

# Nexus of Water Intake, Water Security and Climate Resilience:

A System Science Approach to Improving  
Water Security and Community Health  
in a Changing Climate

NNR-25.564: Nexus-Water Navajo Nation

October 21st, 2025



The Sumner M. Redstone Global  
Center for Prevention and Wellness  
Milken Institute School of Public Health

# Introduction

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- Dr. Xindi Hu, Principal Investigator, George Washington University (GW)
- Dr. Sonya Shin, Co-Investigator, Brigham and Women's Hospital (BWH)
- Carmen George, Co-Investigator, BWH
- Dr. Uriyoán Colón-Ramos, Co-Investigator, GW
- Dr. Daniel Chen, Co-Investigator, GW

\*This project was supported by a pilot grant from the Sumner M. Redstone Global Center for Prevention and Wellness at The George Washington University Milken Institute School of Public Health

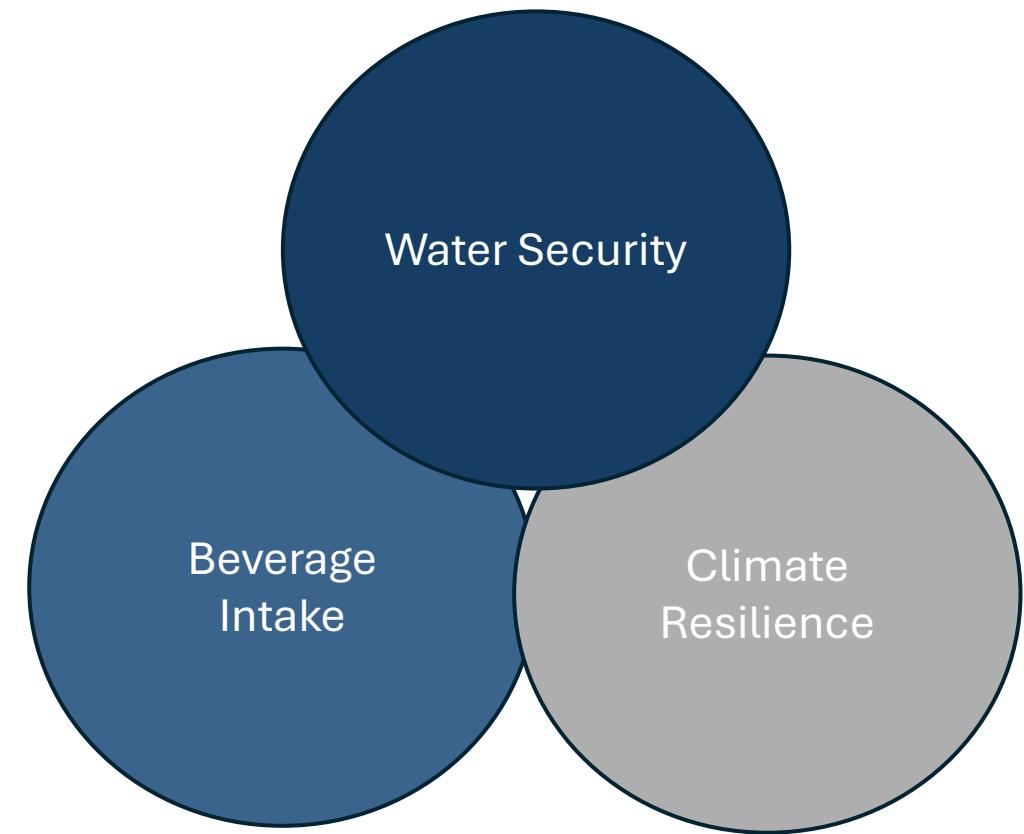
# Project background

- Navajo communities possess generations of knowledge and resilience in managing water resources across diverse and changing landscapes.
- Climate change brings new challenges (drought, saltwater intrusion, and runoff) that threaten the reliability of safe drinking water and place additional strain on these local systems.
- Many households continue to draw on traditional and innovative strategies to secure safe, affordable, and culturally preferred water and beverage sources.
- This project builds on that strength, engaging community members as partners to co-identify drivers of water insecurity and co-develop healthy, sustainable, and climate-resilient beverage choices.



# Addressing a Gap

- Few initiatives meaningfully integrate community expertise to understand how water security, beverage choice, and climate resilience interact.
- Needs: A community-based systems approach to create space for Navajo community members to map complex relationships, identify key lever points, and guide solutions rooted in local priorities and cultural values.



# Importance of Climate Resilience in this Work

- Working with the Water is K’é project team
  - K’é : the system of kinship observed between Diné people and all living things in existence.
  - K’é emphasizes our interconnectedness with the natural and spiritual world of living beings, caring for water and environment is part of caring for community.
- What is new in this project?
  - As climate change increases droughts and rising temperatures, it is essential to combine community knowledge with data-driven tools to anticipate and adapt to changing conditions.
  - A forward-looking and relationship-based approach, ensuring that future water solutions honor cultural values and strengthen community capacity.



[Institute for Policy Studies Drought New Mexico, 2018](#)

# Project objective

This project aim is to develop a shared understanding with community members on the factors that influence drinking water access and safety, and other beverage consumption in the Navajo Nation in the context of a changing climate.

