

# **Quantitative Socio-Economic Cost Benefit Analysis Working Group Modeling Accomplishments Panel and 2022 Goals and Discussion**

Dr. Pei Xu – NMSU/NMPWRC

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**NM Produced Water Research Consortium - Year-end Meeting  
December 1-2, 2021**



**“SEIZE THE OPPORTUNITIES”**

# Socio-Economic Modeling

## *Why Produced Water Reuse*

*Matthias Sayer  
SVP Legal, EHSR  
NGL Energy Partners, LP*

**NM Produced Water Research Consortium - Year-end Meeting  
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# Why PW Reuse?

“Even if we could treat produced water to drinking-water standards, why would we?”

All Politics. All New Mexico. **NM**POLITICALREPORT

*Wastewater, wastewater everywhere: In the Permian Basin, a new kind of boom - 2020*

- *Production likely to continue*
- *Regional Water Stress*
- *Water Balance and Source of Supply*
- *Economic Development*
- *Sustainability*

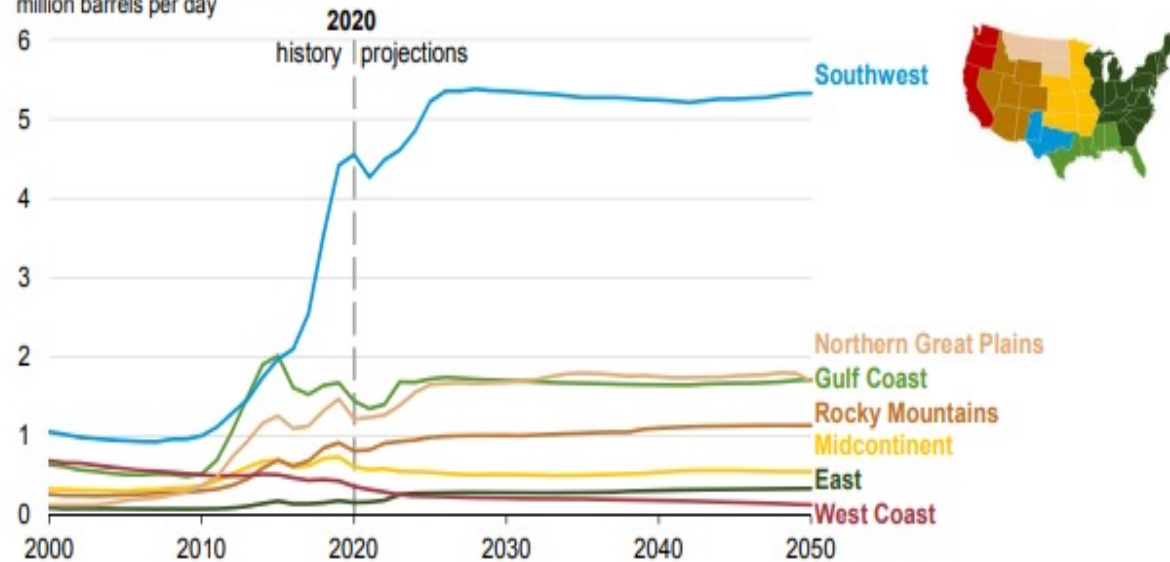
# Why PW Reuse ... decades of supply



## Onshore crude oil production in the Lower 48 states

Onshore crude oil production in the Lower 48 states by region  
AEO2021 Reference case

