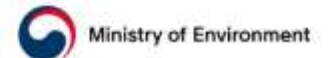


IWRA's XVII WORLD WATER CONGRESS

제 17차 IWRA 세계물총회

29 November – 3 December 2021
EXCO, Daegu, Republic of Korea





TEXAS A&M UNIVERSITY
Texas A&M
Energy Institute



Texas A&M Engineering
Experiment Station

Governance of WEF Nexus Hotspots: *Toward understanding the convergence of researcher and stakeholder perspectives*

Bassel Daher, PhD

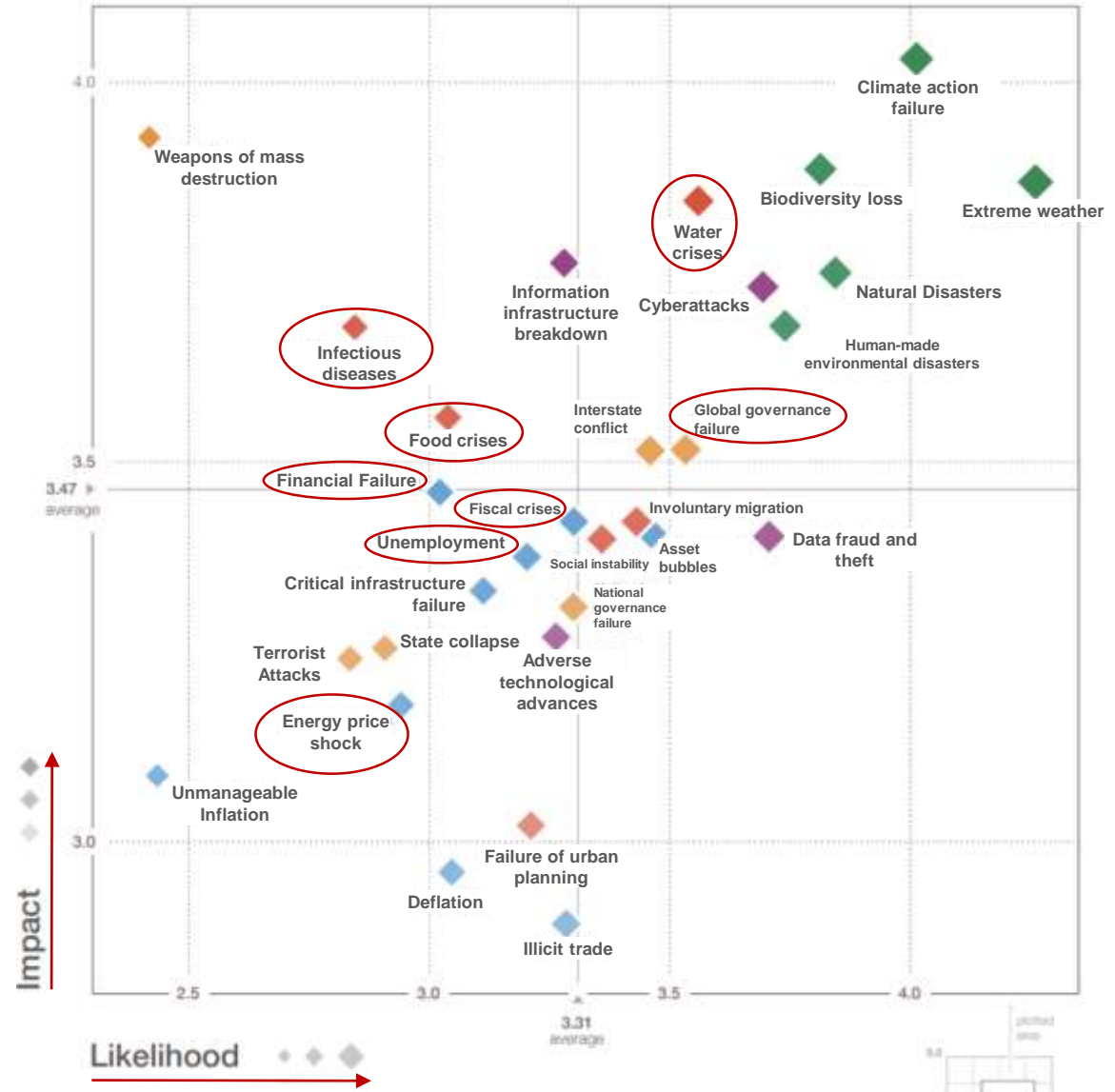
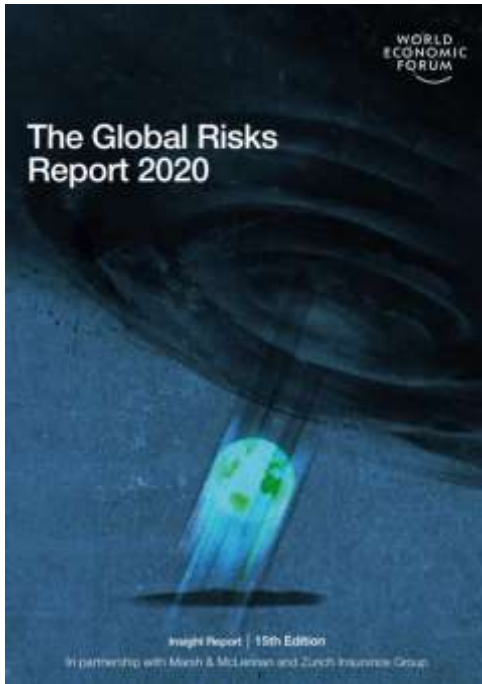
Assistant Research Scientist | Texas A&M Energy Institute

Research Fellow | Institute for Science, Technology, and Public Policy

Adjunct Assistant Professor | Department of Biological and Agricultural Engineering

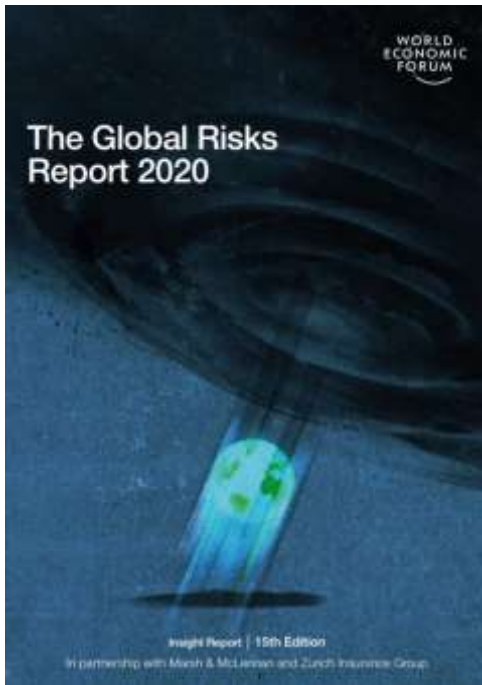
World Water Congress | November 30, 2021

Global Risks Landscape 2020



- Wide range of challenges
- Hard to predict
- Challenges are complex
- Require rapid response
- Require high level of cooperation

