System View to Water Resources Management
12th September 2023 – Beijing
Water and SDGs

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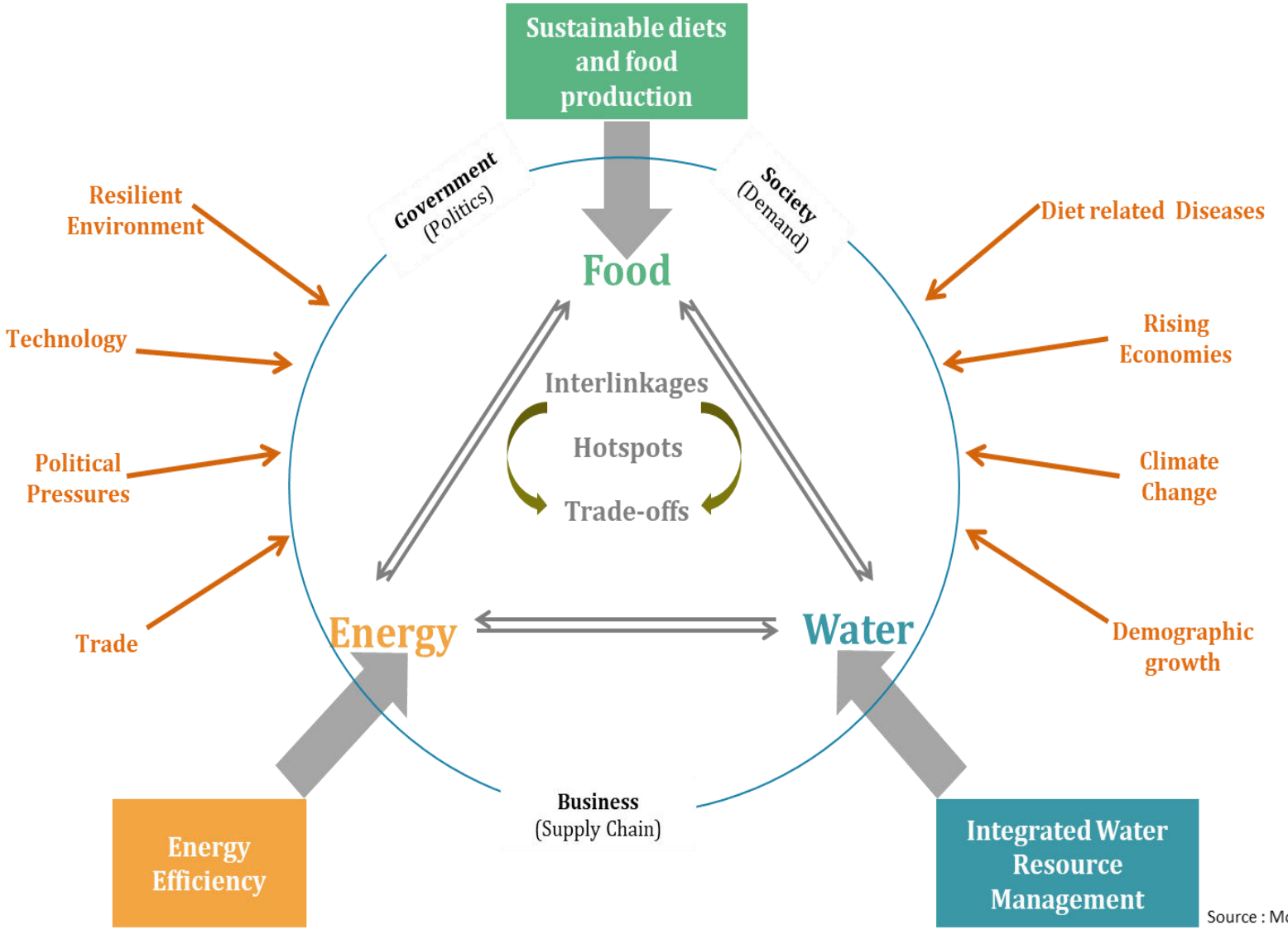
Water is Key to Sustainable Development