million barrels per day



- NM averages 4 to 5 bbls PW / bbl oil
- NM Production likely to continue



AEO2021 Press Release  
February 3, 2021

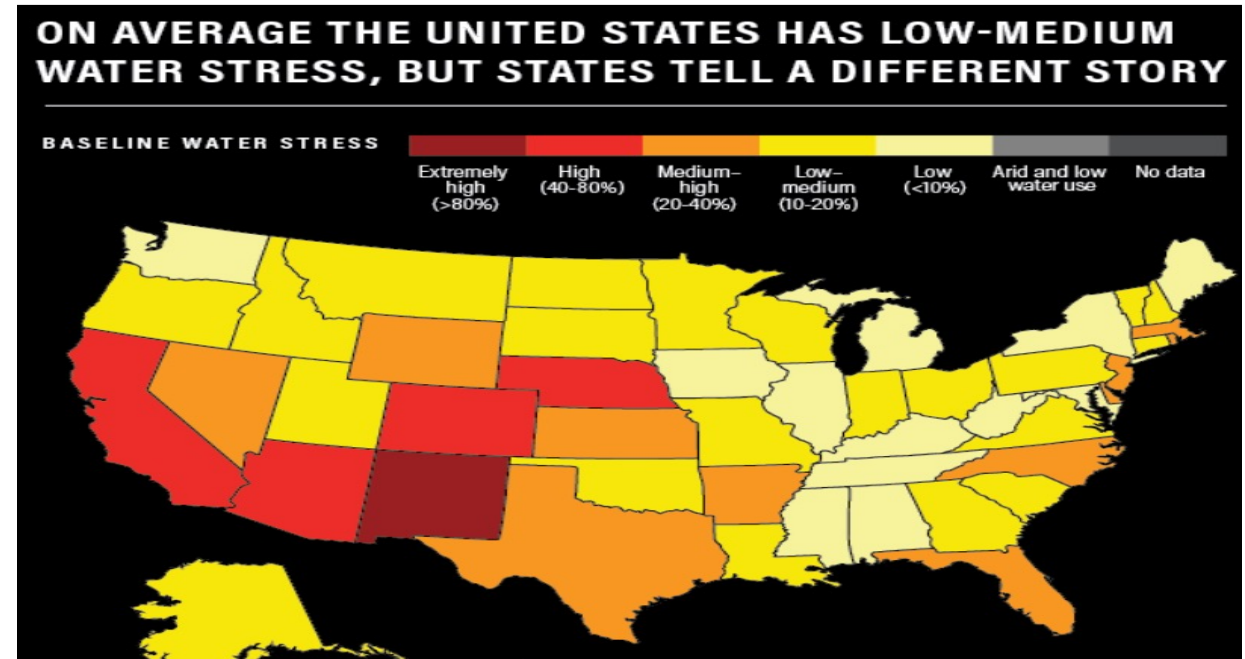


**NM STATE** NEW MEXICO  
PRODUCED WATER  
RESEARCH CONSORTIUM

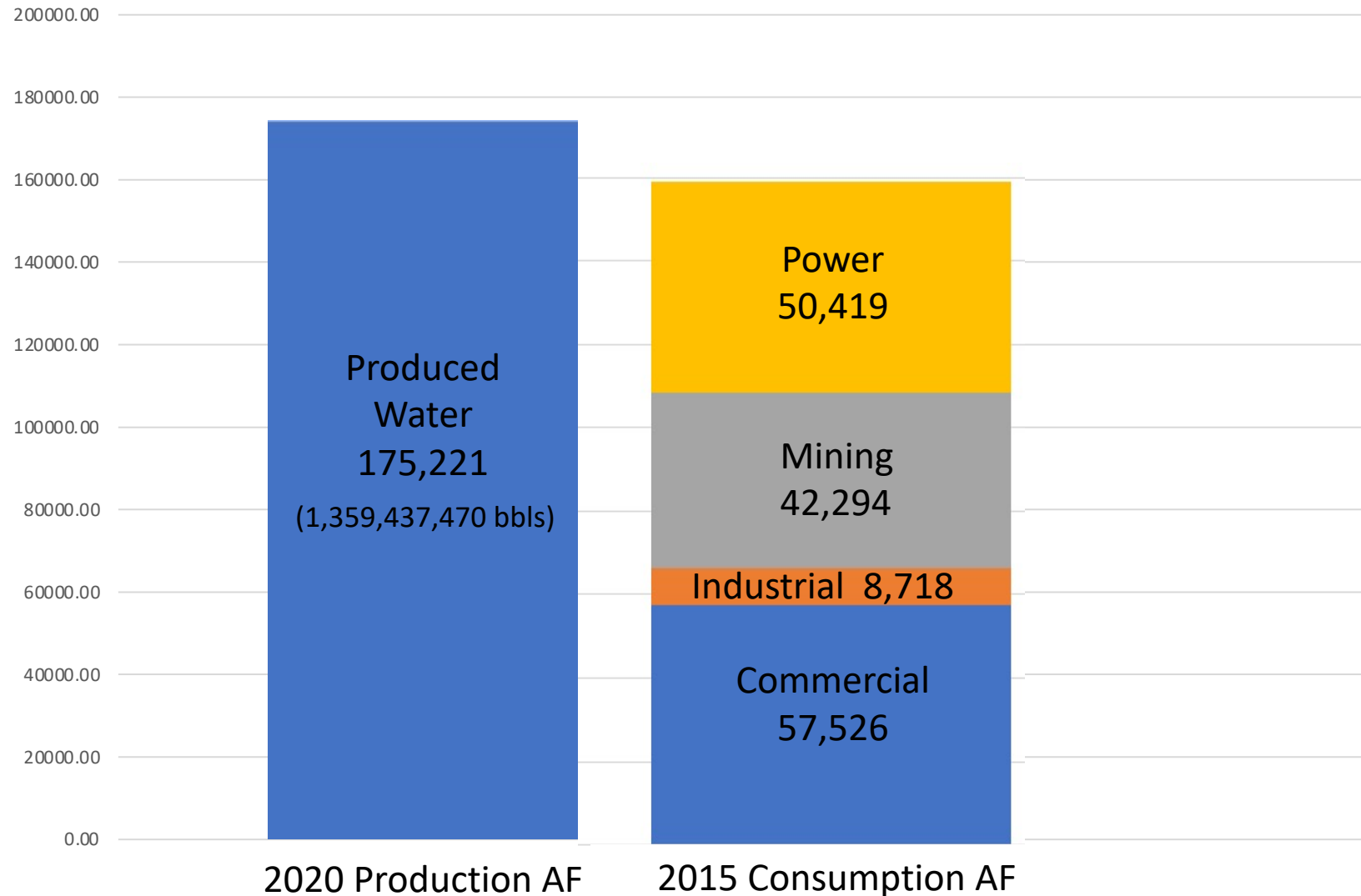


# Why PW Reuse ... water stress

- NM is the only U.S. state facing “extremely high” water stress, on par with the United Arab Emirates, the globe’s 10<sup>th</sup> most water stressed nation.
- “There is no buffer left ... no cushion. We have one hell of a water challenge, and we better plan for it”
  - David Gutzler, retired UNM climatologist, *Interim Water & Natural Resources Committee* 7/13/21

