



# COEQWAL: Democratizing California's Water Futures

**COEQWAL**  
COLLABORATORY FOR EQUITY IN WATER ALLOCATION

Wietske Medema, Program Manager  
Environmental Science, Policy, and Management  
University of California, Berkeley

# How we got here

*19th century institutions*



*21st century climate*



*20th century infrastructure*



- Climate impacts intensify water supply variability
- Infrastructure and institutions lag behind evolving needs
- Longstanding inequities in water access and decision-making

# What is California's Water Future?



# California Climate Action Initiative

- \$100M from California to UC for climate action research and innovation that meet needs of state
- Support applied research on climate resilience, adaptation, and mitigation, with an emphasis on vulnerable communities
- Produce actionable results within 2 years

UNIVERSITY  
OF CALIFORNIA Research &  
Innovation



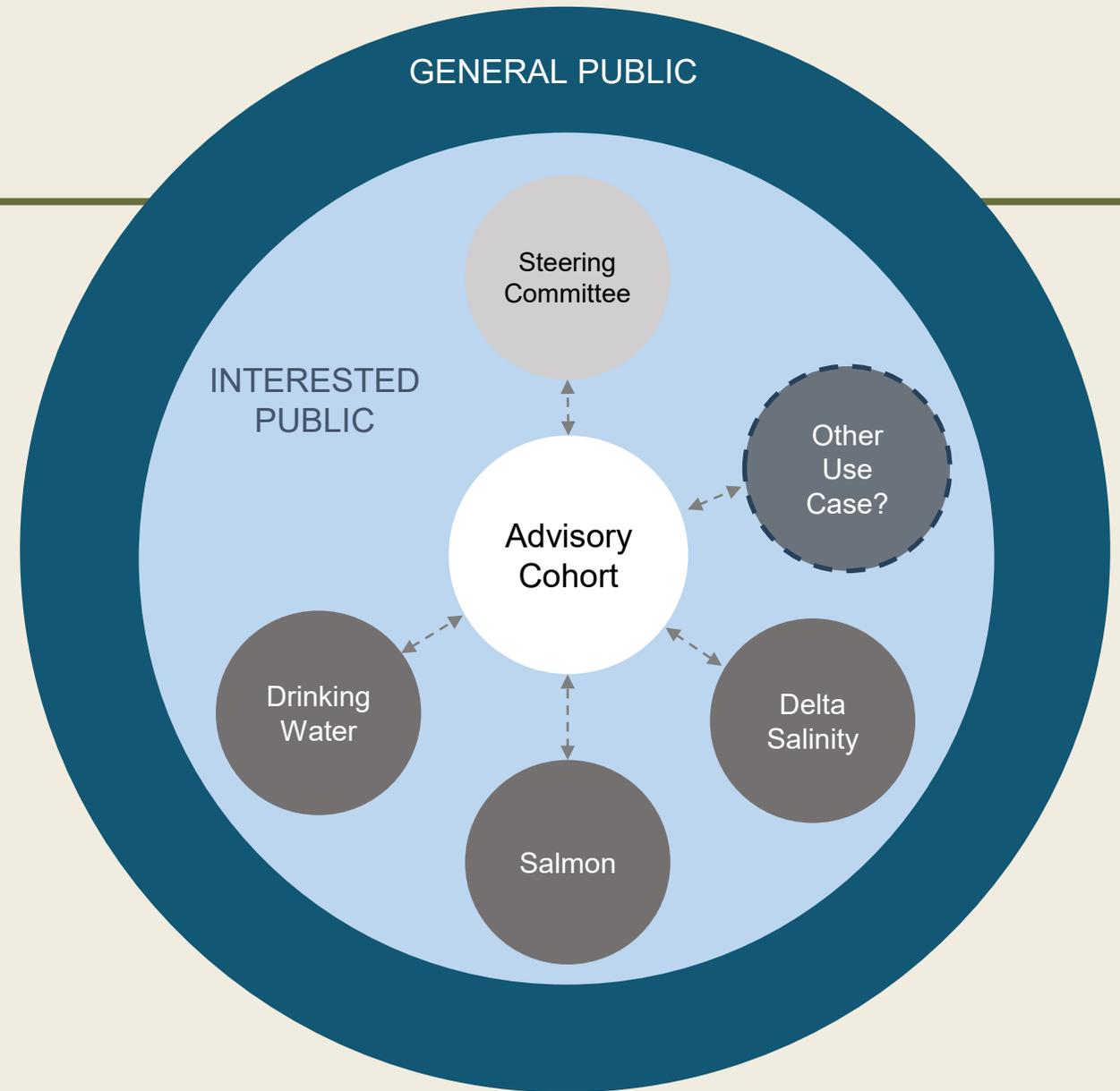
# COEQWAL Project Goal & Objectives

Our overarching goal is to establish an inclusive participatory process that diversifies and enhances engagement in water planning and stewardship.

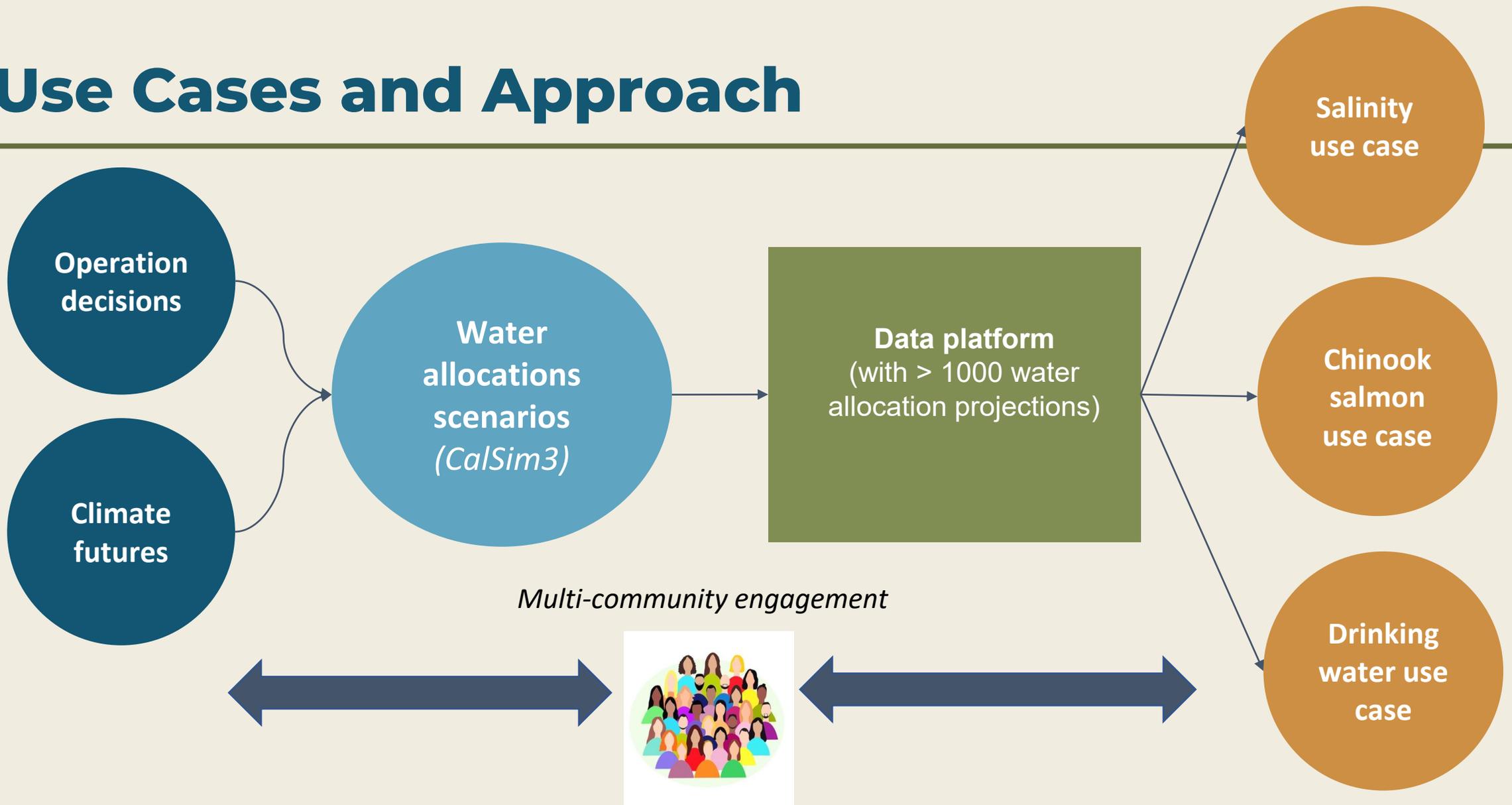
- **Democratize** water futures through inclusive engagement
- **Uplift** historically marginalized communities
- **Advance** equity via open-access data and tools
- **Foster** dialogue and shared understanding
- **Facilitate** collaborative learning about water systems and community values
- **Develop** an accessible data platform to explore scenarios and trade-offs
- **Demonstrate** decision relevance through real-world use cases

# Engagement Structure

- **Steering Committee:** 12–15 agency, tribal, NGO, and water district reps
- **Advisory Cohort:** 40–50 community voices (esp. tribal, EJ)
- **Use Case Groups:** 10–20 stakeholders per topic (e.g., drinking water, salmon)
- **Public Engagement:** Open workshops and outreach materials