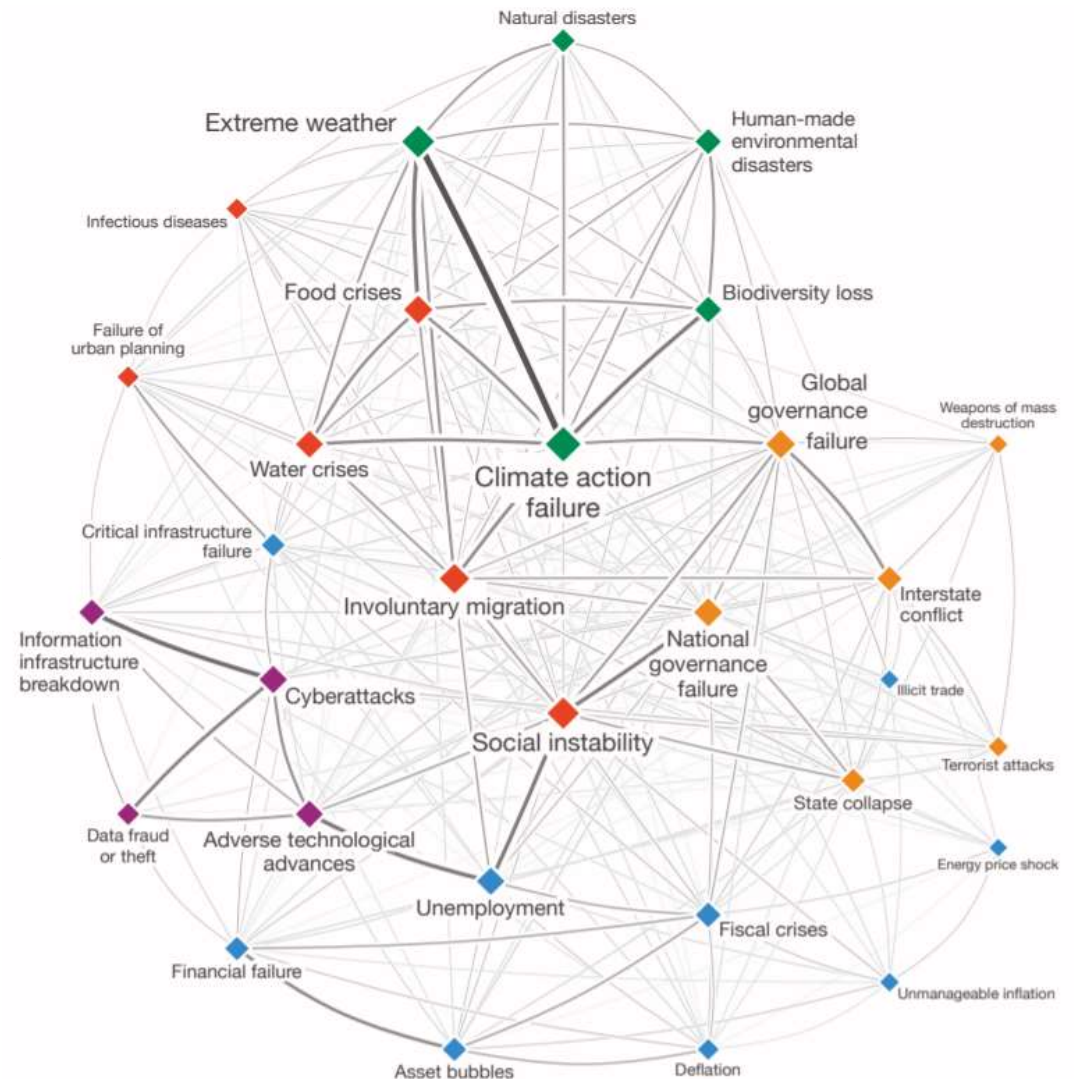
Global Risks Landscape 2020



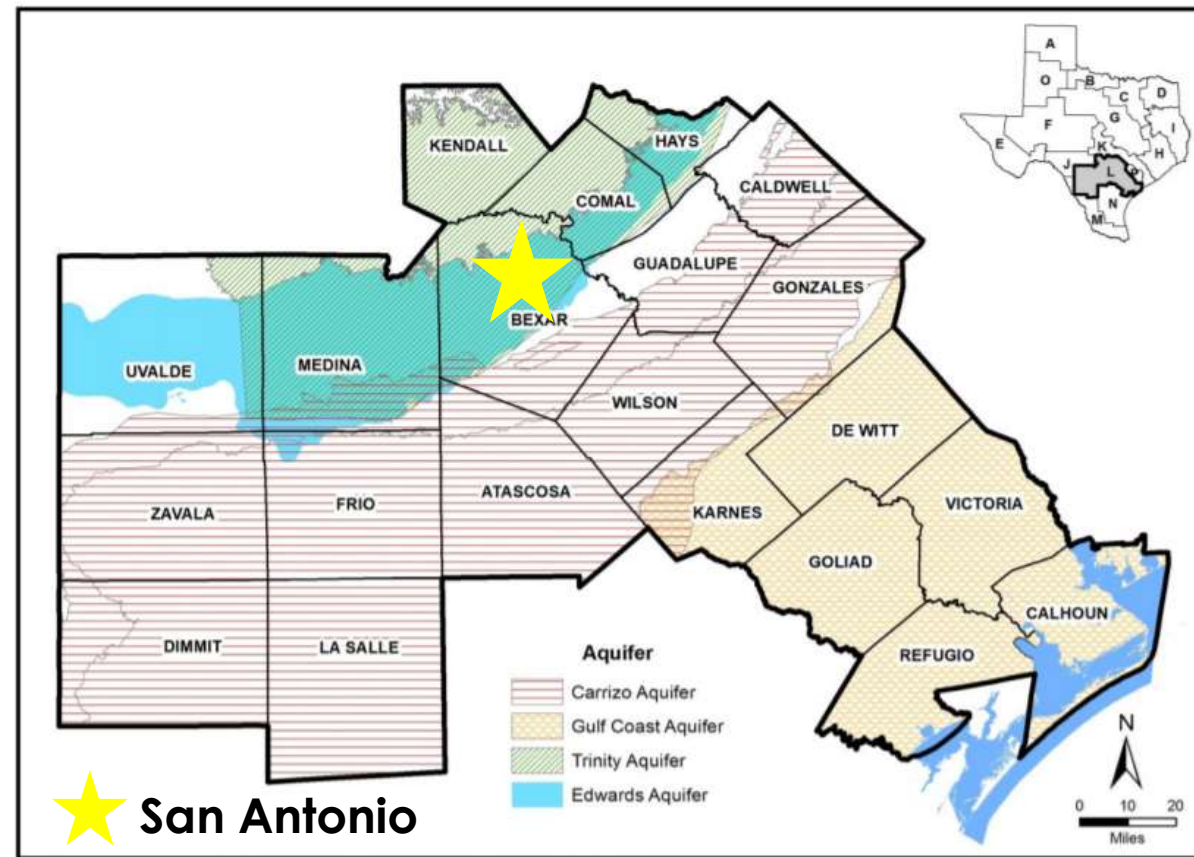
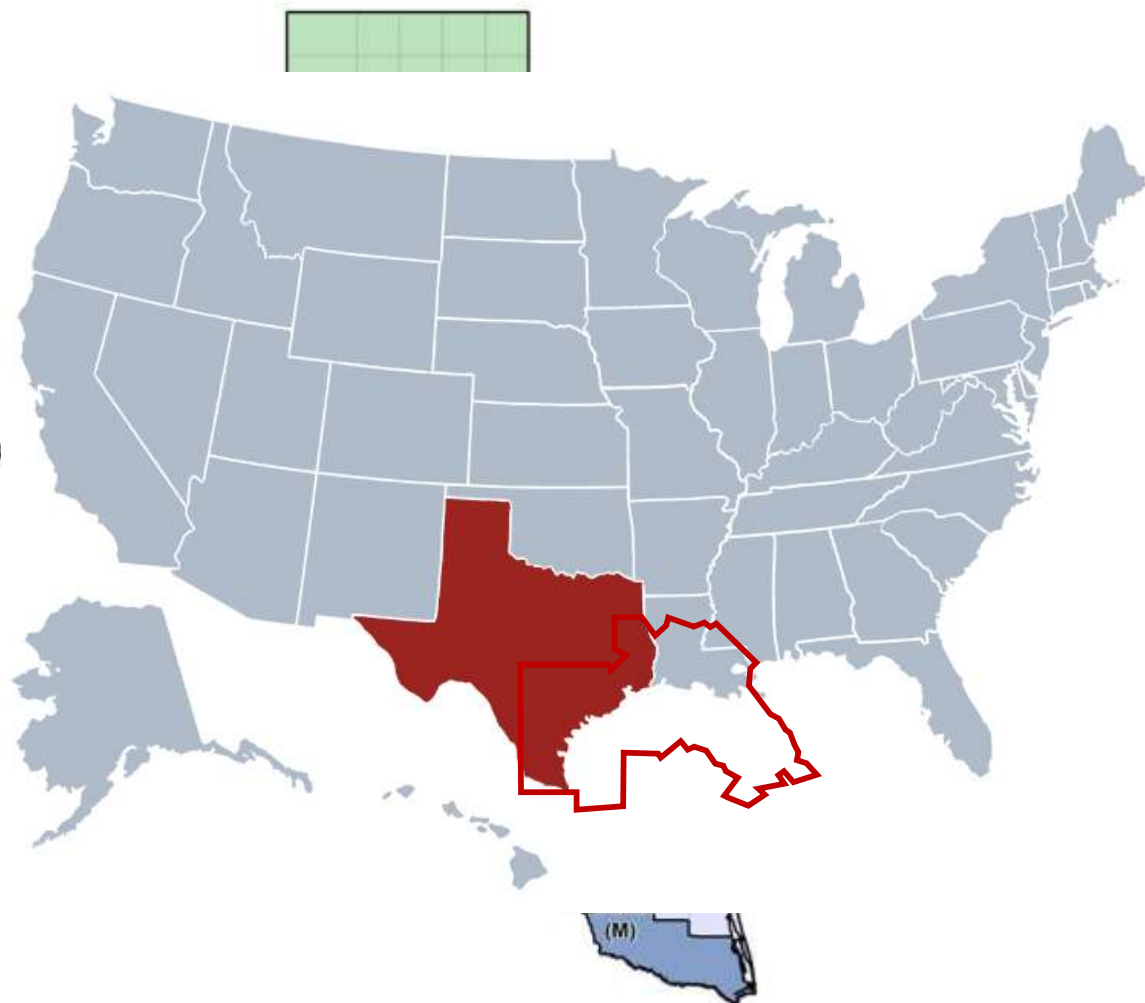
Which are the most **strongly connected** global risks?