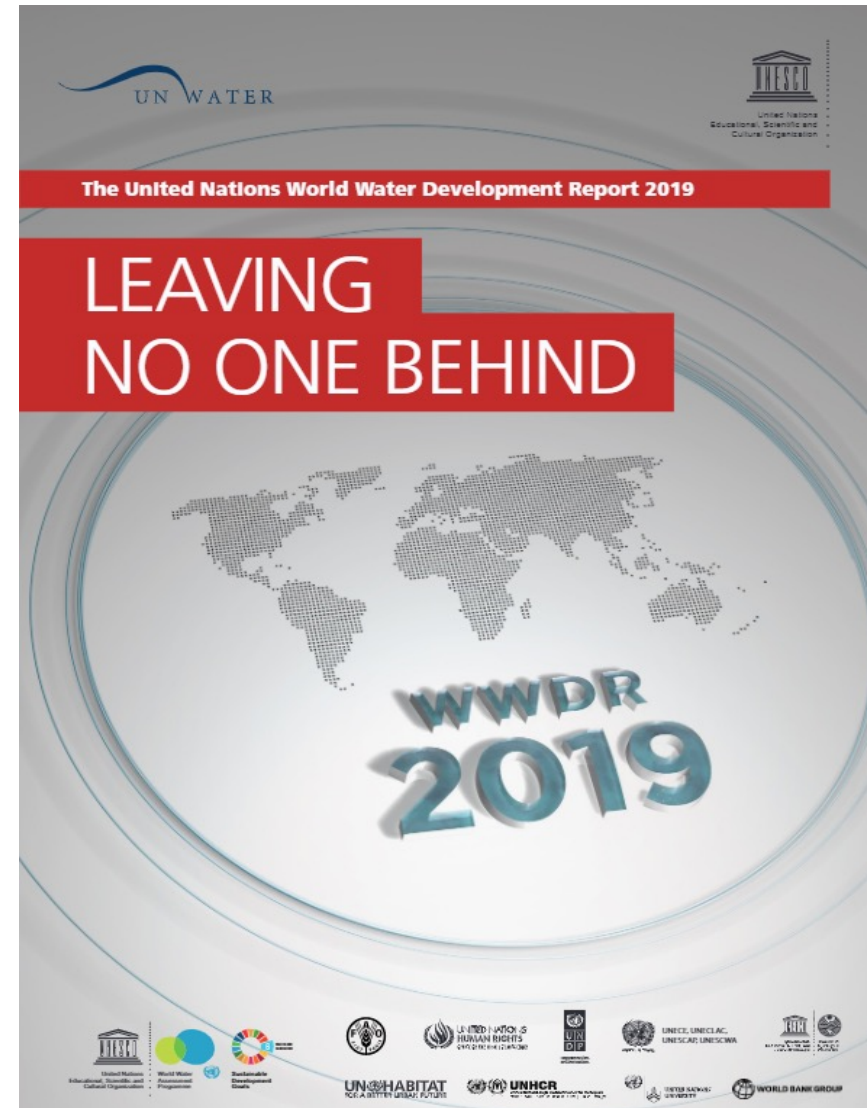


# Why PW Reuse ... enhance water balance?



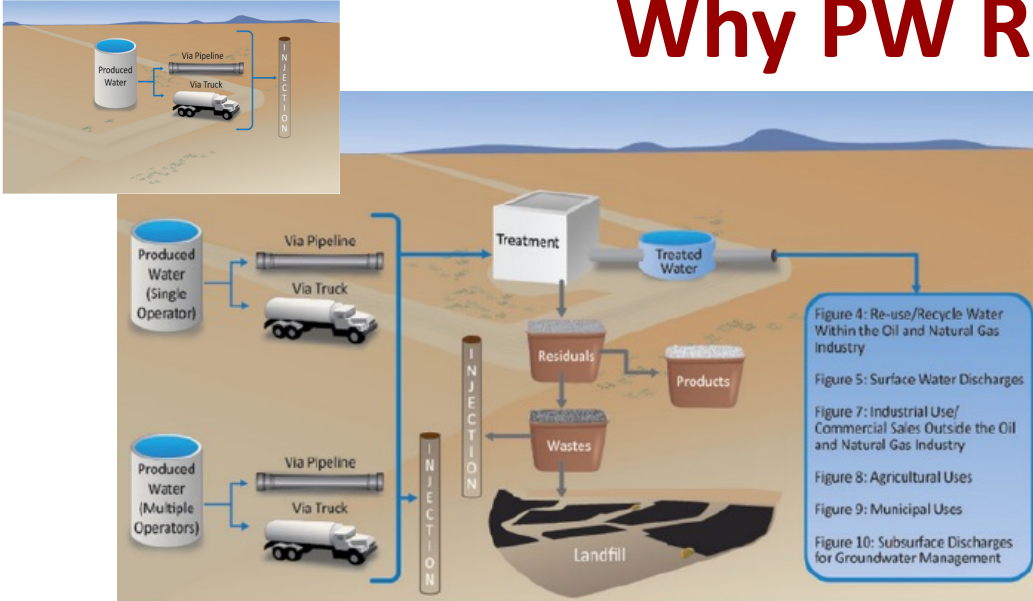
# Why PW Reuse ... economic development

- “An estimated three out of four jobs that make up the global workforce are either heavily or moderately dependent on water. This means that water shortages and problems of access to water and sanitation could limit economic growth and job creation in the coming decades.”
- “This analysis highlights the fact that water is work – it requires workers for its safe management and at the same time it can create work and improve conditions.”

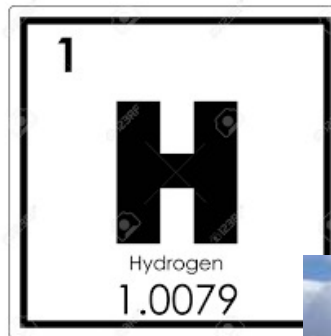




# Why PW Reuse ... sustainability



- GRI 303 Water & Effluents:
  - Ensure availability and sustainable management of water
  - Amount of water consumed by an organization and the quality of its discharges can have impacts on quality of life, social and economic consequences for local communities
- Under 303, organizations encouraged to:
  - Prioritize action in areas facing water stress
  - Understand and respond to local contexts
  - Aim to benefit and respect the needs and priorities of water users
- Energy Transition & water
  - Hydrogen projects
  - Direct air capture







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# Tool for Assessing the Economic, Societal and Environmental Tradeoffs in Oil & Gas Produced Water Management and Reuse



*Vincent Tidwell, Thushara Gunda*

PRESENTED BY

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*Len Malczynski, Jake Jacobson*



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NM Produced Water Consortium



**NM** THE UNIVERSITY OF  
NEW MEXICO



MindsEye Computing, LLC  
Visualizing the Future



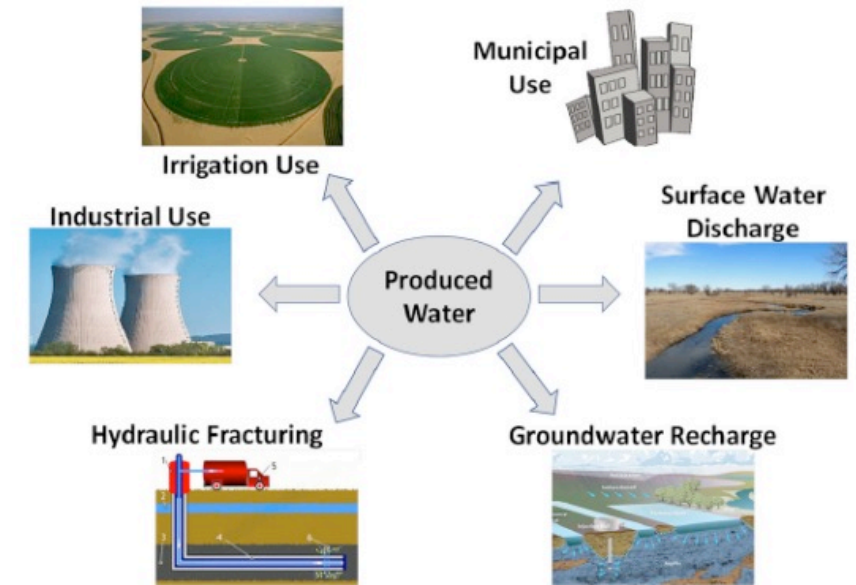
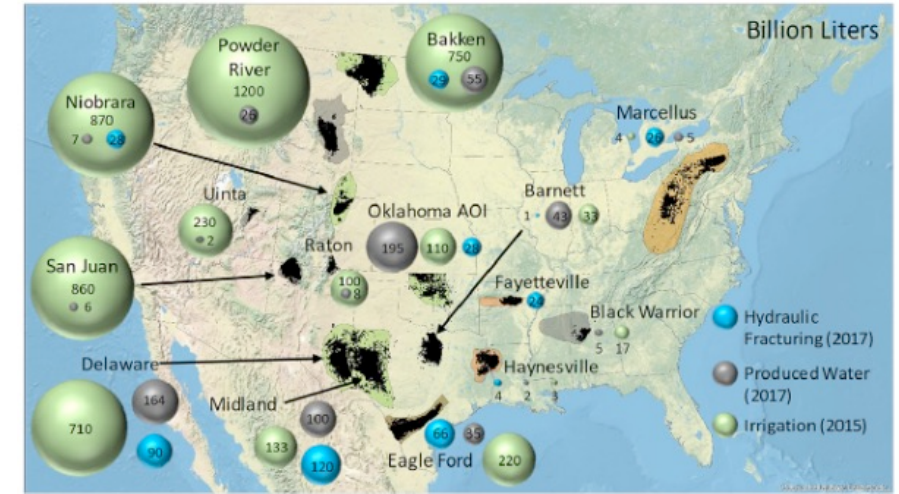
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# Tool for Assessing the Economic, Societal and Environmental Tradeoffs in Oil & Gas Produced Water Management and Reuse