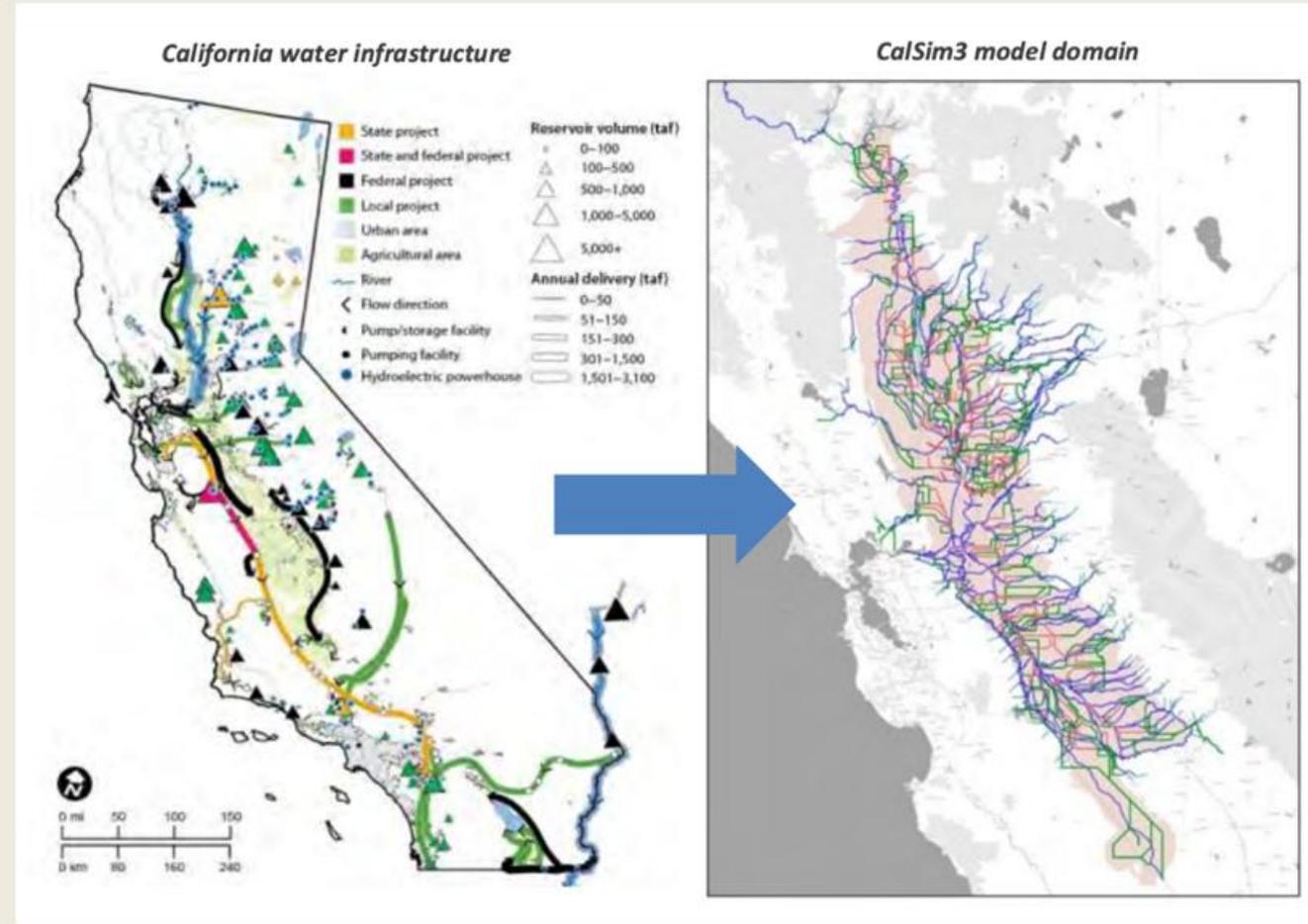
# Use Cases and Approach



# California Water Operations Models

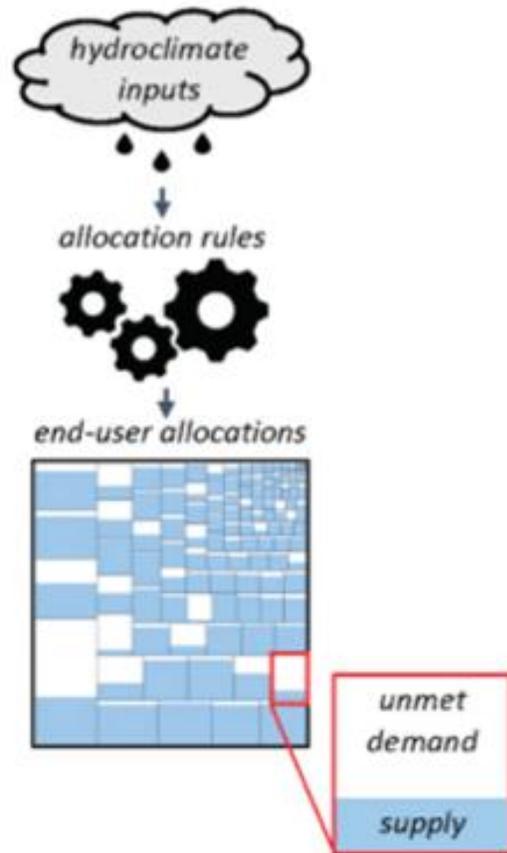
**CalSim3** - water allocation and planning tool for the Central Valley and interconnected basins

Developed by the California Department of Water Resources and US Bureau of Reclamation



# Broader Community-Informed Library of Water Futures

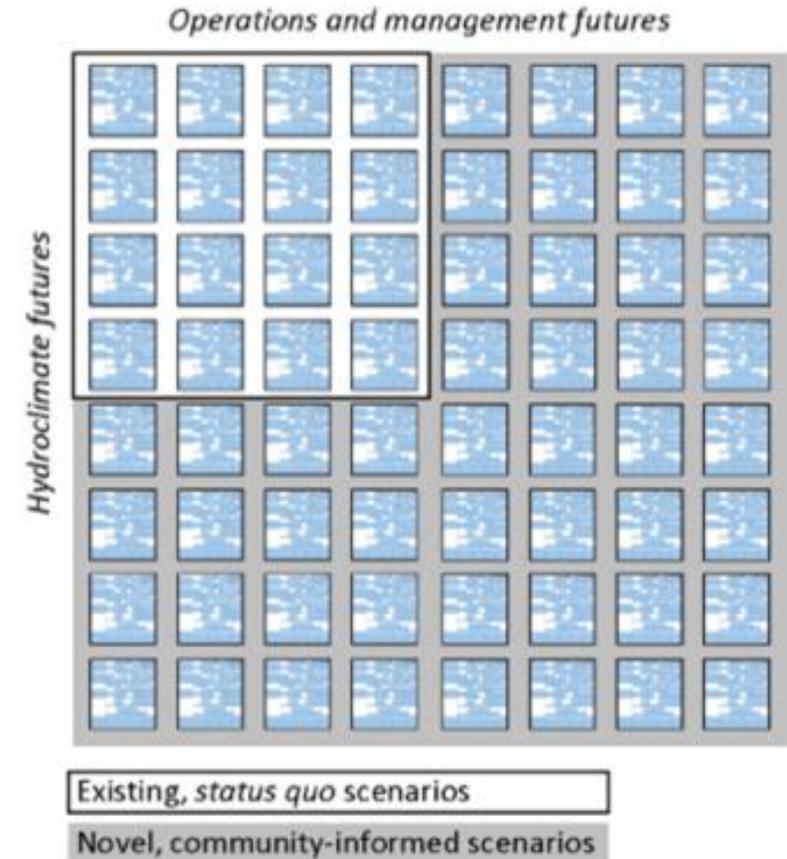
A. CalSim model run



B. CalSim model domain



C. COEQWAL water allocation data library

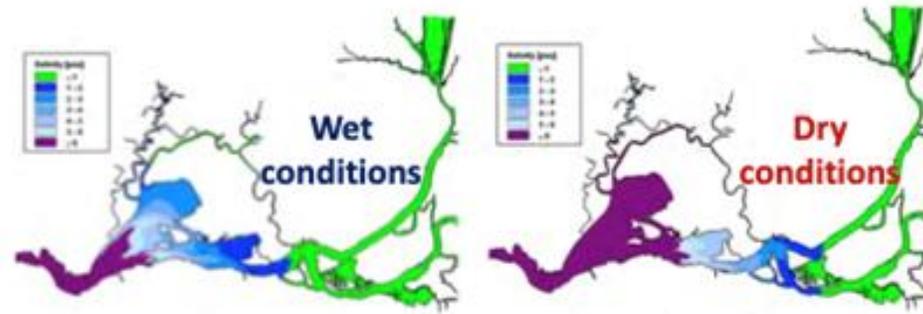


# Trade-off assessments – Linking other Models

allocation scenarios

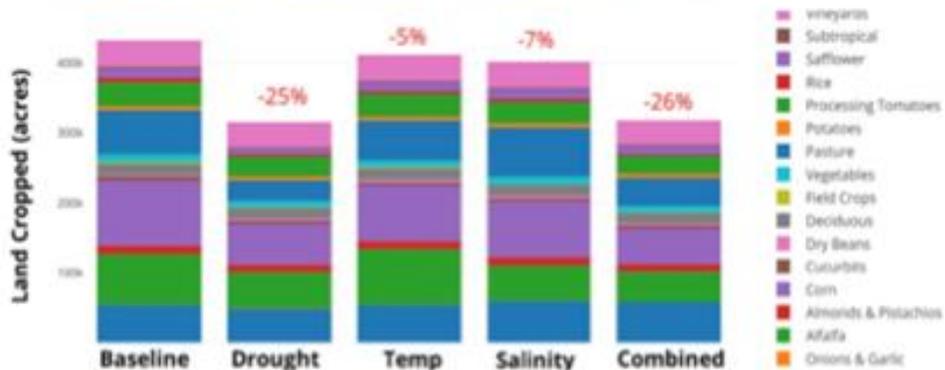


linked models

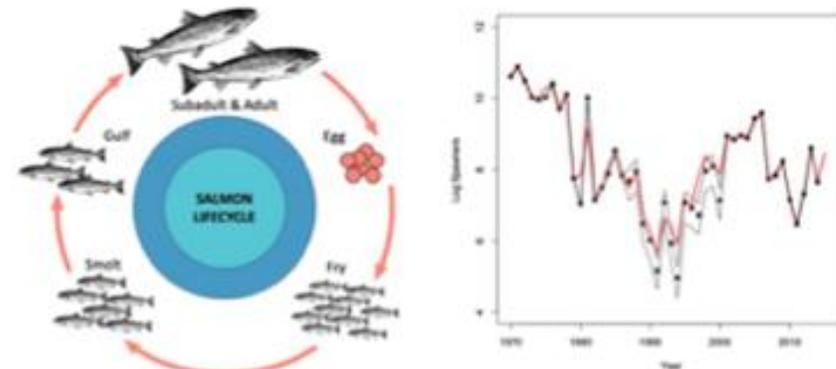


Modeled extent of brackish Low-Salinity Zone  
Source: Herbold and Vendlinski, 2012.