- **Highly interconnected** challenges
- Need for **systems thinking**
- **Infrastructure for improving future resilience:**

- environments to innovate at the interface of different disciplines; emergence of new disciplines
- environments to innovate in ways diverse actors cooperate



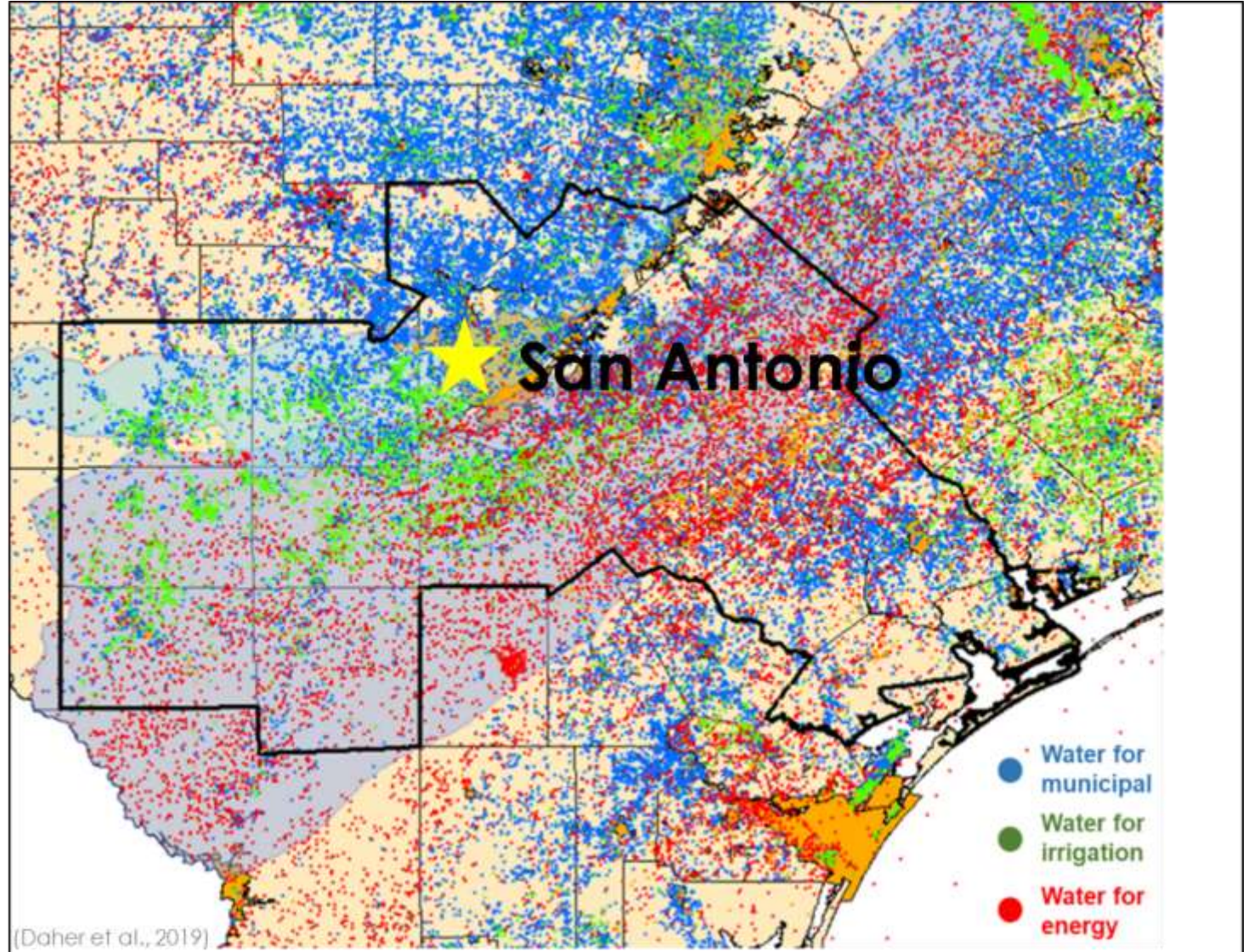
Study Area: San Antonio Region, Texas



Water-Energy-Food Nexus Hotspot

Region L Projections 2020 - 2050

- Population: **+44%**
- Water demand: **+21%**
 - **49%** water for municipal
 - **24%** water for irrigation
 - **25%** water for energy (manufacturing, steam electric power, mining)
- Water shortage: **+78%**
28% of 2050 demand