# Benefits to the Navajo Nation

- Knowledge:
  - The knowledge gained from the overall study will inform future nutrition and sustainability interventions to reduce sugar-sweetened beverage consumption and promote healthy hydration sustainably in Navajo Nation.
- Coordination with local projects:
  - We have partnered with Dr. Sonya Shin and Carmen George from Brigham and Women's Hospital, who lead the Water is K'é project
  - During the Water is K'é project, multigenerational feedback taught us about the cultural importance of water and how water quality concerns influence beverage choices
  - Our planned group model building (GMB) workshop will provide complementary data to existing work in the Water is K'é project to design community-lead interventions

# Timeline and Key Milestones

						
<b>September – October'25</b>	<b>October 21st</b>	<b>November</b>	<b>Late December' 25 – February'26</b>	<b>February-April'26</b>	<b>April-June'26</b>	<b>July'26</b>
Development and Screening of Navajo Nation Research Application	NNHRRB Meeting Presentation	Study Implementation GMB Workshop on November 17th	Data Analysis and Preliminary Findings Member check-in with participants to confirm findings	Data Work Session	Final Report and Dissemination Plan	Transfer of Data

# Community Involvement

## Location of Workshop:

- Farmington, New Mexico

## Planning:

- The study project was developed based on the feedback that we have gathered through community listening and from our community advisory group members (CAG).

## Implementation:

- We will work with community members including parents and caregivers of children, youth, CAG members, educators, public health practitioners, and growers in this project
- Inviting them to take part in the event.

# Community Involvement

## Dissemination of findings

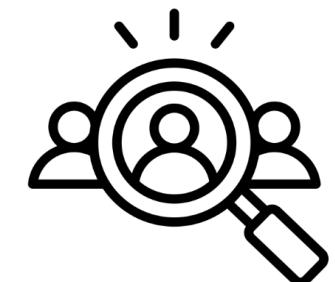
- We will meet again with participants virtually a month or two after the workshop to present the findings and receive feedback on the results to ensure that we have accurately captured their perspectives.
- Findings of the workshop will be shared with participants in a newsletter after analysis is complete.

## Technical Assistance:

- We will collaborate with local communities to apply for grants
- We will present the study findings at the Navajo research conference.

# Recruiting Participants

- Existing Community Advisory Group (CAG)
  - The Water is K'é project's CAG will be invited to participate in the workshop.
  - The existing CAG consists of public health providers, community activists, traditional knowledge holders, early educators, cultural experts, health promotion experts, parents, and elders.
- Recruitment procedure:
  - Potential participants will be approached by Dr. Shin and Carmen to ask if they would be interested in participating in the workshop.
  - A date and time for the workshop will be shared with participants if they are interested in participating.
  - The study team will explain the purpose of the workshop and invite potential participants to ask questions about the project and/or workshop.
- Workshop participants will be compensated with a \$50 gift card for their time (~4 hours)



# Methods and Procedures

- The workshop will use Group Model Building methods to facilitate discussions among the community members.
  - [Link to Group Model Building scripts](#)
- The workshop will be recorded, transcribed (including the replacement of any identifiable information), and analyzed by the research team.
- After initial analysis of the workshop findings, the research team will coordinate another date to meet with participants (virtually) to relay the findings and ensure that the results captured are an accurate representation of the group's perspectives on water access and safety.

# Thank you!

Dr. Xindi (Cindy) Hu

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# Research Team



## Advisory board

Dr. Wendy Ellis, GWSPH

Dr. Ana Maria Garcia Blanco, Instituto Nueva  
Escuela de Puerto Rico (INE PR)

Dr. Charlotte Wagner, Stockholm Environment  
Institute



## Research support team

Natalia Guerra Uccelli, GWSPH

Sneha Rout, GWSPH

# Table of Group Model Building Scripts

Script Name	Function Outputs	Outputs
1. Elephant Parable	The Elephant Parable introduces the concept of system dynamics to participants through a metaphor for complex systems.	Participant familiarity with complex systems
2. Hopes and Fears	Hopes and Fears helps elicit and establish expectations around the GMB session and the overall project.	List of participant hopes and fears grouped by themes
3. Presenting the Reference Mode	Presenting the Reference Mode helps develop shared understanding among participants about the dynamics of the problem and the group's preferred dynamics of the issue in the future.	A behavior over time graph for the model problem
4. Variable Elicitation	Variable Elicitation helps facilitate shared understanding about the model problem and boundaries for causal loop diagram development.	A list of key variables related to the problem
5. Dots	Dots allows participants to vote on key variables and further define the boundaries of the causal loop diagram.	A shortened list of prioritized variables
6. Causal Mapping in Small Groups	Causal Mapping in Small Groups is led by a facilitator to draw a causal loop diagram or systems map by building inclusive conversations within subgroups. This is followed by a 'report-out' where smaller groups show their output and explain it to the other groups for mutual learning.	A sub-group causal loop diagram or systems map
7. Reflector Feedback and Action Items	Reflector Feedback is given by a reflector who summarizes insights told in small groups. The reflector also seeks elicitation of action items.	A summary of insights from the GMB session and a list of action items elicited from participants.
8. Summary of action items, Next Steps & Closing	During Next Steps & Closing, participants raise ideas for project next steps and build shared understanding on how to collaborate in the near future.	Short term plan for continuing the work