Scenario Output Results – Land Cropped (acres)



Delta Adapts results on crop changes from openDAP model  
Source: Medellin-Azuara



Winter Run Salmon Life Cycle Model  
Source: NOAA

# Scenario themes

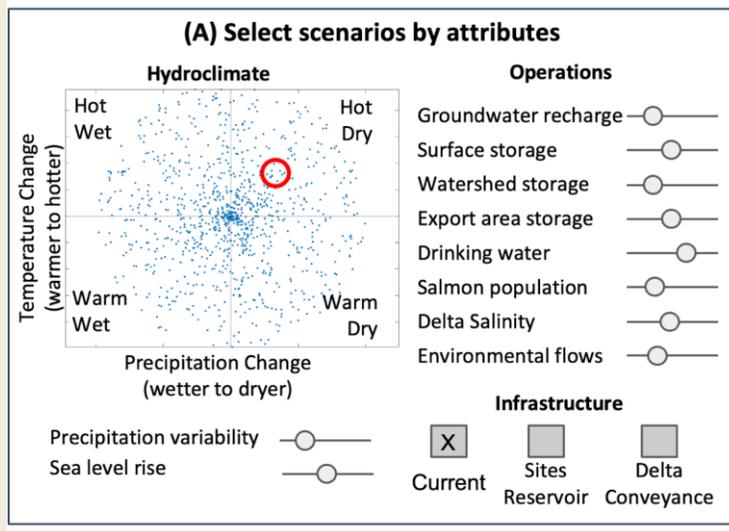
---

1. Current operations for California Water
2. Managing Groundwater in a changing agricultural landscape
3. Changing river flows for the environment
4. Prioritizing drinking water for communities
5. Changing Delta outflows for the environment
6. Improving reliability of Delta exports for farms and cities
7. Sustaining uses in the Delta for communities and farms

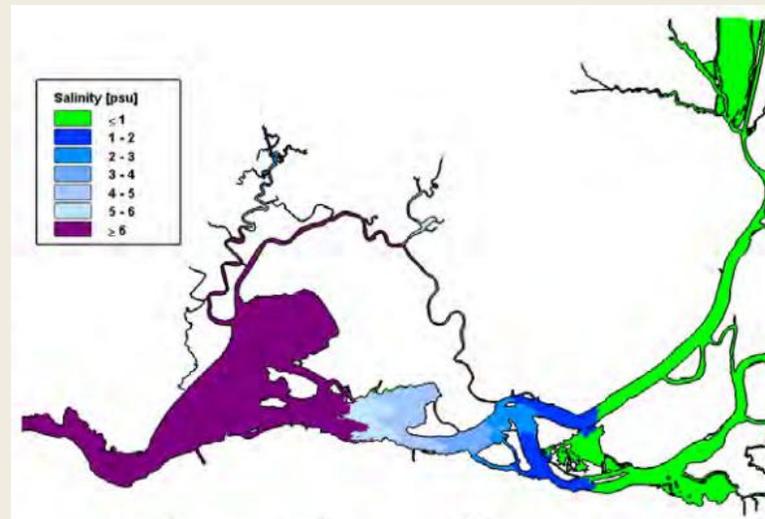
# What Does Success Look Like?

- A dynamic website that invites exploration of water futures
- A community that sees its values reflected in decisions
- A culture shift toward collaborative, equitable water governance

## Web platform



## Visualization tools



## Human networks



**"Water equity is malleable** in that it is subject to the context in which it exists and people's perceptions, which differ both spatially and temporally. This suggests that **water equity is an iterative and continuous process.**"

Higgs and Meissner, 2024.

# Equity Dimensions

## ● **Distributional Equity – “Crown”**

Ensures fair and just outcomes — like access to water and environmental benefits — especially for historically underserved communities.

## ● **Procedural Equity – “Trunk”**

Promotes inclusive, transparent decision-making processes that give communities real voice and power.

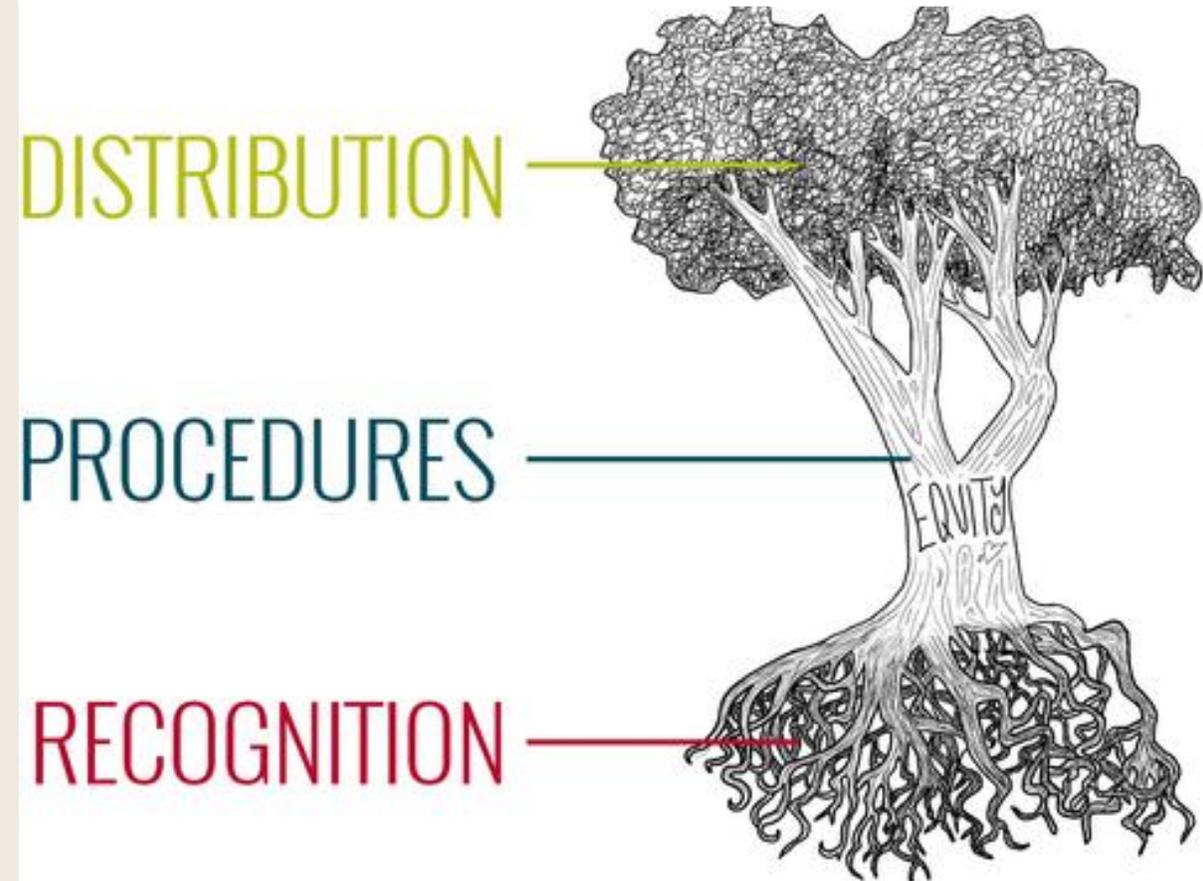
## ● **Recognitional Equity – “Roots”**

Acknowledges diverse cultures, identities, and histories, especially those of Indigenous and marginalized communities.

## ● **Structural Equity – “Environment”**

Focuses on transforming the systemic conditions — laws, policies, and institutions — that shape and perpetuate inequities.

## STRUCTURAL



# Evaluating Distributional Equity with Tiered Thresholds

We combine **modeling**, **tiered thresholds**, and **community-informed context** to assess equity across scenarios:

 <b>Scenarios</b>	Water futures modeled with CalSim3
 <b>Tiered Thresholds</b>	Define levels of access, from critical to thriving
 <b>Needs-Based Lens</b>	Recognize that needs vary by region, climate, and culture
 <b>Focus Areas</b>	Drinking water, agriculture, ecosystems, and Delta communities
 <b>Equity Insights</b>	Identify who is underserved and where trade-offs emerge

# Primary outcome thresholds

## → “Key outcomes” for scenario themes

1. Current operations for California Water
2. Managing Groundwater in a changing agricultural landscape
3. Changing river flows for the environment
4. Prioritizing drinking water for communities
5. Changing Delta outflows for the environment
6. Improving reliability of Delta exports for farms and cities
7. Sustaining uses in the Delta for communities and farms



- **Community water deliveries**
- Environmental river flows
- Salmon population status
- Agricultural production
- Delta outflow (ecosystem health)
- Delta exports (salinity control)
- Water quality for in-Delta uses
- Reservoir storage
- Groundwater levels

# Thresholds – What are they, and why do they matter?

## What Is a Threshold?

A threshold is a **meaningful boundary** — a specific value that marks a critical point. Below it, **risks increase**. Above it, systems can **function, survive, or thrive**.

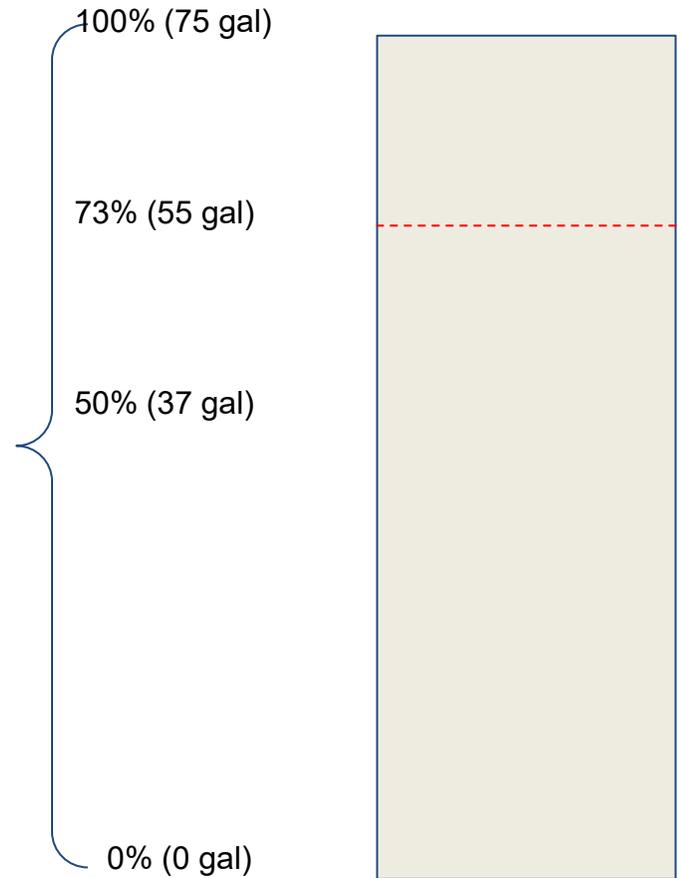
## Why Thresholds Matter?

-  **Translate model outputs** into real-world outcomes
-  **Prioritize needs** during scarcity
-  **Assess performance and distributional equity** across the system
-  **Evaluate resilience** by showing which areas stay viable or adapt over time

# Defining performance metrics and thresholds

Continuous values that measure the degree to which an objective is met (gallons, TAF, % of CalSim demand, etc.)