Gap and Objectives

Gap

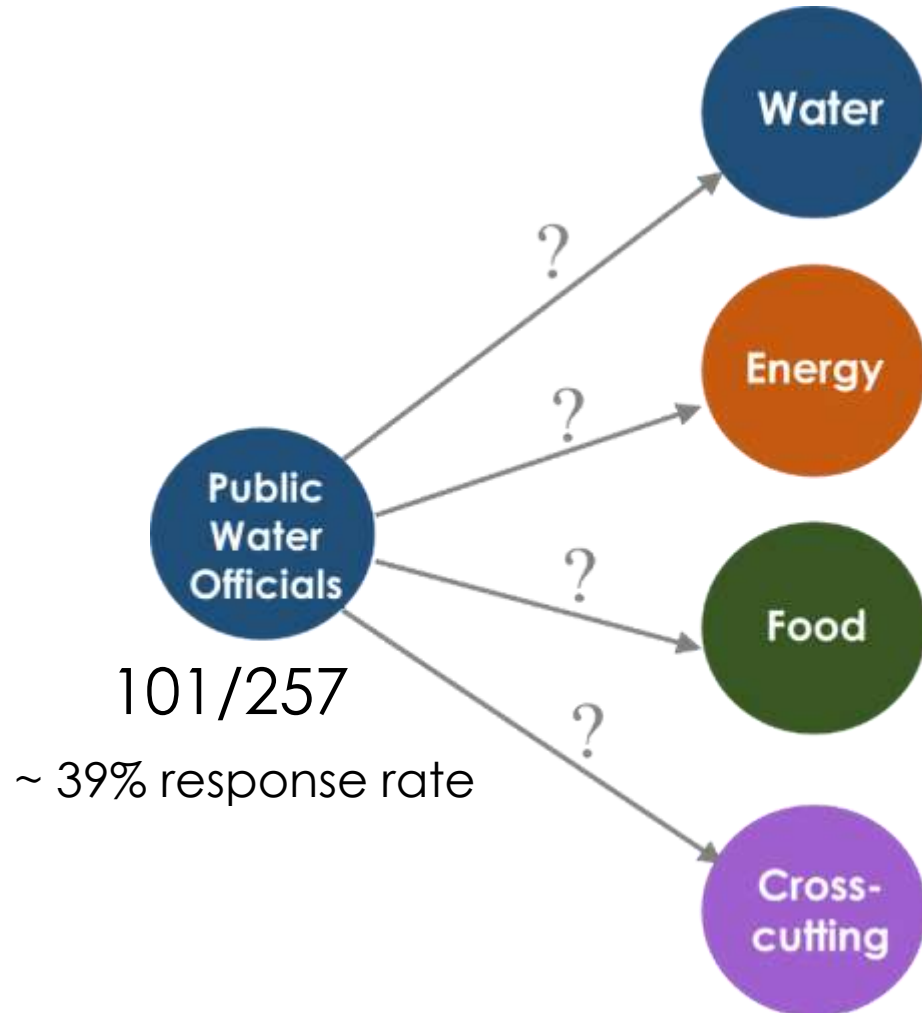
Little is known about the levels of communication and coordination among officials responsible for making the decisions affecting management of interconnected resources.

Objectives

- (1) **quantify** current **levels of communication** between decision makers within water, energy, and food domains
- (2) **evaluate** the relation between water officials' **perception of future water challenges** and **levels of communication**
- (3) **evaluate** the relation between **participation in stakeholder resource planning forums** and **levels of communication**

Methodology

Survey with Water Officials in San Antonio



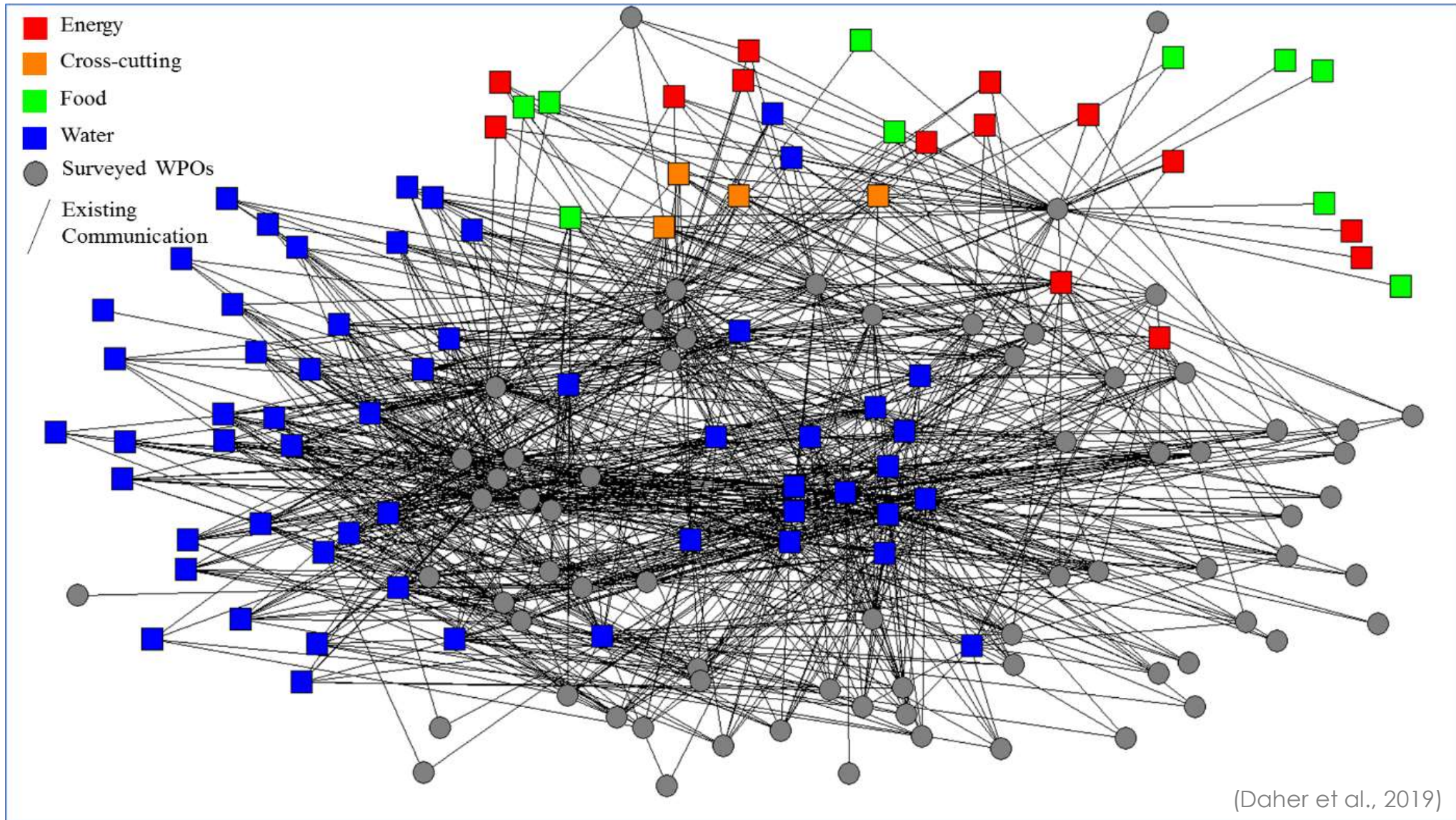
Methods for Stakeholder Identification and classification

