of all three cities show support transformational strategies, Denver residents expressed significantly higher levels of support than Phoenix residents.

Influencing Factors and Key Findings

- Our results provide partial support for the hypothesized model:
  - **environmental worldview** and **perceived personal responsibility** predicted public perceptions of the need for water sustainability *transitions*
  - These two variables, along with **socio-economic resources** and **trust in government**, predicted support for transformational *strategies*.
- The theoretical model **replicated across** the three samples, which shows robust evidence of the generalizability of the findings.

Discussion and Implications for Research and Policy

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Implications for Research and Policy

- Findings inform policy processes for:
  - Appropriate intervention scales
  - Socially acceptable types of reform
- Mix of generic innovation policies and targeted sectoral (and technology-specific) policies is important to create integrated policies

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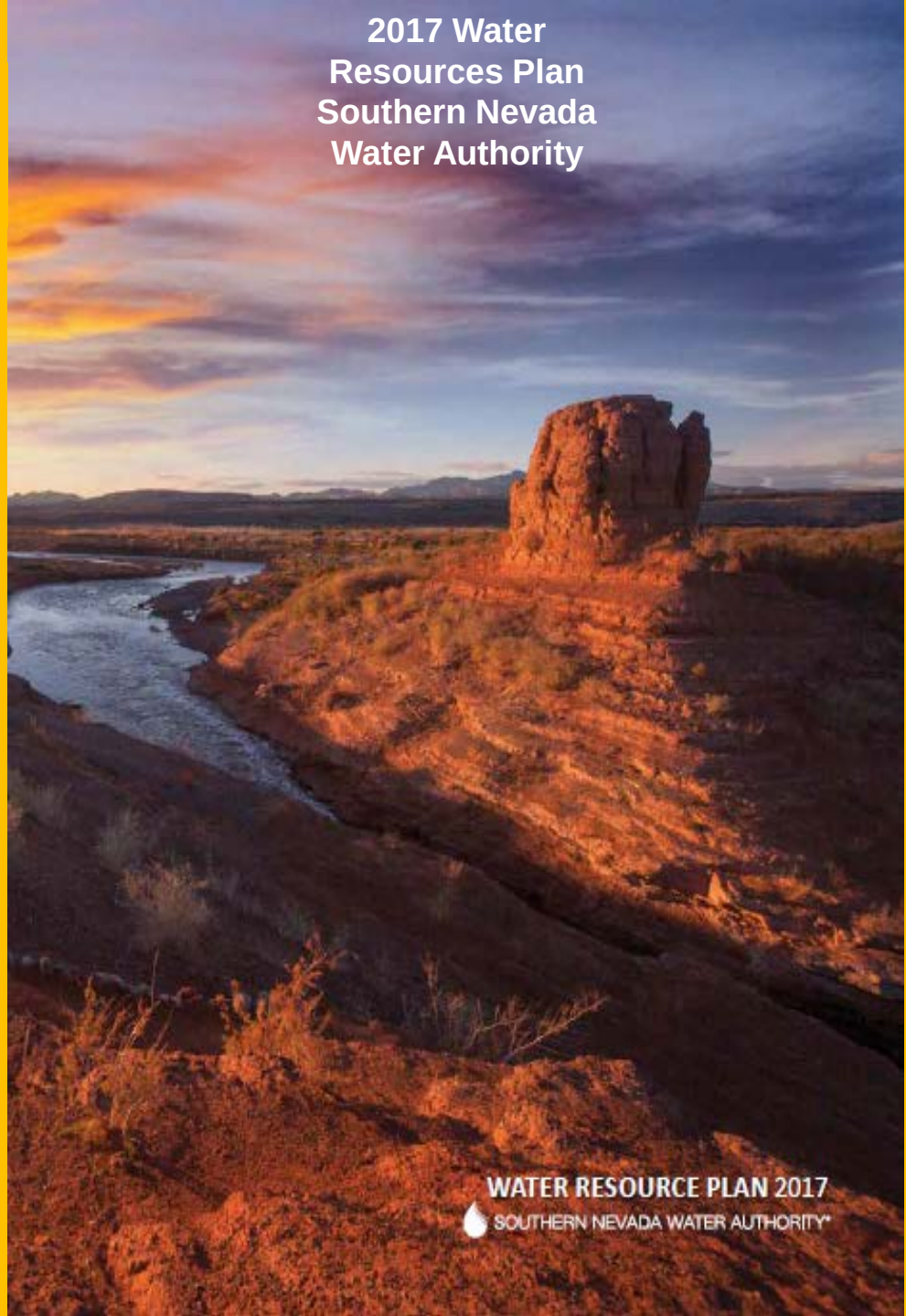