Example: if CalSim defined demand equals 75 gallons per day, a performance metric could include the % of 75 gallons delivered.



**Threshold:** a discrete value of an outcome that has a clearly defined interpretation and meaning.

Example: the CalSim defined demand equals 75 gallons per capita per day, and the “short-term survival minimum” threshold equals 55 gallons per capita per day (or 73% of the CalSim defined demand).

CalSim defined demand

Additional water above what CalSim thinks is required

# Why tiered thresholds?

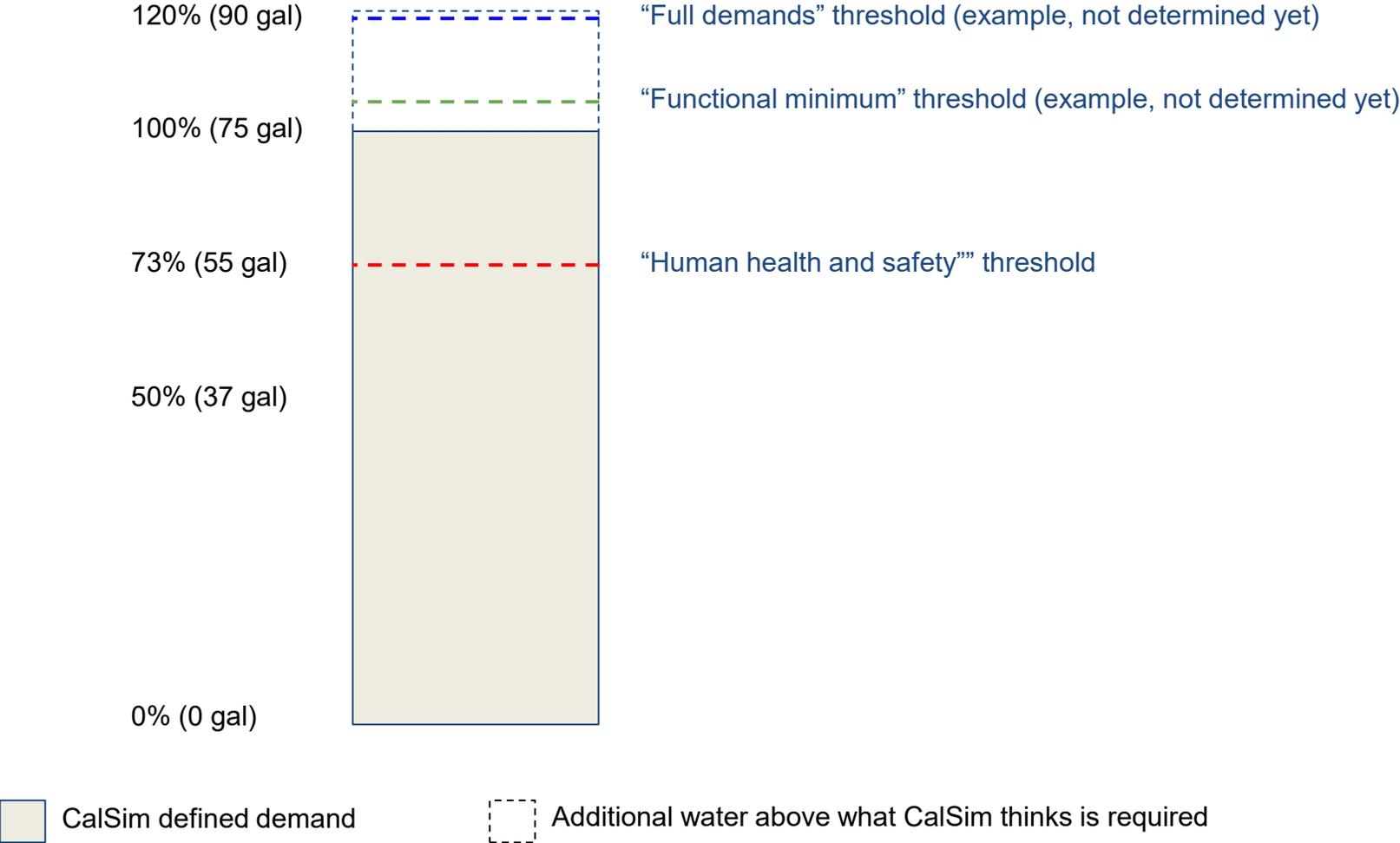
---

- Survival ≠ Functionality ≠ Thriving
- Better reflects real-world system stress
- Supports more nuanced trade-offs = improves trade-off decisions
- Cascading risks and impacts can be captured
- Specify spatial & temporal scales for evaluating thresholds

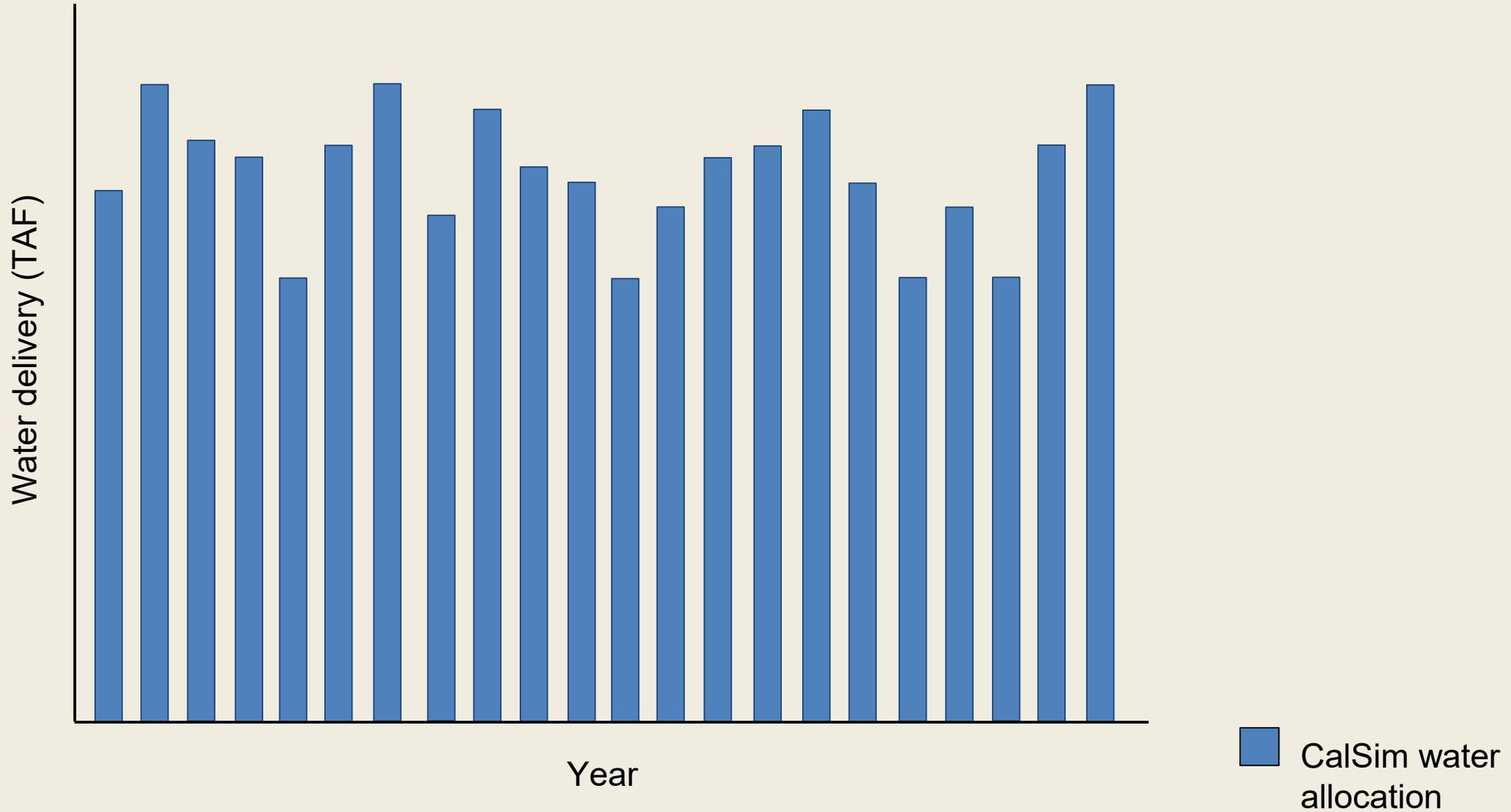
# 1. Outcome threshold – Community water deliveries

Tier	Description	Rationale
Tier 1 – Full System Demands	All essential and non-essential needs are met, including municipal and industrial demands, assuming reasonable water efficiency measures are in place.	≥95% of years meet full demand; health & safety met in 100%.
Tier 2 – Functional Minimums	Represents moderate curtailment; core needs and services maintained.	≥95% of years meet functional minimum; health & safety met in 100%; Tier 1 not met.
Tier 3 – Human Health and Safety	Bare minimum for drinking, hygiene, cooking (55 GPCD).	Health & safety met in 100% of years; Tiers 1 & 2 not met.
Tier 4: Failure to meet basic human needs	Basic health and safety needs not met.	None of the above are achieved.