- Scoping/literature web search
- Self-identification

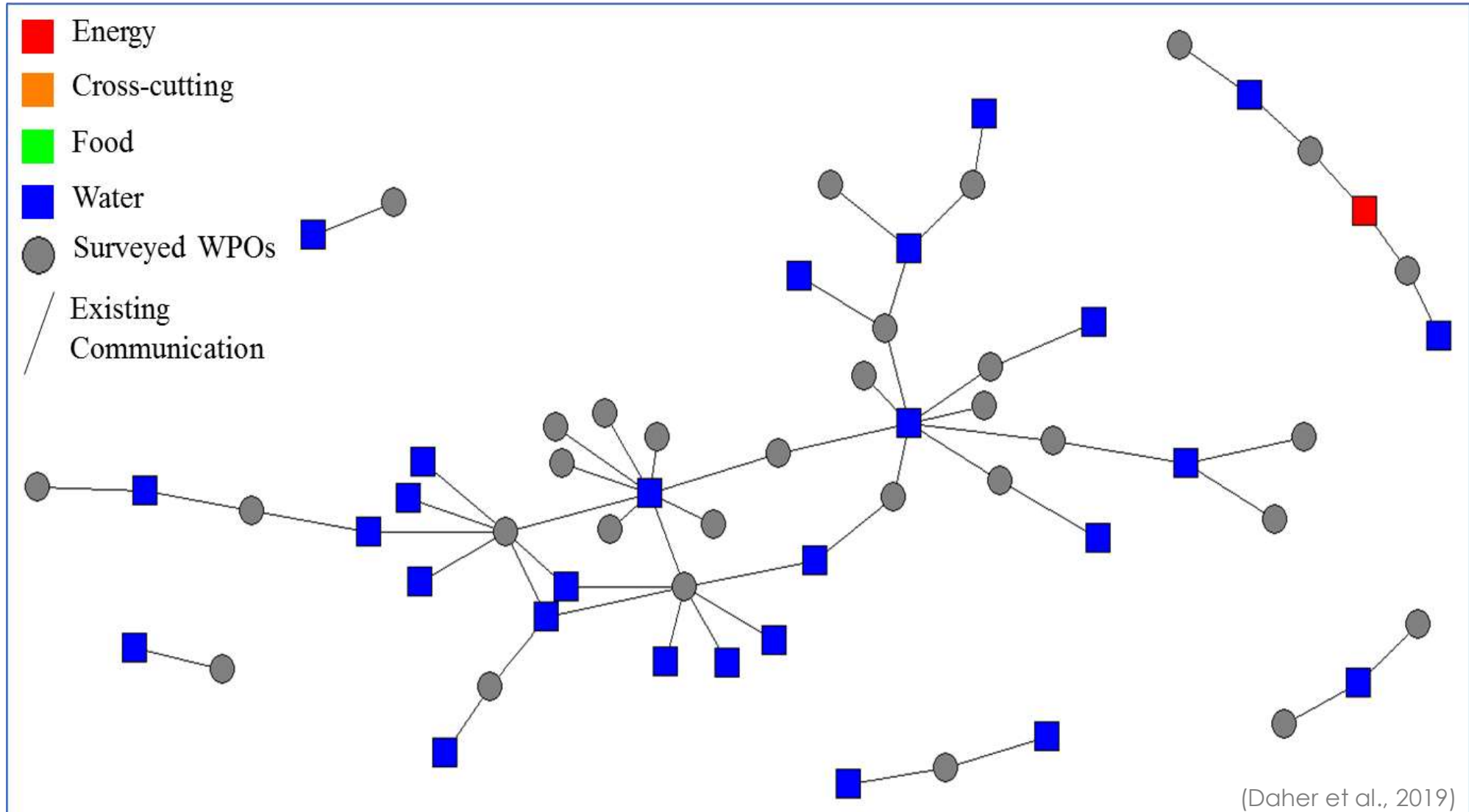
Methods for Stakeholder Relations

- Social network analysis

Network Map: **any level** of communication



Network map: **weekly** communication



Role of participation in engagement meetings

Hypothesis:

The **frequency of communication** of people at water institutions with others from water, energy, and food institutions is **improved as a result of their participation** at stakeholder cooperative planning efforts in San Antonio.

Survey Question

“Over the last year, as part of your job, have you personally participated in any kind of stakeholder forum or cooperative planning effort with organizations or agencies other than your own?”

	No Participation	Participation
No Communication	91%	77%
Some Communication	9%	23%

- Water centric meetings/
directed at water managers

Table 5: Results from Bivariate Regression Predicting the Influence of Stakeholder Forum Participation on Communication

	Model 1: WW	Model 2: WE	Model 3: WF	Model 4: WC
Participation in Stakeholder Forum	0.283** (0.089)	0.050 (0.043)	-0.392 (0.450)	-0.061 (0.364)
Constant	0.270*** (0.063)	0.082** (0.030)	0.830* (0.320)	0.821** (0.259)
R-squared	0.099	0.015	0.008	0.000

* p<0.05, ** p<0.01, *** p<0.001

N=95

Role of concern about future water availability

Hypothesis: People at water institutions who are **less concerned about water's future availability**, are **less likely to communicate** with others from different water, energy, and food institutions in San Antonio.

Survey Question

Overall, how concerned are you about **future water availability** in the San Antonio Region?



Table 6: Results from Bivariate Regression Predicting the Influence of Concern about Water Availability on Communication

	Model 1: WW	Model 2: WE	Model 3: WF	Model 4: WC
Concern for Future Water Availability	-0.014 (0.019)	-0.002 (0.008)	0.010 (0.064)	-0.013 (0.060)
Constant	0.501*** (0.137)	0.125* (0.061)	0.307 (0.470)	0.699 (0.442)
R-squared	0.007	0.001	0.000	0.001

* p<0.05, ** p<0.01, *** p<0.001

N=88

- Insufficient evidence to support hypothesis
- Capacity building/ interconnected challenges
- Lack of mechanisms to communicate