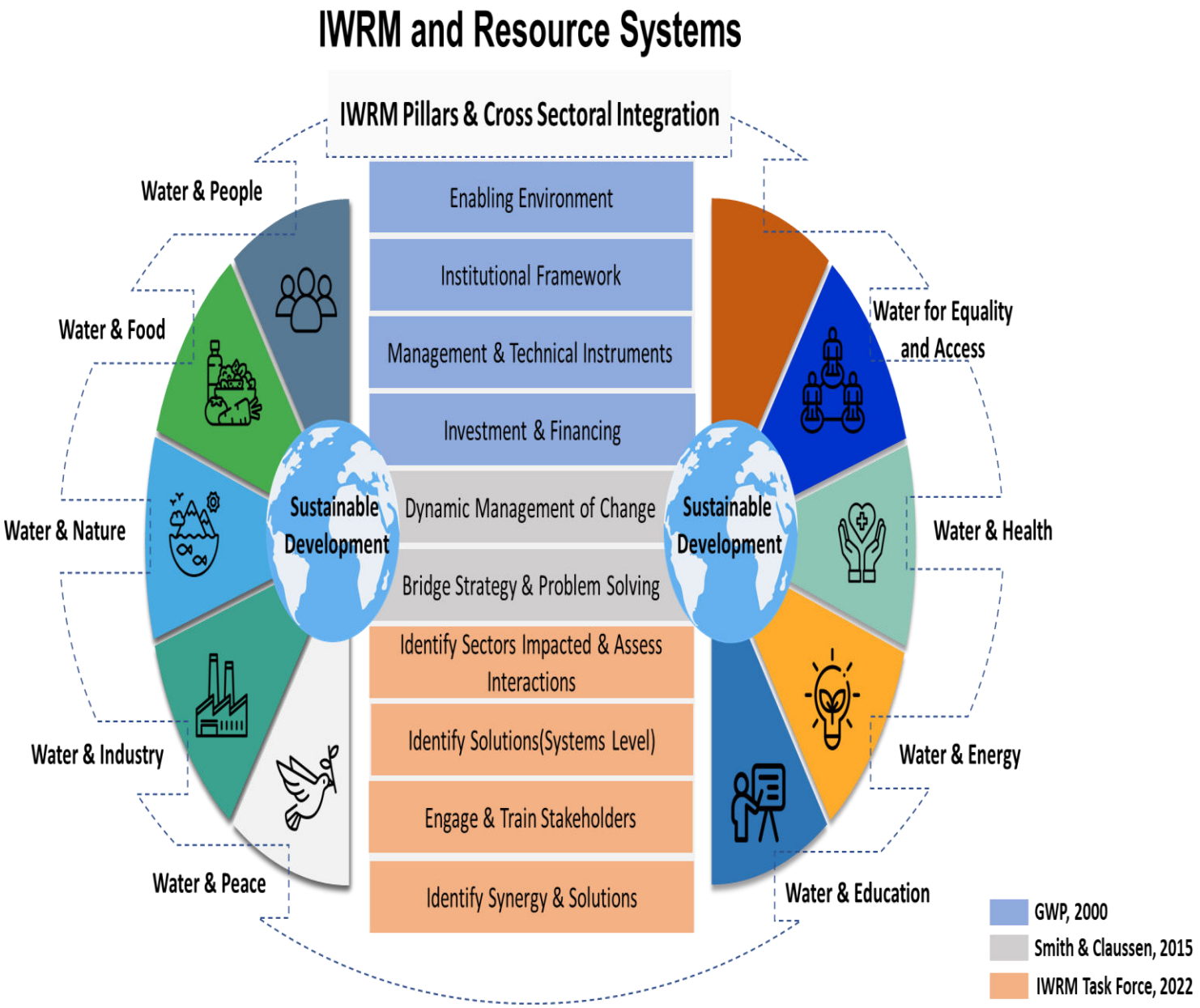
TOGETHER WE MAKE WATER A GLOBAL PRIORITY