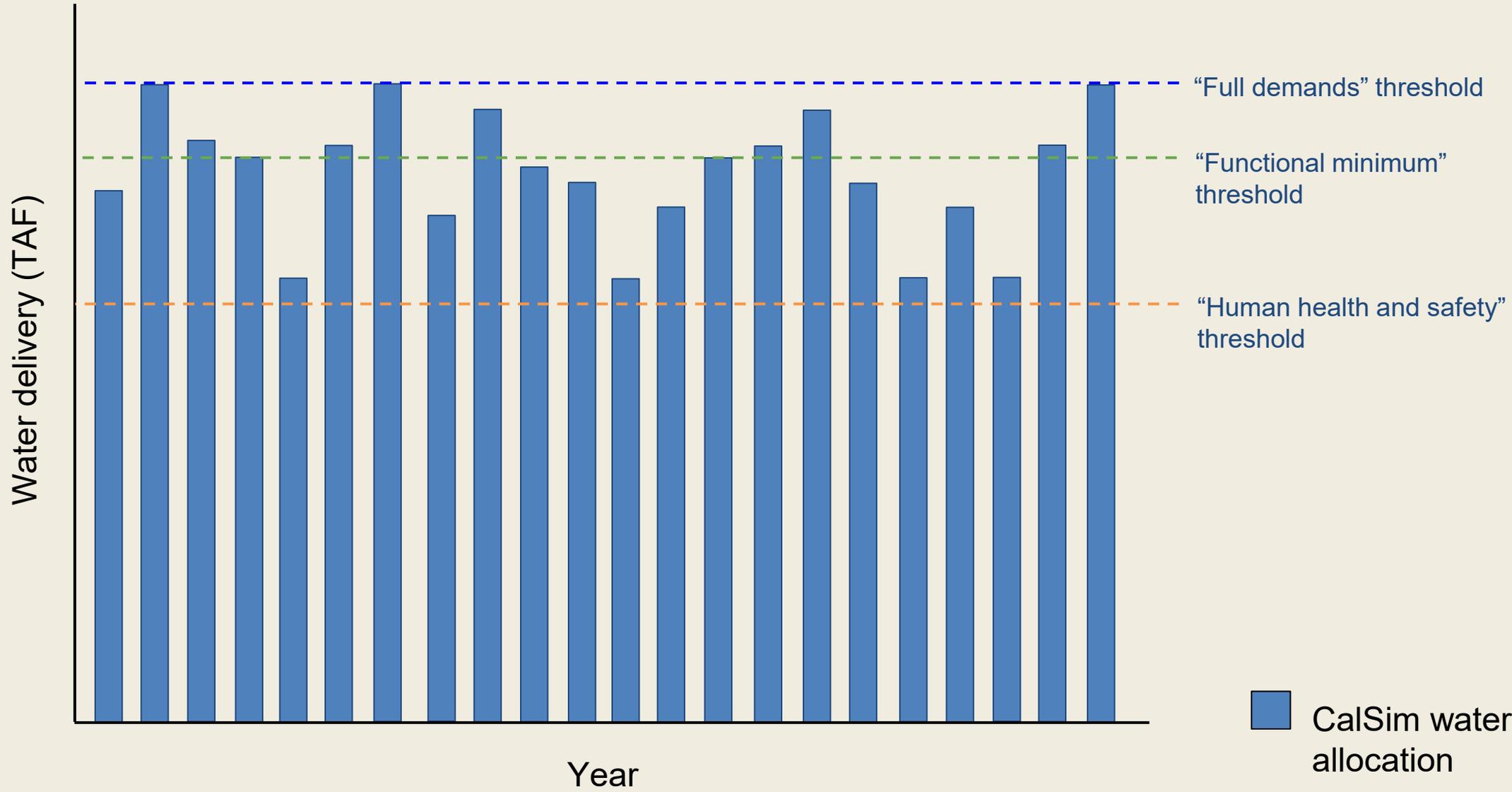
# Community Water Deliveries — Visual tiered thresholds



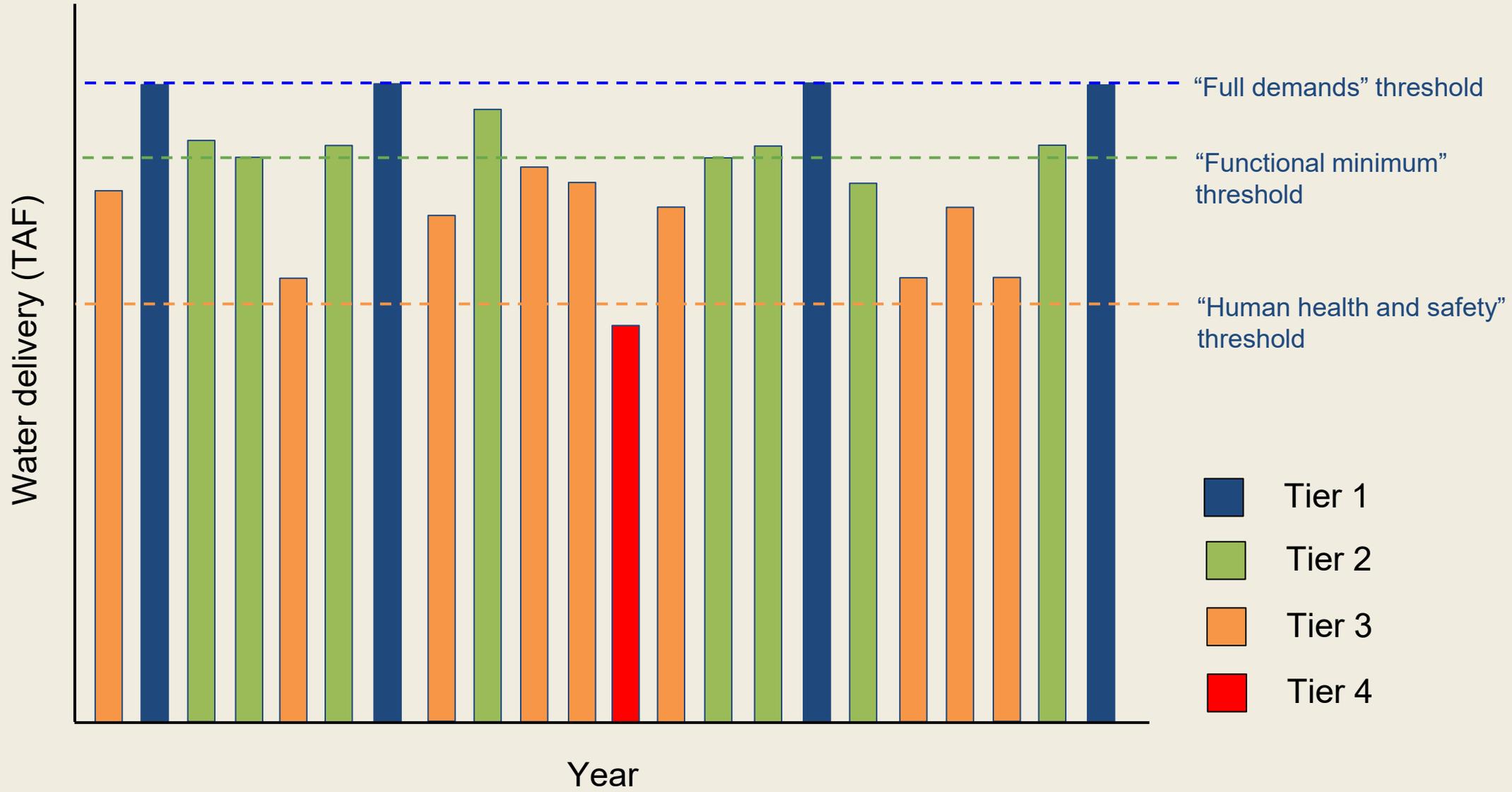
# Water deliveries to community A



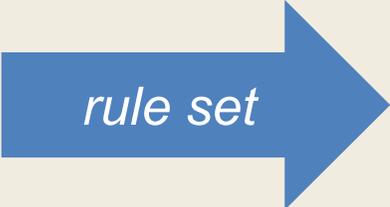
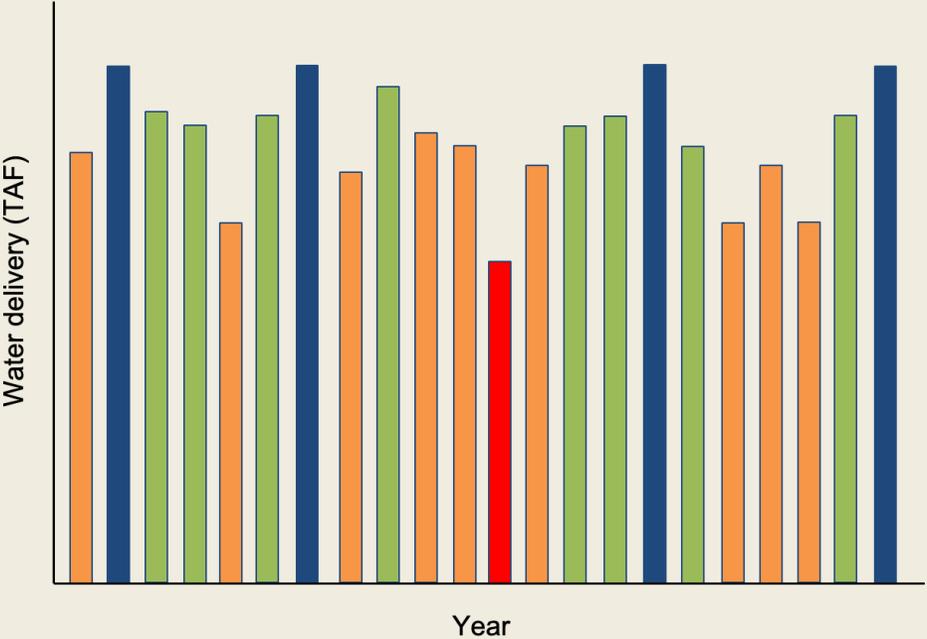
# Water deliveries to community A



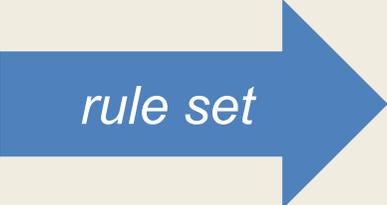
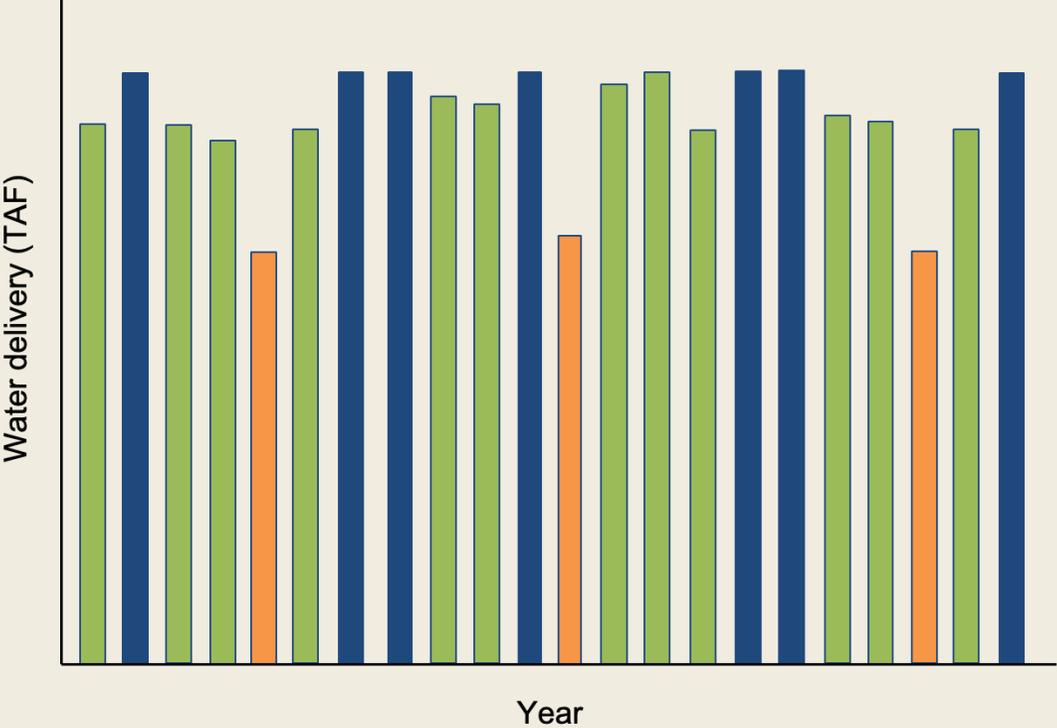
# Water deliveries to community A (for scenario X)