Stakeholder Engagement Workshop

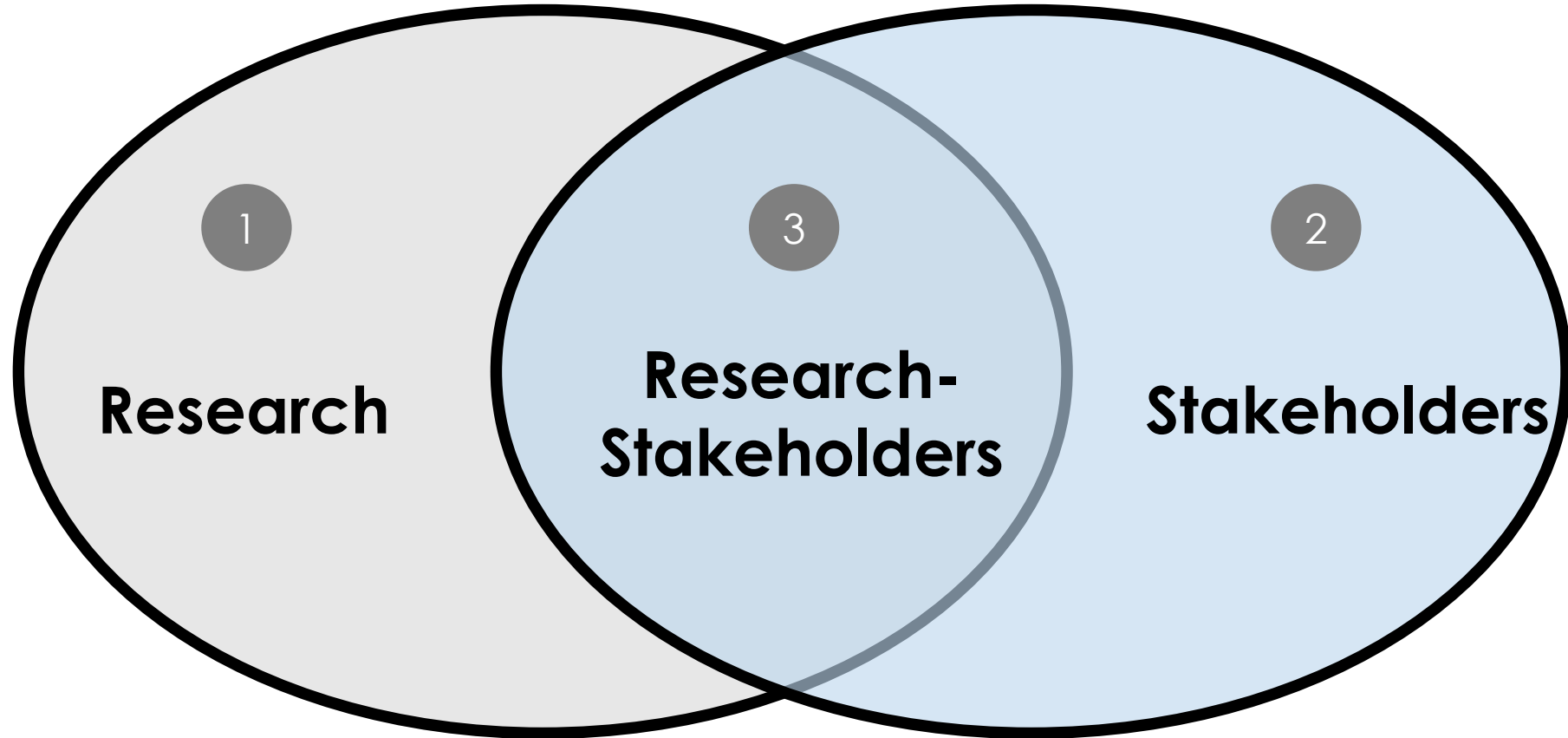
Barriers to Communication



*Stakeholder Engagement Meeting in
San Antonio, TX*

1. **Legal and procedural barriers:** Institutional mandates and lack of coordination mechanisms.
2. **Financial:** who will pay for the time and effort involved in pursuing increased communication?
3. **Uniformity of Language:** units, abbreviations, syntax and context of problems and solutions.
4. **Planning Horizons:** differ for water, energy, and food (10 to 50 years) causing ideological differences and creating barriers.
5. **Different values systems** differ across sectors and organizations.
6. **Competition** between local, regional, global organizations and across industries leads to issues of confidentiality, restricted data.
7. **Self-interest versus collective goals** - Silo mentality
8. **Lack of common goals** and collaborative projects

Enabling Environments



Gap and Study Objectives

Gap

Little work has investigated the **convergence of perspectives** of **academic research groups** with the **regional stakeholders** regarding issues related to the resource challenges faced.

Objectives

- 1) **evaluate level of convergence** between researchers and regional stakeholders perspectives regarding San Antonio Region's WEF challenges;
- 2) **identify barriers to and opportunities for improving communication** between the WEF organizations and the researchers involved.

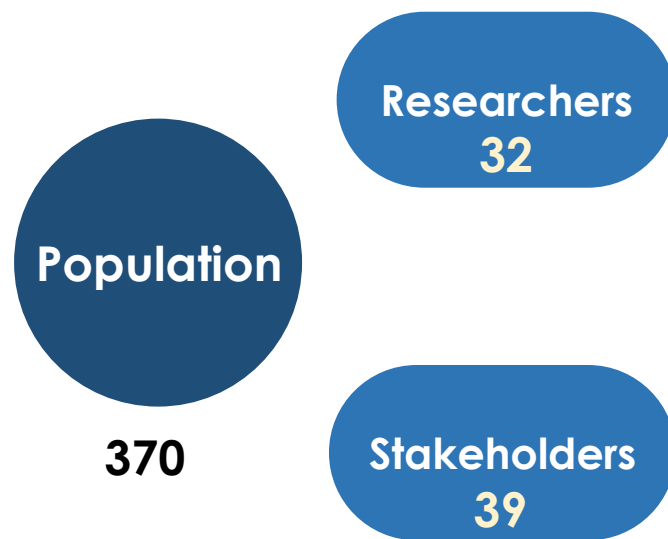
Methodology

Survey with:

- **Researchers** involved with WEF related research in San Antonio
- **Stakeholders:** Governmental, Business, and Civil Society organizations focused on water, energy and food in San Antonio Region

Methods for Stakeholder Identification and classification

- Organizing Committee
- Post workshop survey / snowball sampling
- Scoping/literature web search
- Self-identification



71/370 = 19.2% response rate



- Questions related to WEF in San Antonio
- Gap = Δ means
- t-test



- Survey question about barriers to cooperation
- Convergence: t-test to Δ means

H1: Convergence

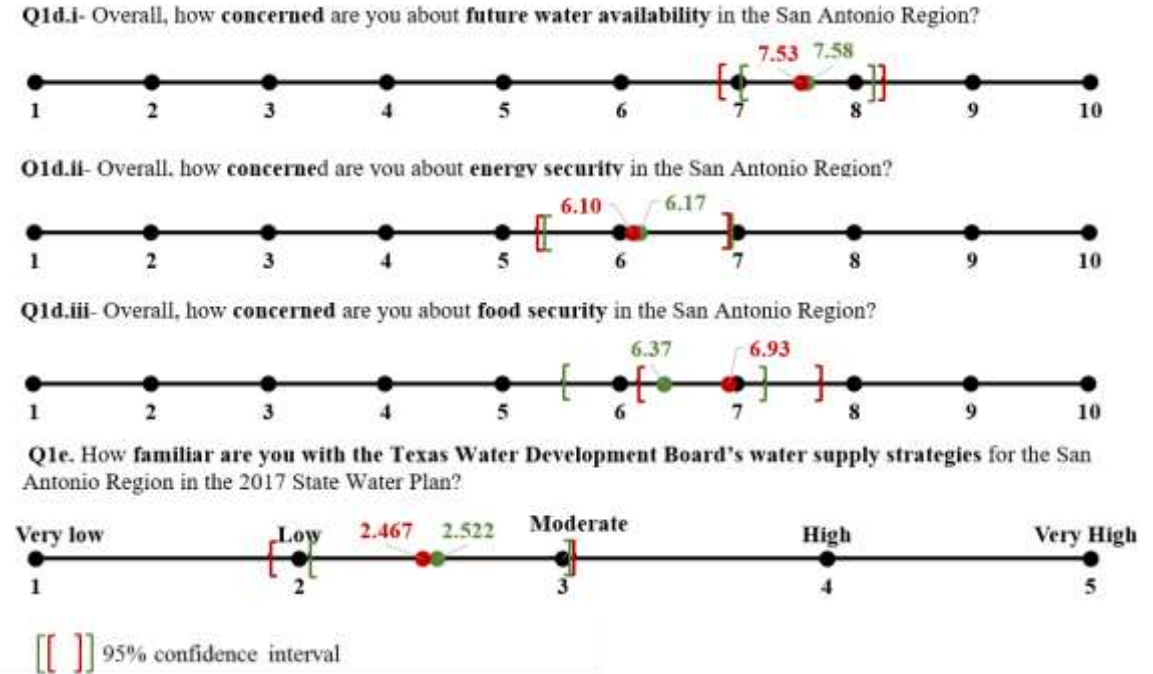
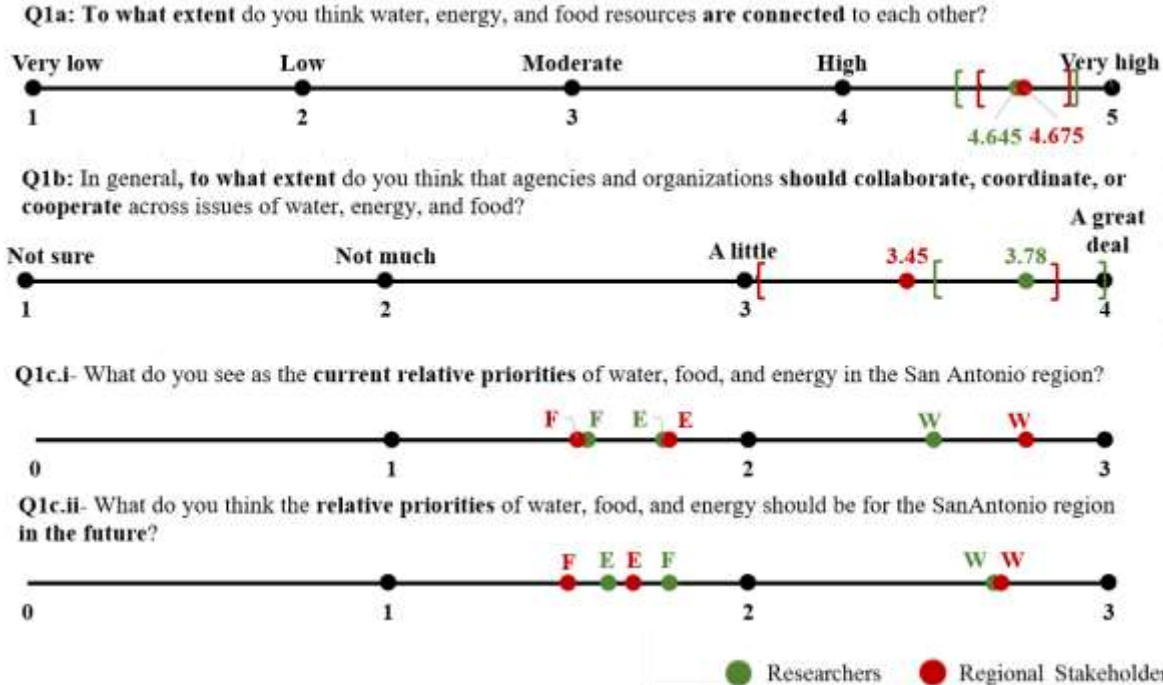
Hypothesis 1: The perspectives of researchers and regional stakeholders from San Antonio converge on water, energy, and food related issues of the region.