**Goal:** Develop an integrated model for assessing the economic, societal and environmental tradeoffs associated with alternative produced water management and fit-for-purpose treatment and reuse.

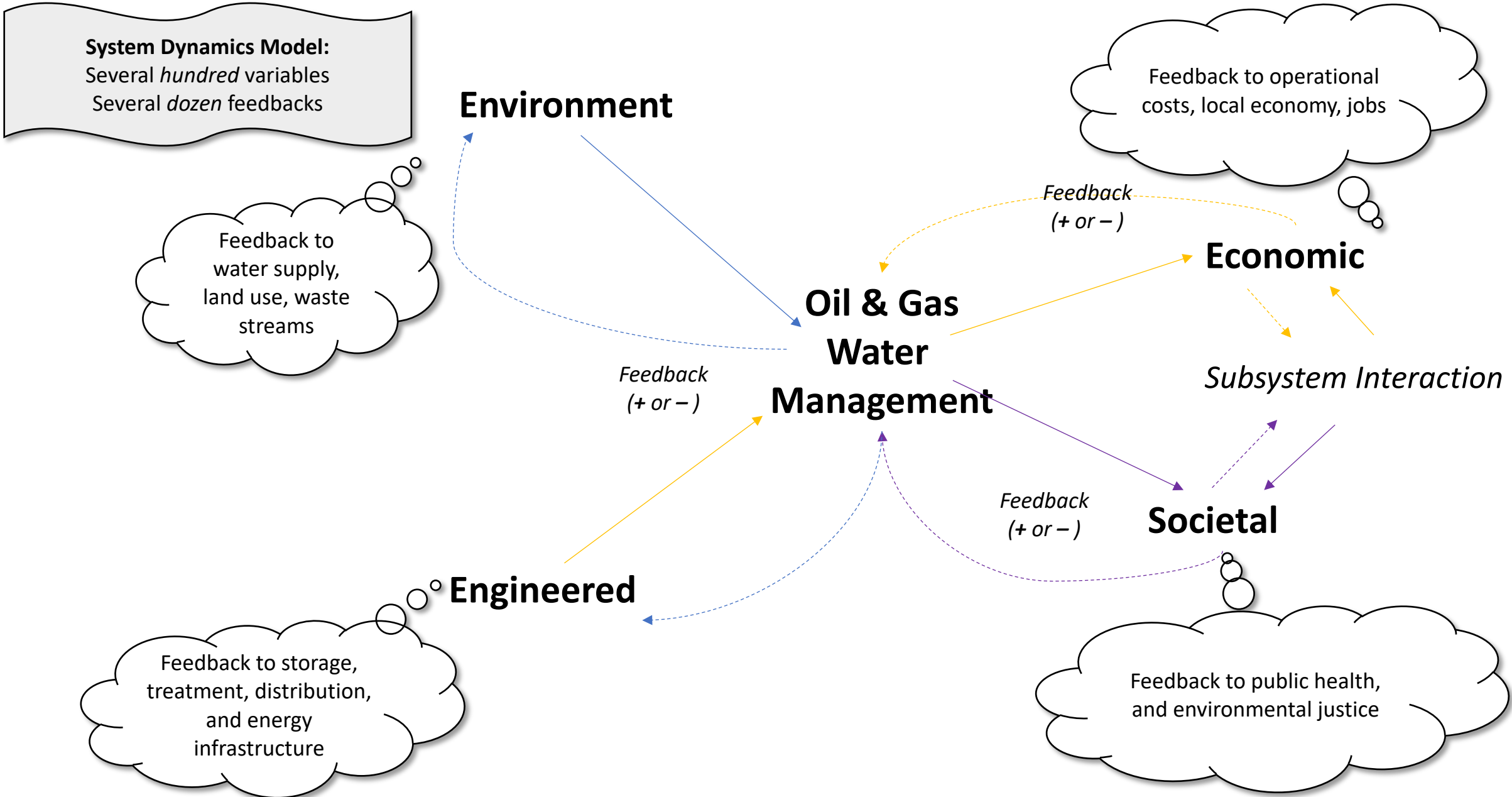
**Problem:** While many oil producers are considering qualitative Environmental, Social, and Governance (ESG) strategies to assess the general cost and benefits of the reuse of produced water, there is no comprehensive tool for **quantitatively** assessing the full costs and benefits of alternative produced water management and reuse strategies