# Water deliveries to community A (for scenario X)

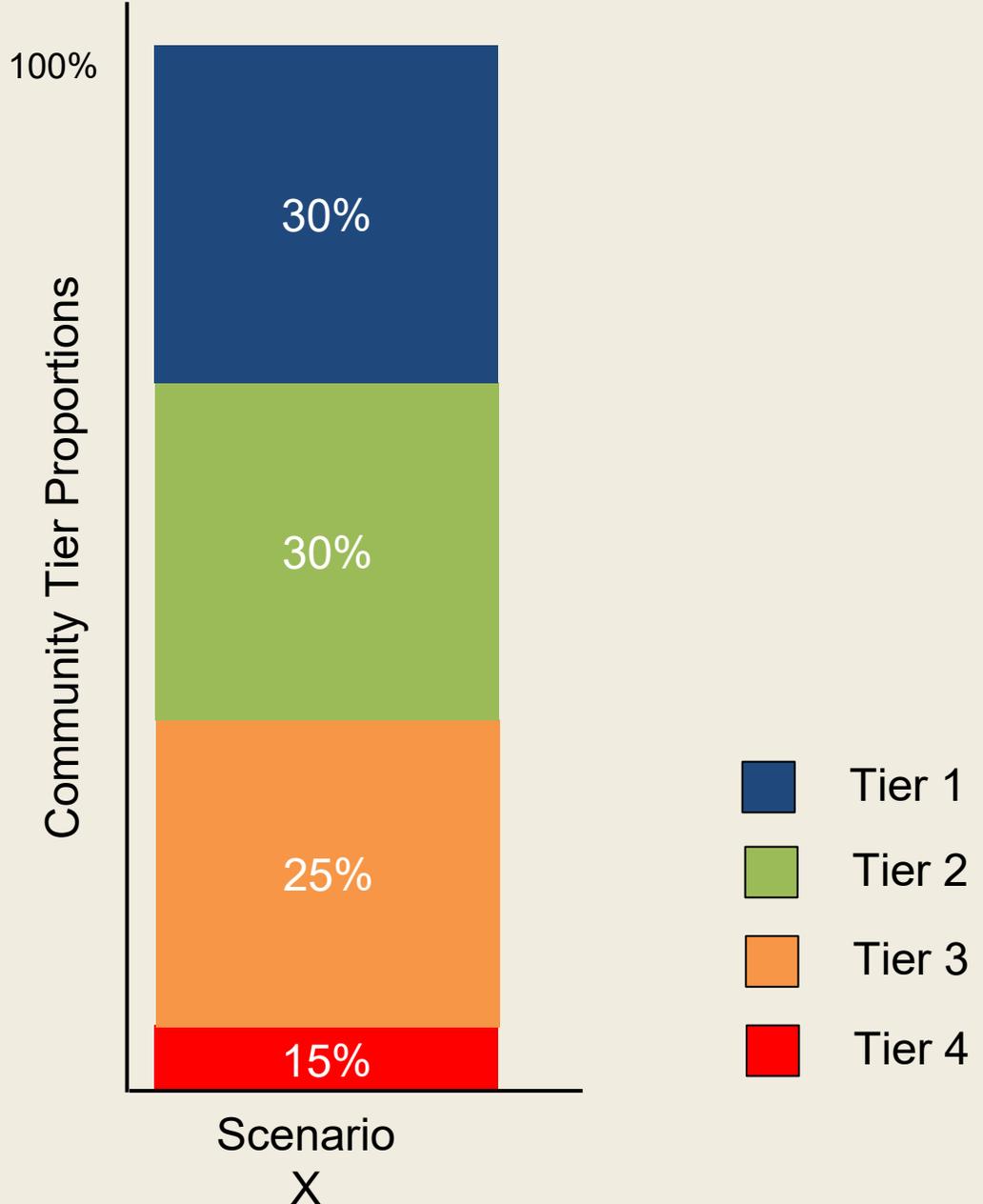
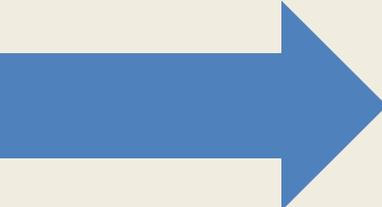


# Water deliveries to community A (for scenario Y)

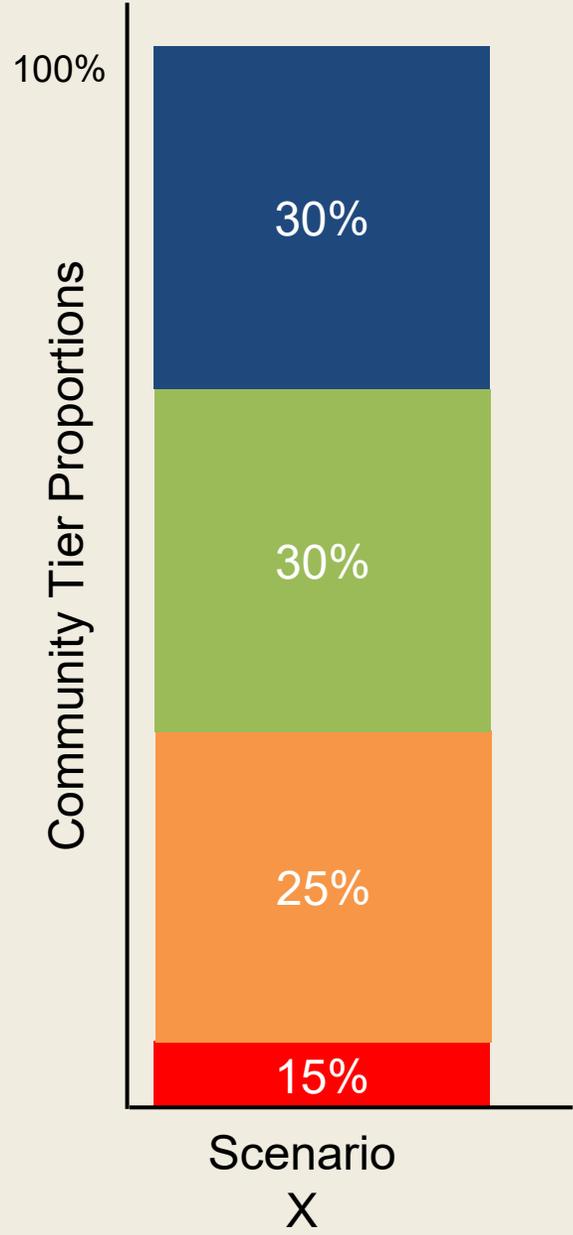


# Community tiers (for scenario X)

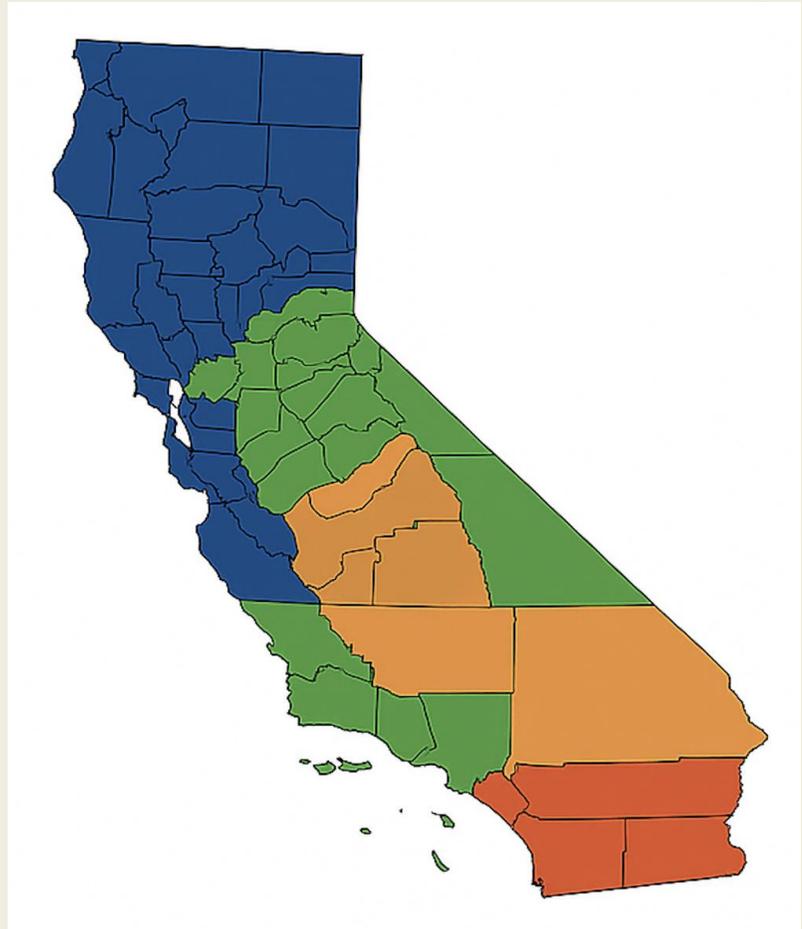
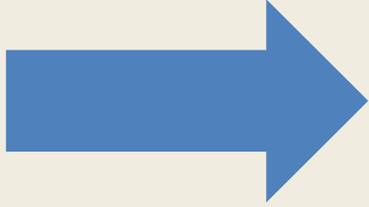
Community	Scenario X
A	3
B	3
C	2
D	2
E	1
F	1
G	1
H	2
I	2
J	2
K	4
L	3
M	1