Six areas examined:

1. **extent of interconnectedness** between water, energy, and food in the region.
2. **level to which local agencies need to cooperate** across issues of water, energy, and food.
3. **current relative priorities** of water, food, and energy in the San Antonio region, and what they should be in the **future**.
4. **level of concern** towards future **water availability, energy security, and food security** in the region.
5. **level of familiarity** with the **Texas Water Development Board's** water supply strategies for the San Antonio Region in the 2017 State Water Plan.
6. **potential** of different **Texas Water Development Board strategies** in meeting the Region's water needs in the coming 10 years.

H1: Convergence (6 areas)

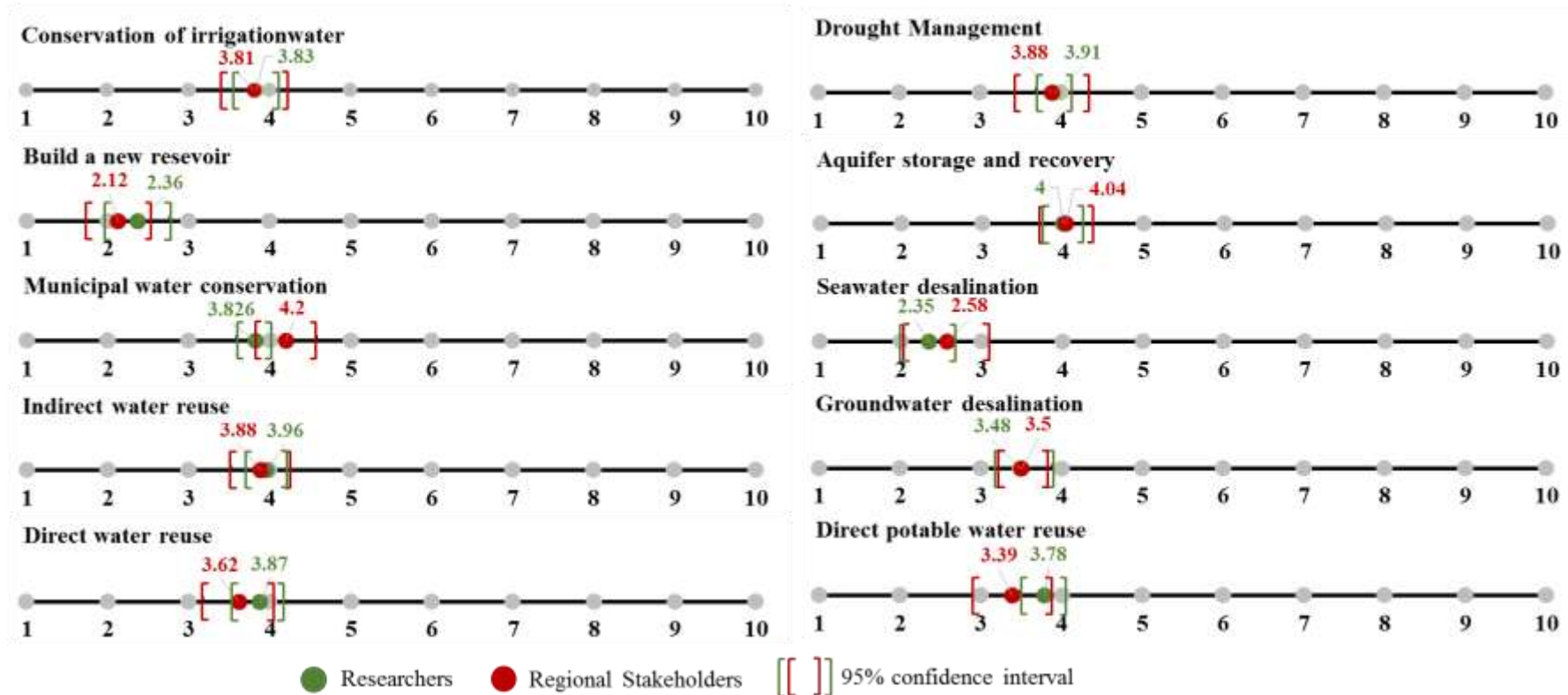
Convergence over the six areas



- difference of perspectives is not statistically significant, indicating **aspects of convergence**
- difference in **future relative priorities**

H1: Convergence (TWDB strategies)

Please indicate **how much potential** you think each **listed strategy** has for managing water to help the San Antonio Region meet its water needs over the next ten years?