Need For System's Approach

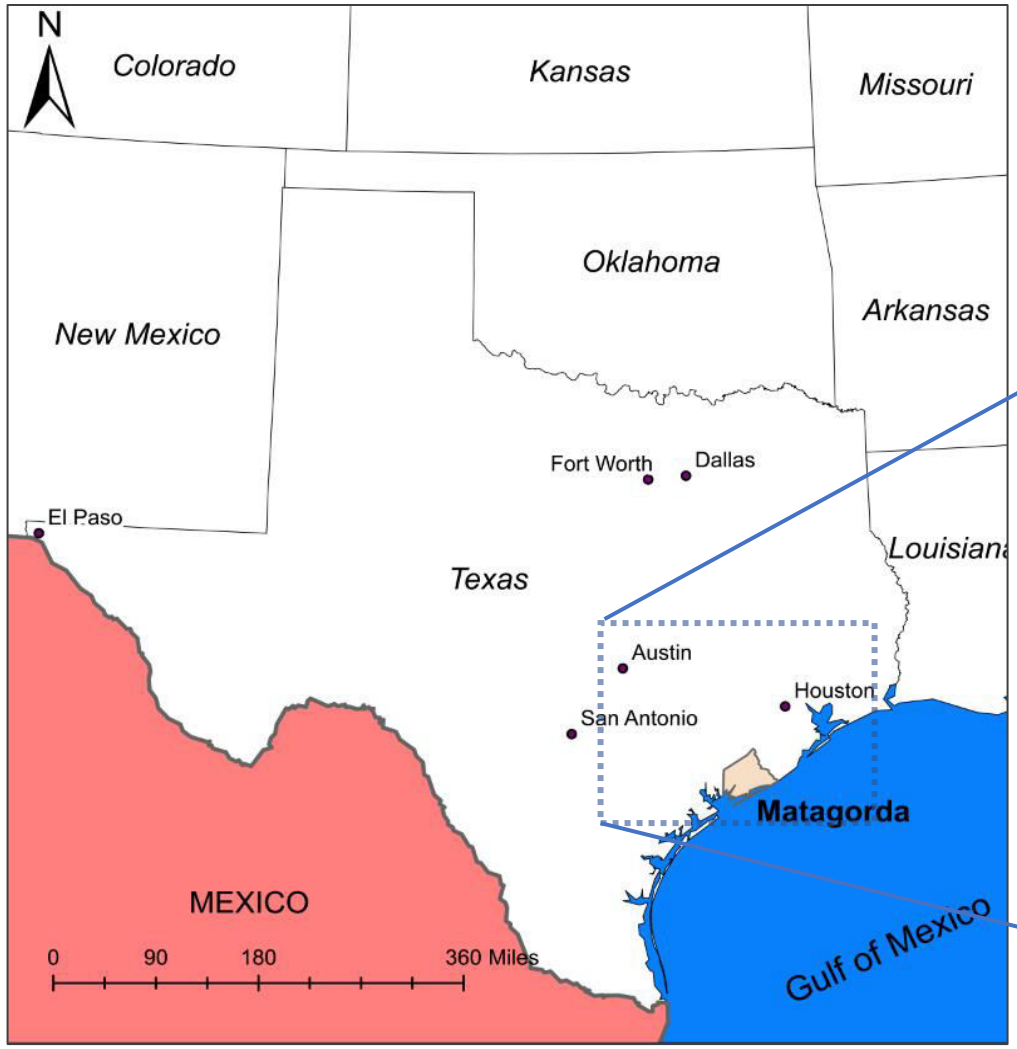


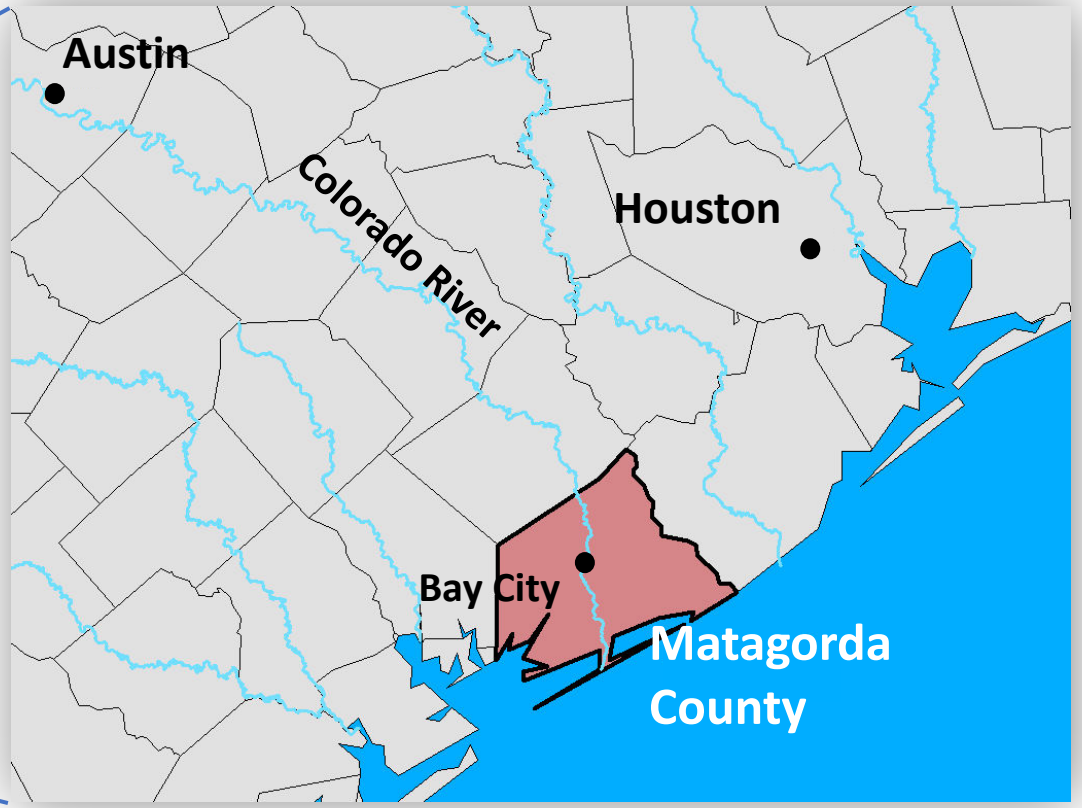
Source : Mohtar, 2020

A New Vision For IWRM



CASE STUDY: MATAGORDA COUNTY, TEXAS





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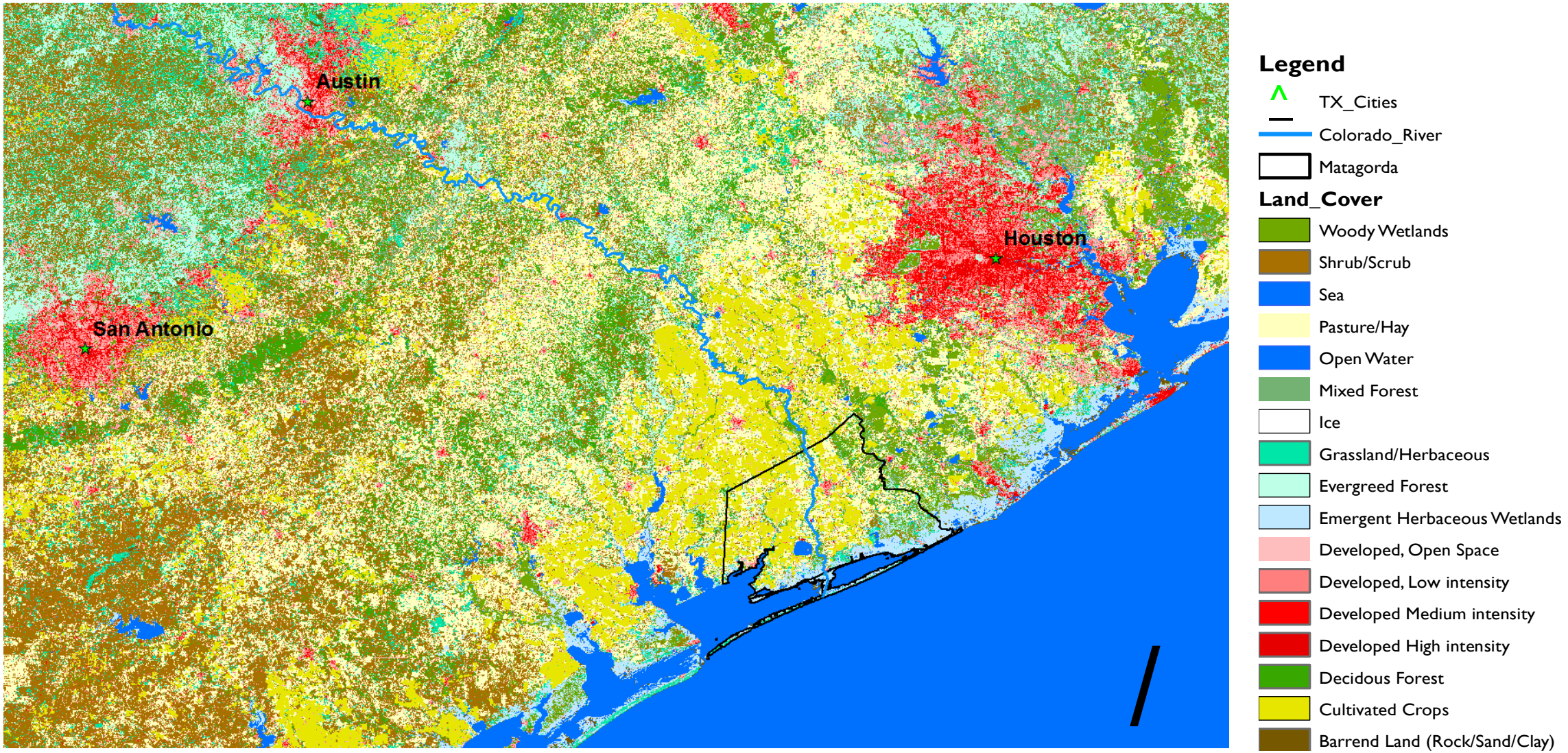
MATAGORDA COUNTY LAND USE



Data Source:s MRLC and TWDB

Research Question & Objectives

Research Question:

How does the Water – Energy – Food Nexus approach help in **water-related infrastructure decisions to mitigate water stresses** in Matagorda County?

Objectives:

I. Develop a system level water – energy- food nexus tool/platform to assess tradeoffs for water planning scenarios in Matagorda County

II. Identify feasible interventions that can mitigate risks and vulnerabilities of the primary resources (water, energy, food) for Matagorda County.

III. Draw recommendations for future water allocations in Matagorda County based on economic, social and environmental sustainability and implications on energy and food resources .