# Equity Outcomes for Drinking Water Access

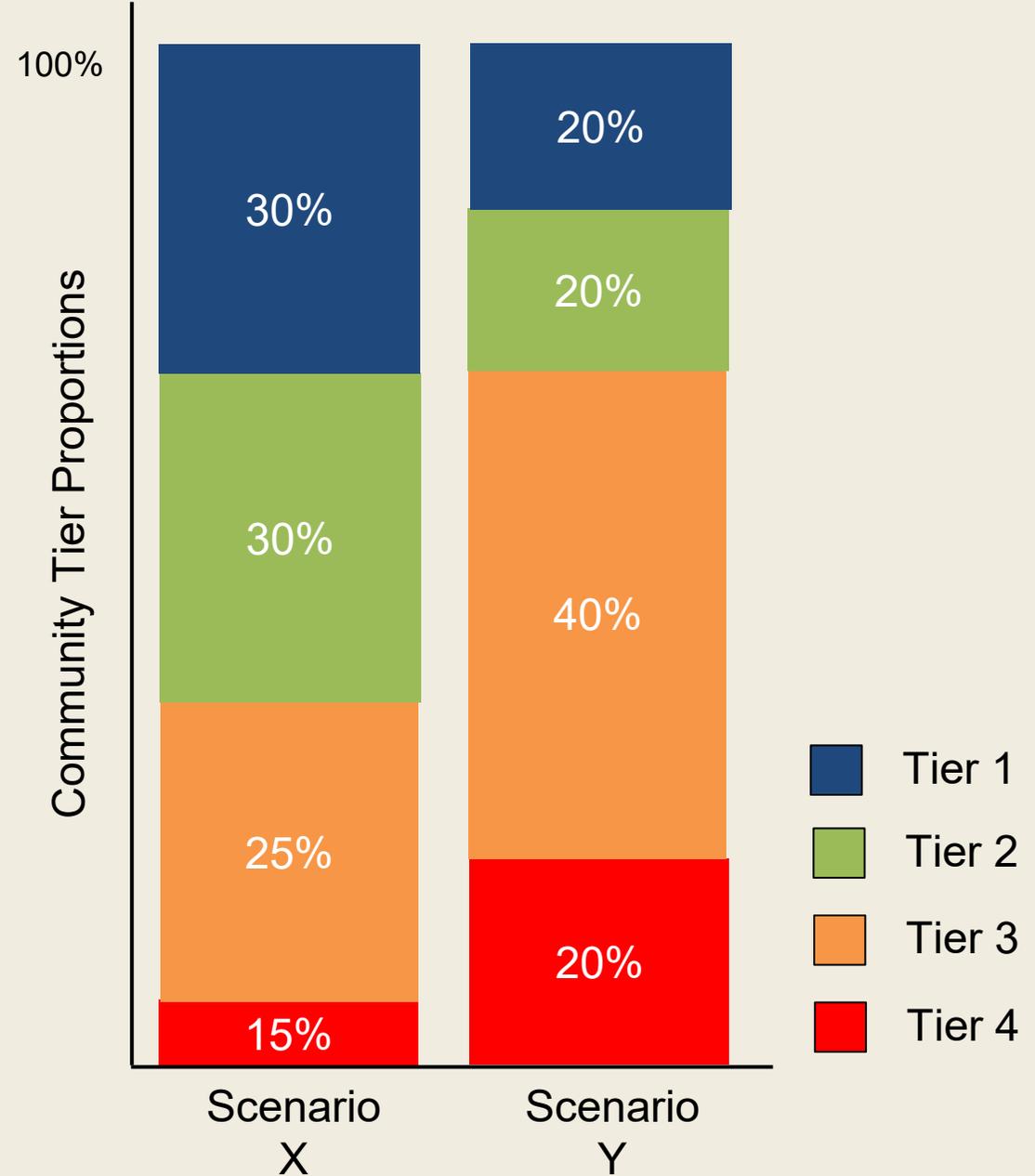
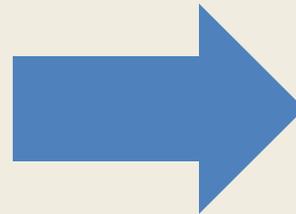


- Tier 1
- Tier 2
- Tier 3
- Tier 4

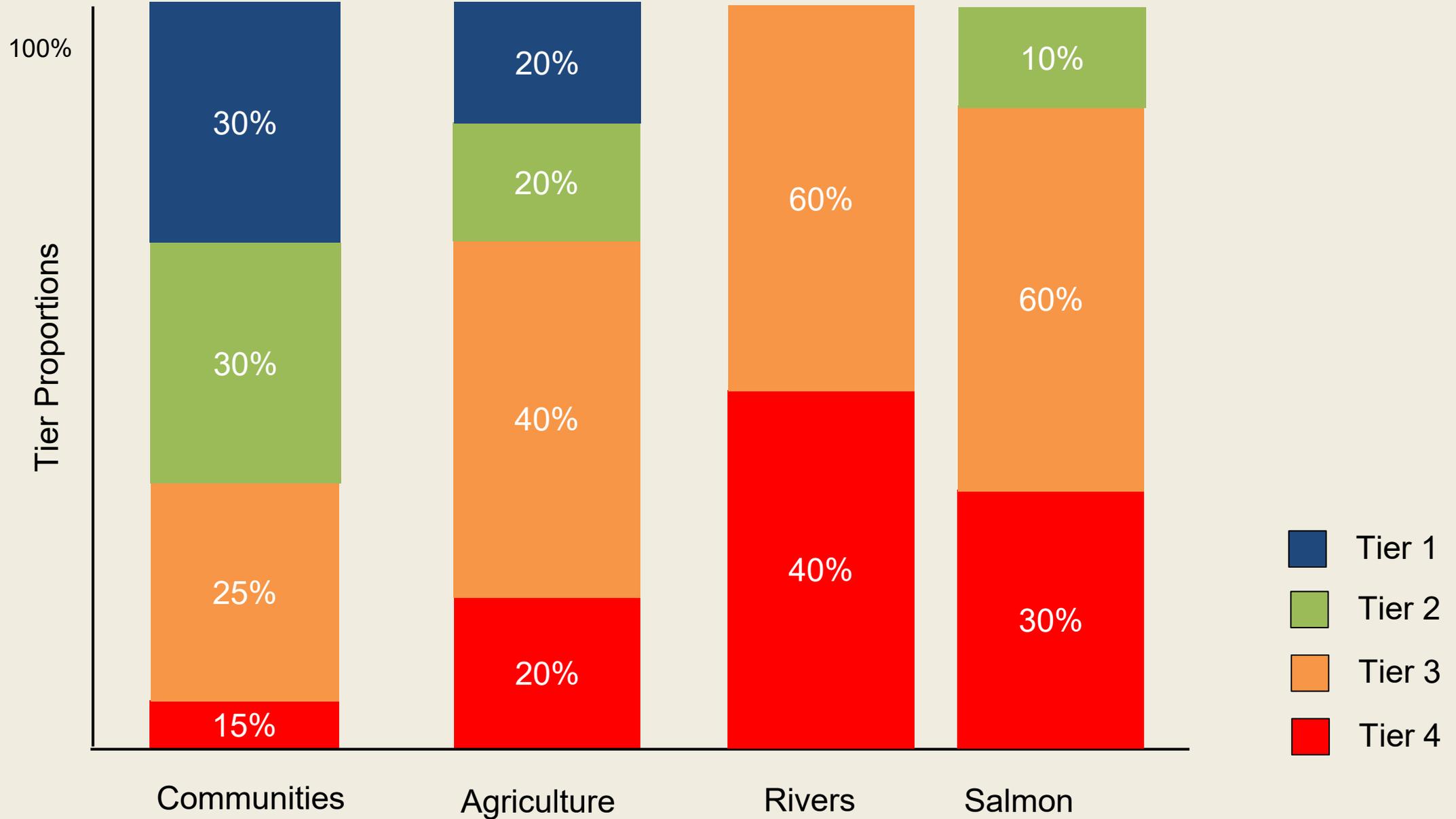


# Community tiers (for multiple scenarios)

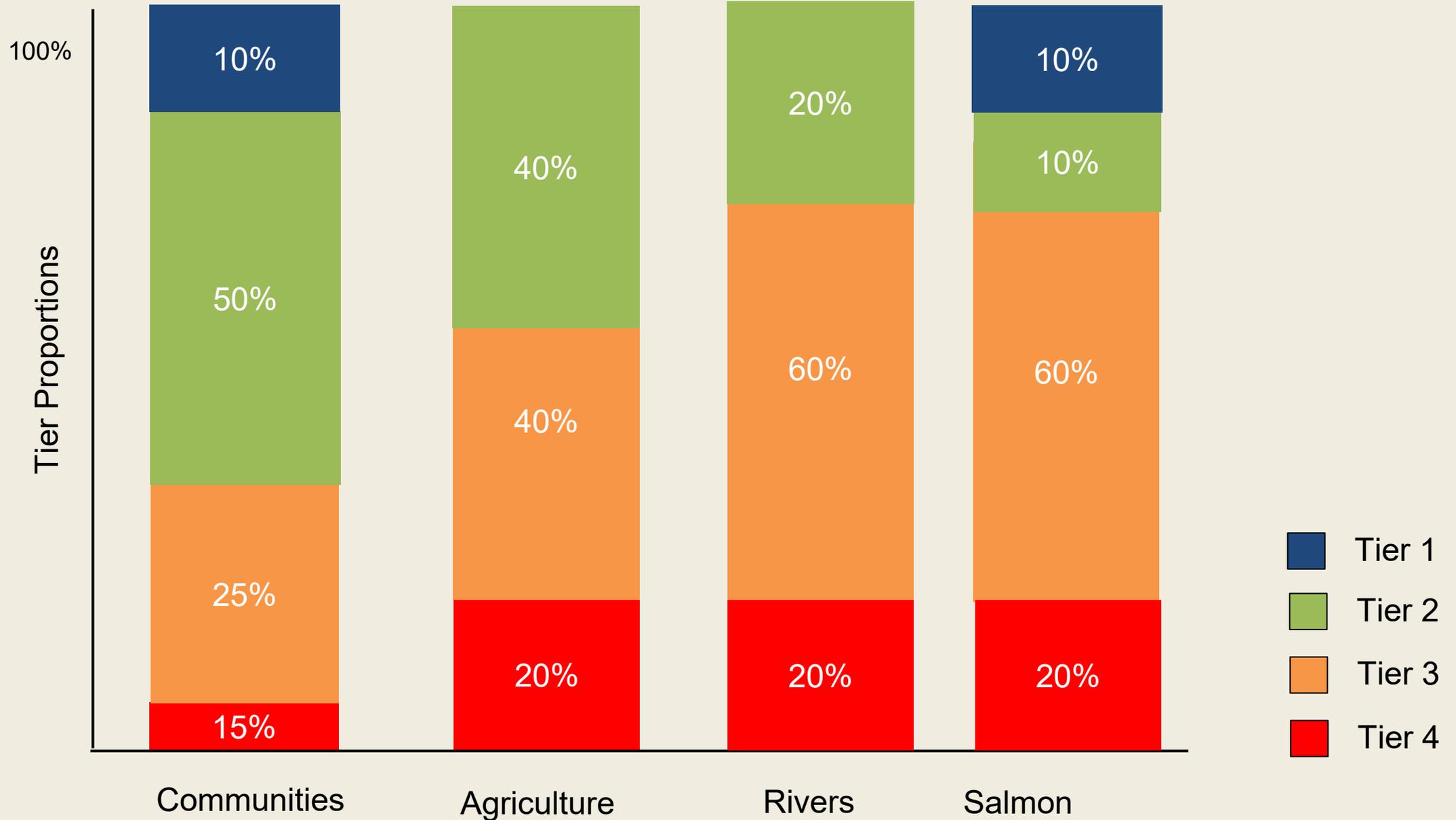
Community	Scenario X	Scenario Y
A	3	4
B	3	3
C	2	3
D	2	3
E	1	2
F	1	2
G	1	1
H	2	3
I	2	3
J	2	2
K	4	4
L	3	4
M	1	1