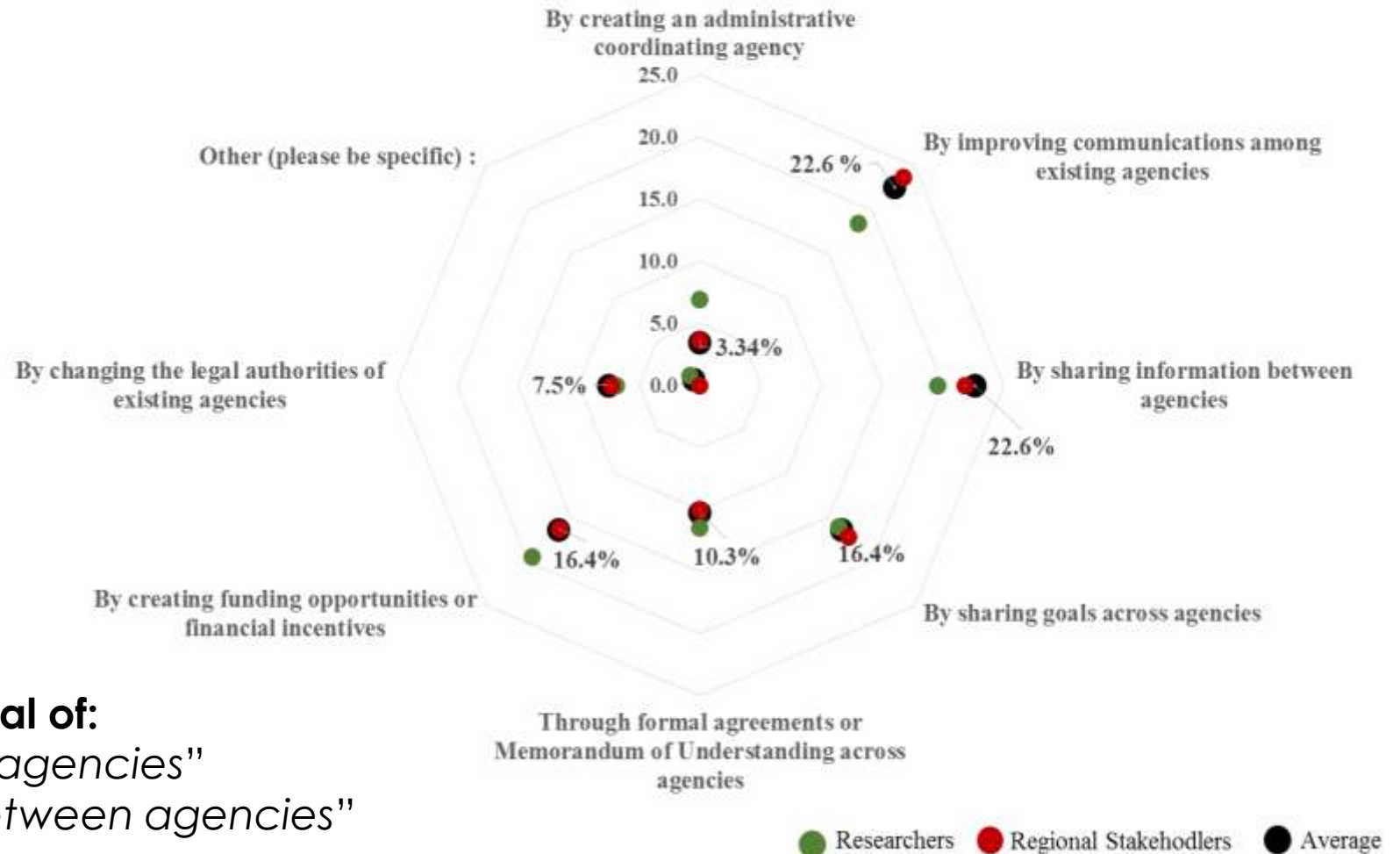
- **Researchers** highest potentials: 1) **aquifer storage and recovery**; 2) indirect water reuse
- **Regional Stakeholders** highest potentials: 1) municipal water conservation; 2) **aquifer storage and recovery**
- **Convergence** on lowest potential: “**building a new reservoir**”
- **insufficient evidence** to conclude no convergence between both groups regarding the potential of TWDB’s regional water strategies.

H2: Improving cooperation

HYPOTHESIS 2:

Researchers converge with regional stakeholders from San Antonio over **ways to achieve greater cooperation** between water, energy, and food organizations in San Antonio Region.

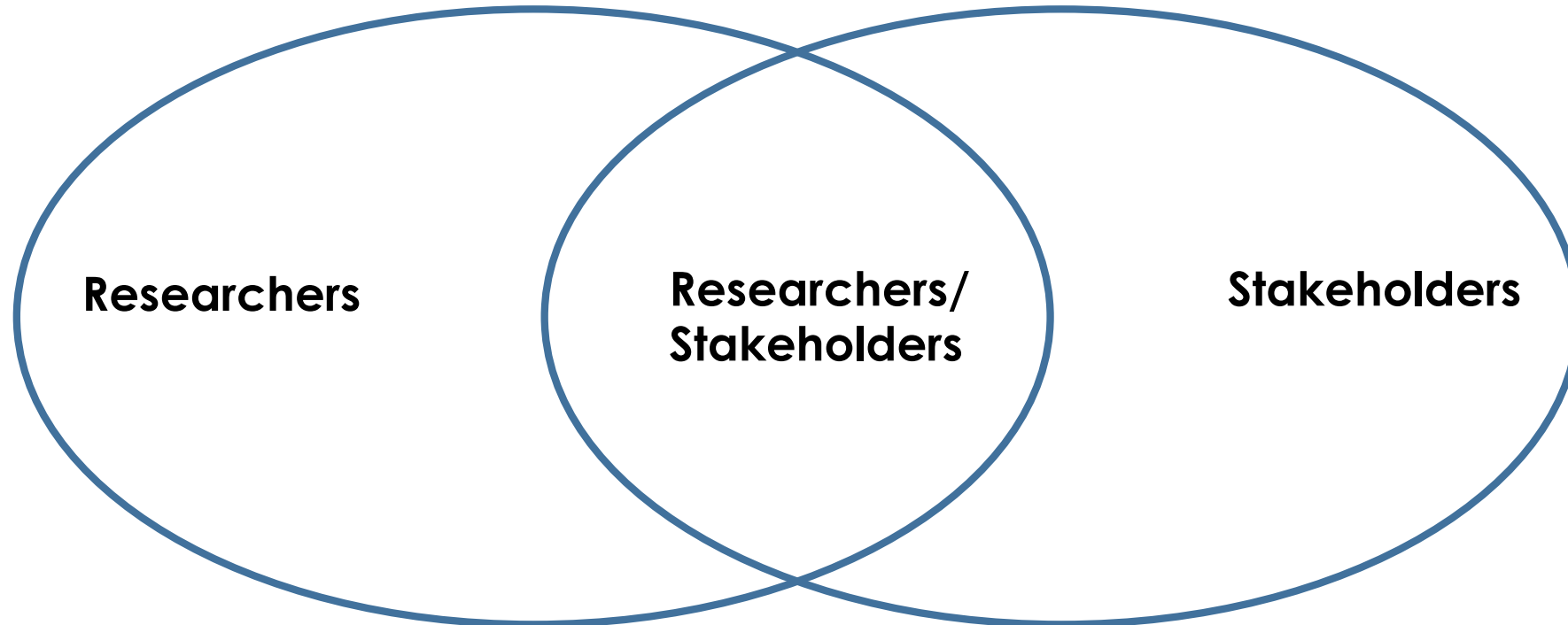
In your view, how could cooperation across issues of water, energy, and food best be accomplished?



Convergence on the high potential of:

- “sharing information between agencies”
- “improving communication between agencies”

Three enabling environments



- Daher, B., Hannibal, B., Mohtar, R. H., & Portney, K. (2020). **Toward understanding the convergence of researcher and stakeholder perspectives related to water-energy-food (WEF) challenges: The case of San Antonio, Texas.** *Environmental Science & Policy*, 104, 20–35. doi: 10.1016/j.envsci.2019.10.020
- Daher, B. (2019). **Bridging Physical and Social Sciences to Unlock New Potential for Addressing Interconnected Resource Challenges.** PhD Dissertation, Texas A&M University.

Thank you

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