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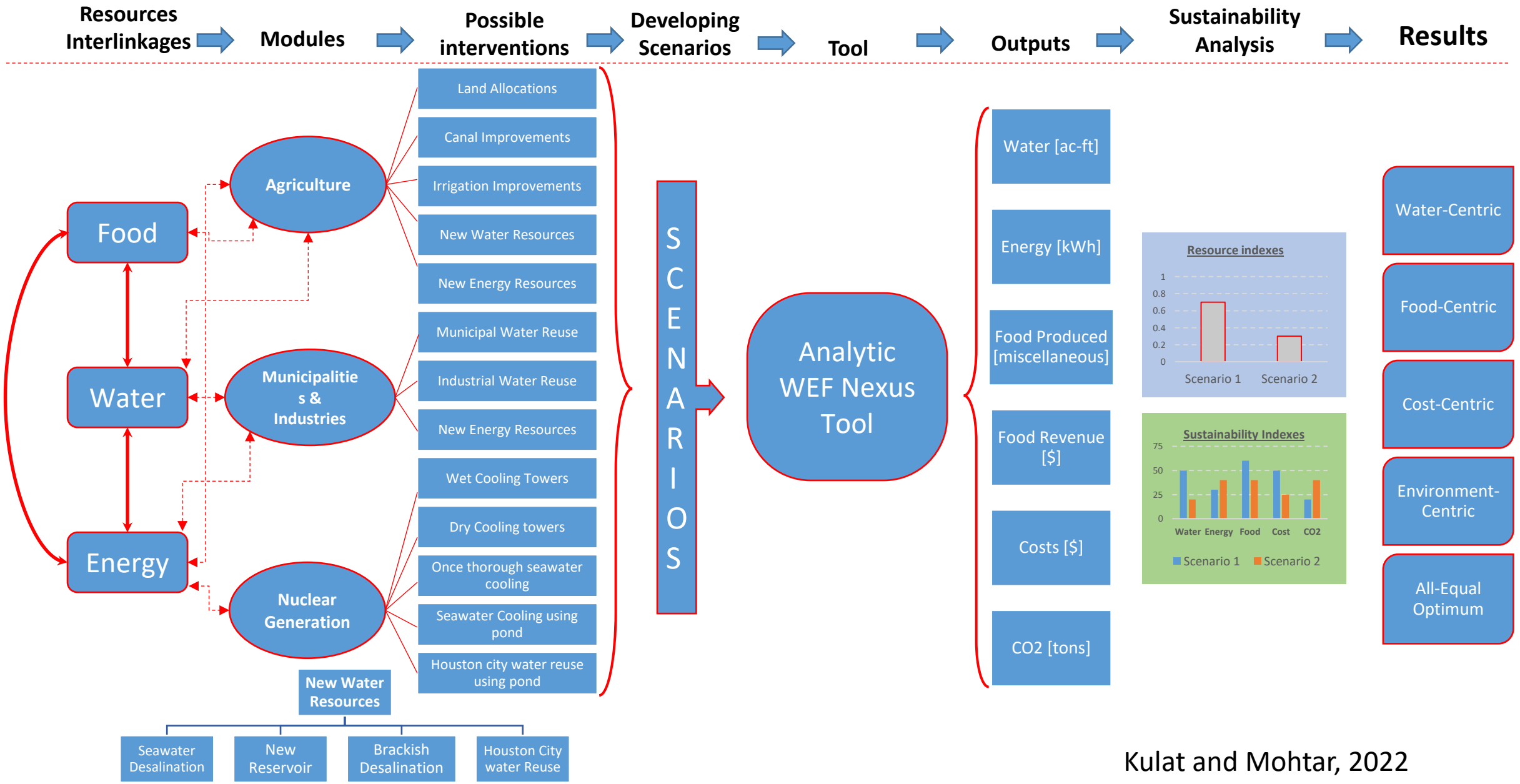
Framework



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Outcomes of analyses

Scenario 9: The Best Scenario

Possible Interventions Included:

- Conveyance System Improvement
- On-farm Irrigation Improvement
- Building New Reservoir
- Building Desalination for Brackish Water
- Building Water Treatment for Reuse
- Seawater Use for Cooling
- Solar Farm