# Tiers for multiple categories (for scenario X)

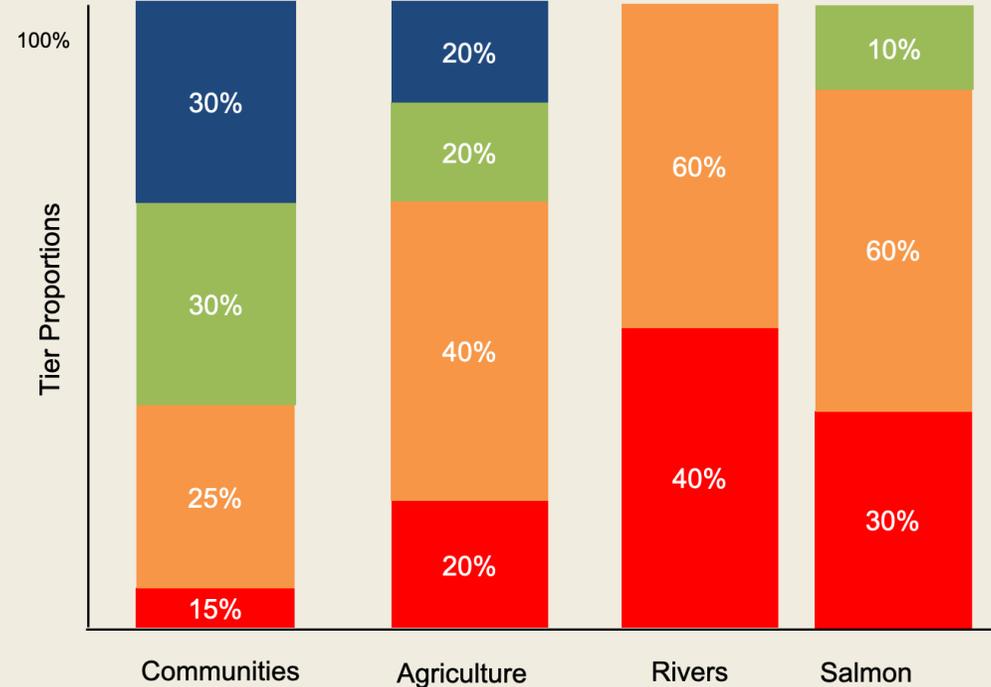
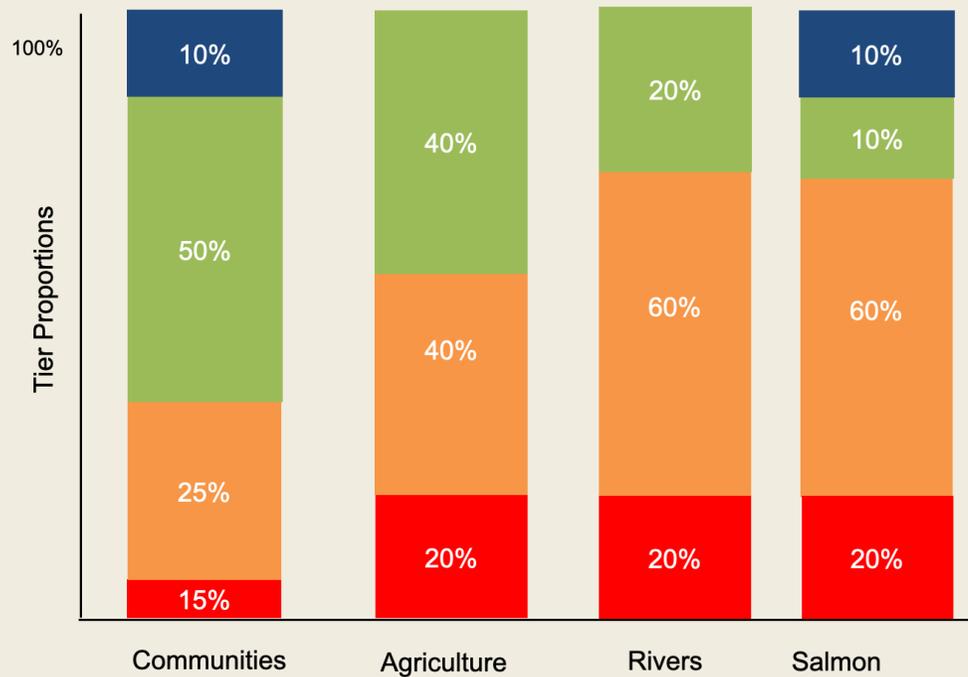


# Tiers for multiple categories (for scenario Y)



# Tiers for multiple categories and scenarios

$$\text{EQUITY}_Y > \text{EQUITY}_X$$



# Thresholds Evolve: Climate-Aware & Community-Informed

## Climate-Adjusted Thresholds

- Rising heat + system stress (Drinking Water)
- Shifts in flow timing (Environment & Salmon)
- Changing irrigation demands (Agriculture)
- Salinity sensitivity (EC/TDS)

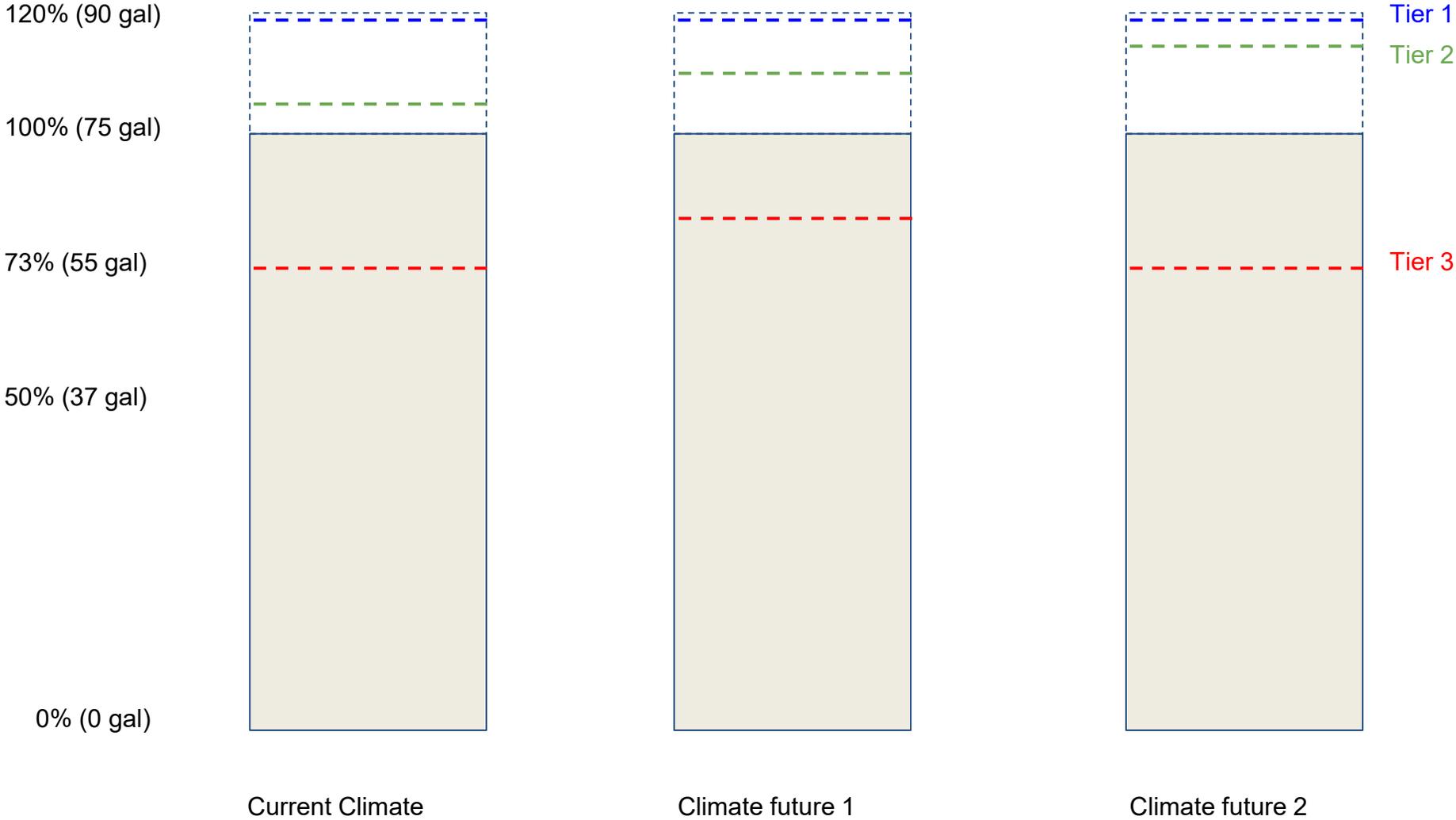
## Community-Informed Thresholds

- Regional needs vary — thresholds must reflect **local priorities**
- Co-develop thresholds through **public participation**

## Our Approach

- Provide **default thresholds** in the dashboard
- Enable **user customization** to adjust for local or cultural needs
- Increase transparency, equity, and relevance

# Adjusting thresholds for climate futures



# What's Next – Questions?

## ✂ Technical Work

- Finalize **tiered thresholds** (incl. groundwater & reservoir storage)
- Integrate into models and conduct **post-processing**
- Evaluate scenario performance using key metrics

## 🧠 Community Engagement

- Share results and gather feedback
- Validate assumptions with local insight
- Interpret trade-offs together

→ **Goal:** A framework that is both scientifically robust and community informed