Implications for Research and Policy

- Opportunity to engage the public
  - Fairly widespread recognition about need for change…
  - But very little awareness of how to engage in process

- Further exploration of trust in government's operationalization and influence

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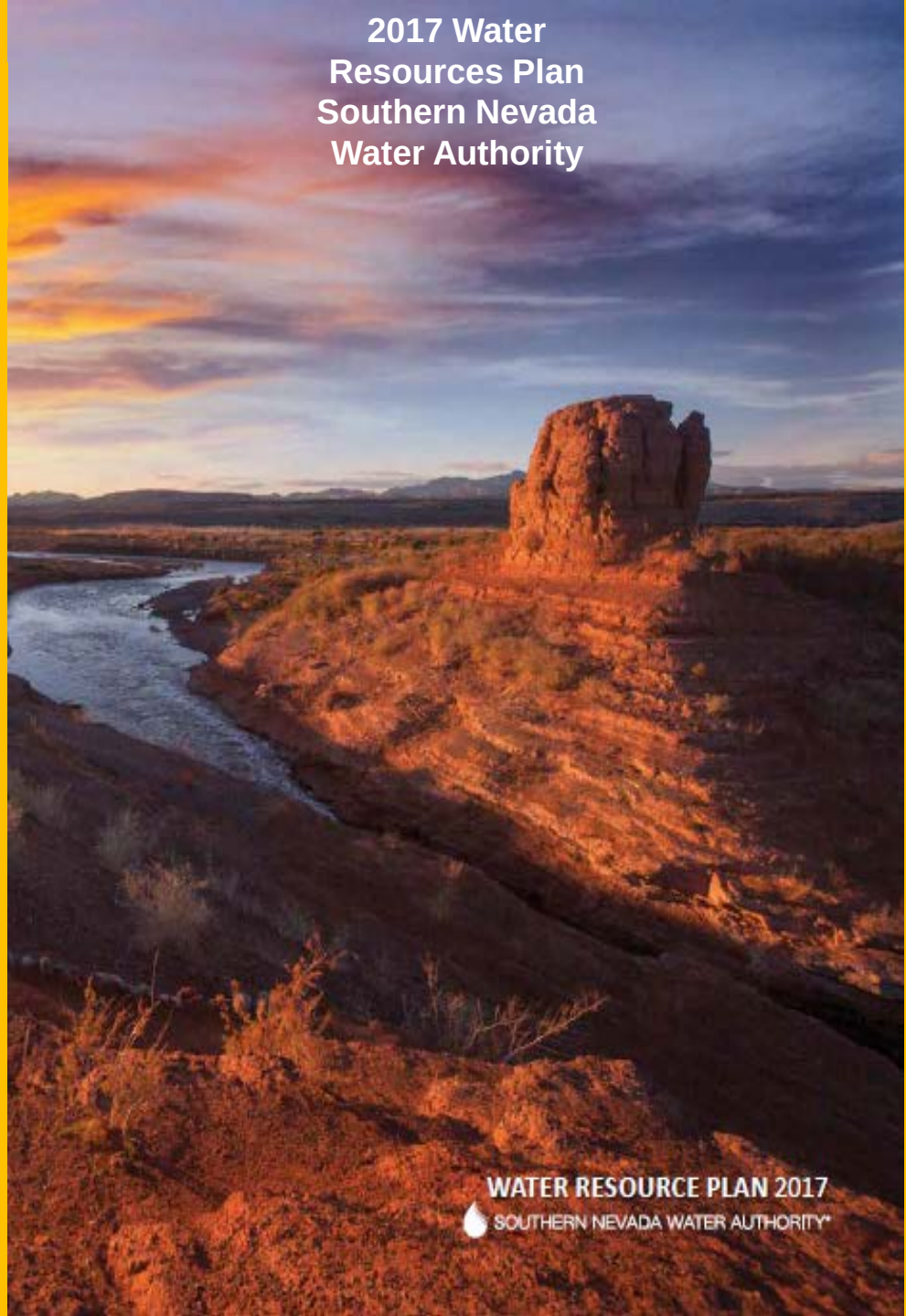

The take home point...

Public support for urban water sustainability transitions and transformational strategies in Denver, Phoenix, and Las Vegas enable managers, policy makers, and citizens to explore novel innovations in support of large-scale societal change.

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Thank You!

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