## Oil and Gas Water Management



Source: Scanlon et al. 2020

# System Dynamics





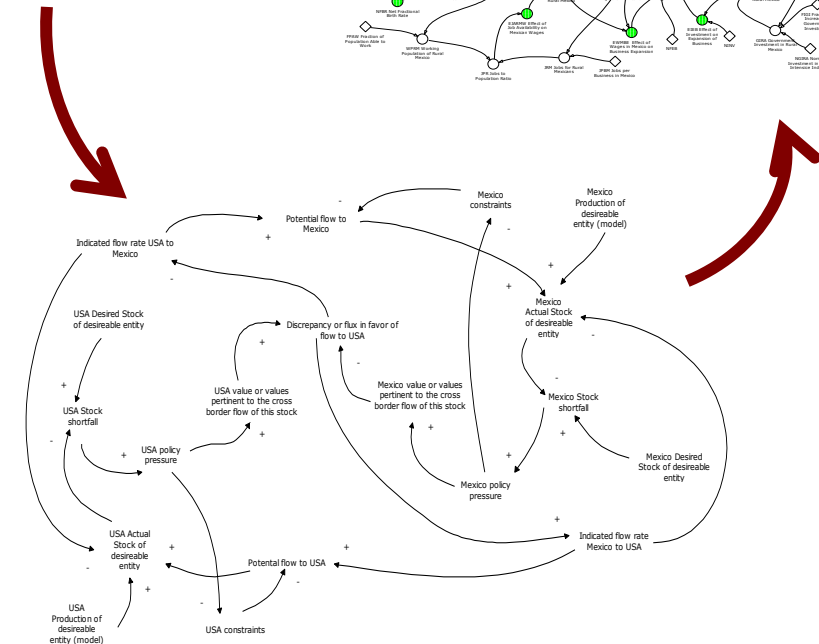
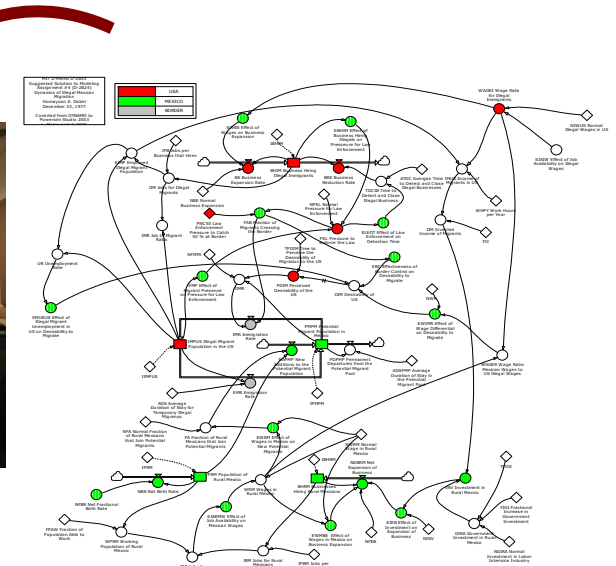
# Stakeholder Engagement

- **Leverage New Mexico Produced Water Research Consortium network of industry, regulators and developers**
- Process of engaging decision-makers and stakeholders in:
  - Model development, and
  - Decision analysis.

Conducted events on the following topics:

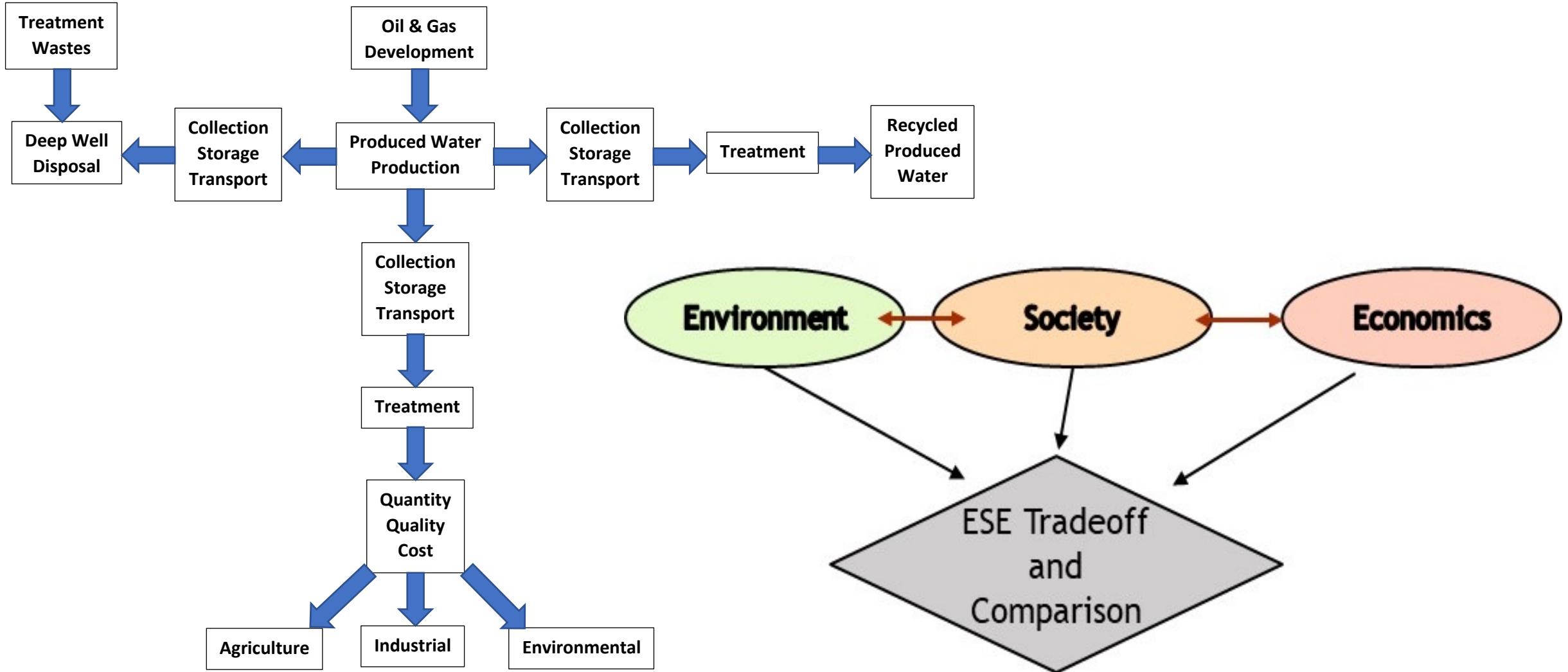
- Data resources,
- Overarching model structure,
- Oil & gas water disposal,
- Oil & gas production, transport and storage (3),
- Southeast NM water resources,
- Economic impacts and water use, and
- Public health effects (2).