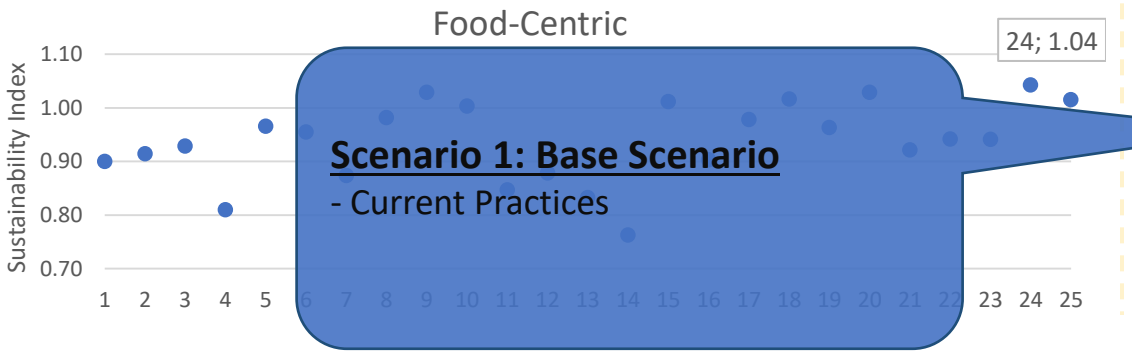




Scenario 14: Worst Scenario

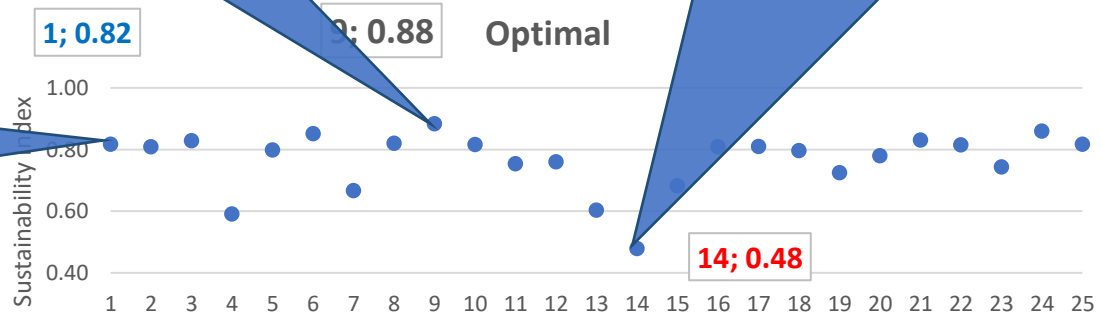
- Cropping Pattern Change (More Water Demanded Crops)
- Conveyance System Improvement
- Building desalination plant for Seawater
- Building desalination plant for Brackish
- Bringing wastewater from Houston
- Seawater use for Cooling



Scenario 1: Base Scenario

- Current Practices



x-axes represent scenarios while y axes are for sustainability indexes

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Conclusion

	Base	Best
	1	9
Water Demand (ac-ft)	374,874	355,419
Water Supply (ac-ft)	212,843	299,520
Energy Demand (kWh)	59,458,409	144,334,764
Solar Energy Production (kWh)	0	103,990,216
CO2 Emission (ton)	12,284	10,086
Ag. Revenue ($)	188,218,475	239,187,955
Project Costs ($)	190,772	19,159,627
Ag. Supply percentage	21%	61%

What are the benefits of the Nexus Approach?

- The Nexus approach provides a platform to choose the most sustainable combination of infrastructure
- If the best scenario applied, the sectors driving water-energy-food are warranted to do their job without sacrificing their routine work:
  - Municipal users get all indoor & outdoor water use demand (100% reliability)
  - Industrial users who utilize water receive water for their manufacturing, mining, processing etc (100% reliability)
  - STP Nuclear Generation is be able to cool its reactors with no restriction for energy production
- **Farmers receive more water than usual so that they make more benefit despite infrastructure project cost.**
- **Considerable amount of the population relies on Agriculture, so economy and other sectors of the county are expected to do well.**
- **Overall, primary resources are saved with less environmental damage.**

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THANK YOU