Bi-weekly meetings with NMPWRC social-economic working group

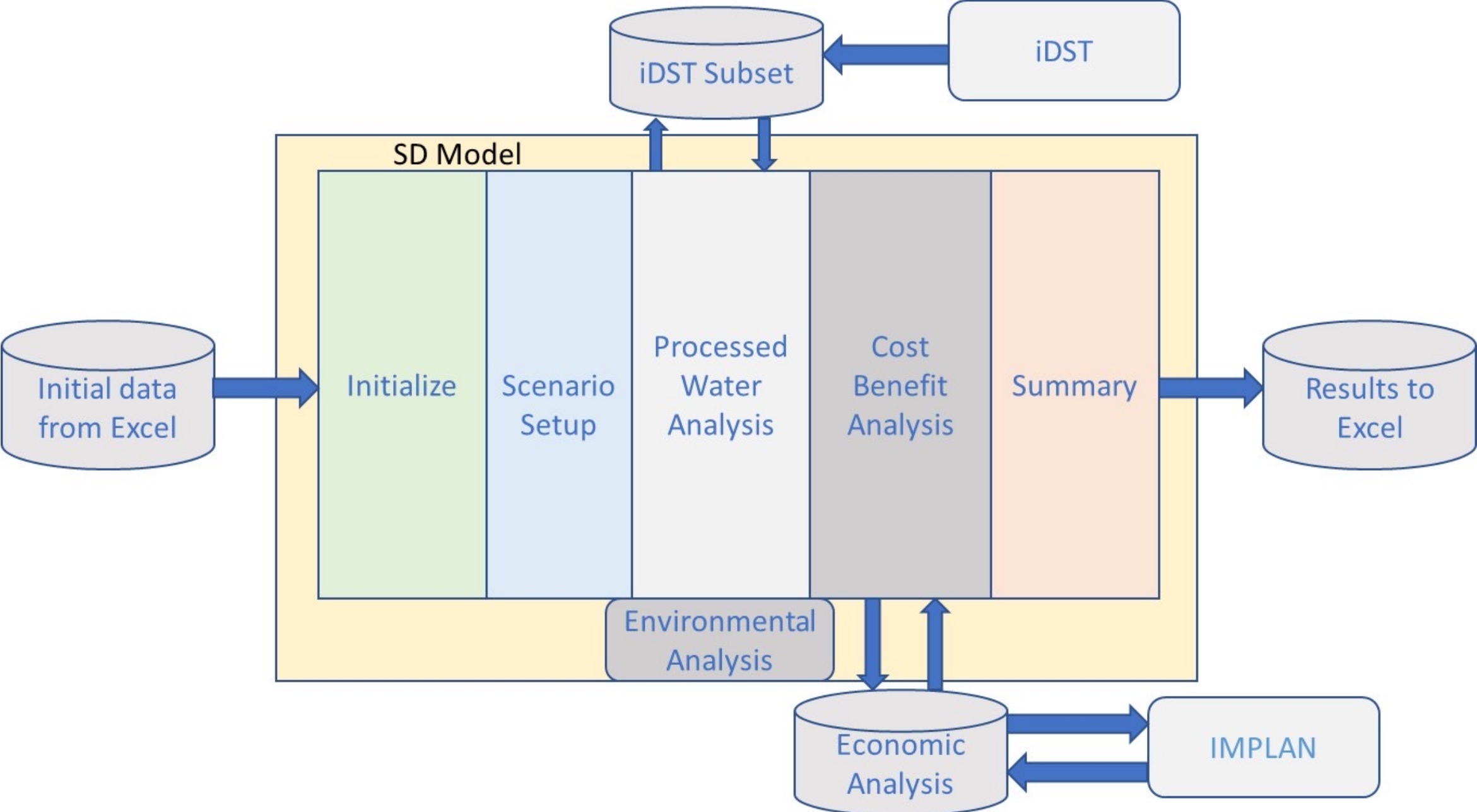


# PW-ESESim

## PW-ESESim Conceptual Model



# PW-ESESim







# PW-ESESim

## Social: Human Health

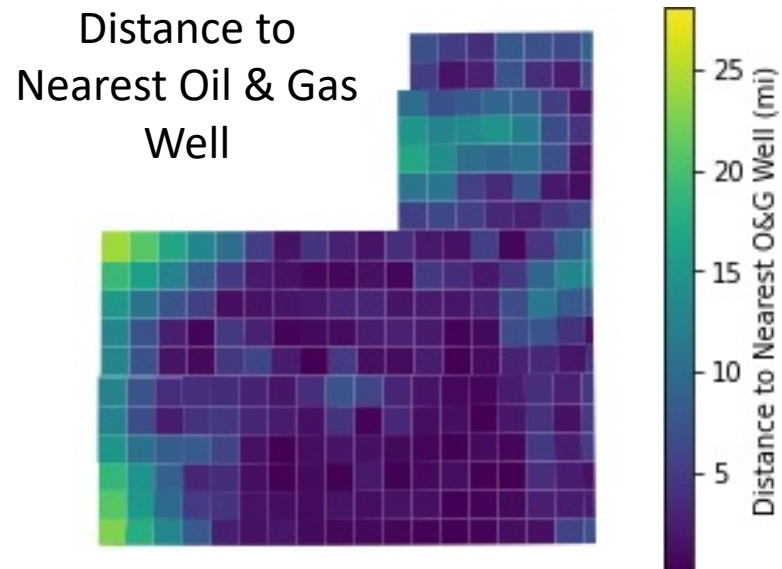
- Based on EPA's Exposure and Fate Assessment Screening Tool (E-FAST)
- Determine change in dose rate for both acute and chronic exposure:
  - Pecos River (incidental contact)
  - Fish Ingestion
  - Groundwater contamination
  - Inhalation (spray irrigation)
- Compare to exposure with current water quality.
- Index to Concentration of Concern levels



# PW-ESESim

## Social: Environmental Justice

- Metrics adapted from:
  - California Environmental Protection Agency's Environmental Justice Screening Tool (CalEnviroScreen 4.0), and
  - Washington State Department of Health's (WaDOH) Environmental Health Disparities tool



### Metrics and State

<u>Aa</u> Indicators	▼ Variable Type	▼ Status
Proximity to oil and gas activity	Environmental Exposure	Static
Proximity to PW disposal	Environmental Exposure	Static
Proximity to heavy traffic	Environmental Exposure	Static
Decreased air quality due to traffic	Environmental Exposure	Dynamic
Decreased water quantity	Environmental Exposure	Dynamic
Impaired waters	Environmental Exposure	Dynamic
Poverty rate	Socioeconomic	Dynamic
Unemployment rate	Socioeconomic	Dynamic
Household affordability	Socioeconomic	Static
Historic cultural sites	Cultural	Static