Water-Energy-Food Nexus

Toward Sustainable Resource Management

wefnexus.tamu.edu/courses-at-tamu/baencven-642

CVEN 642 / BAEN 642

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TEXAS A&M UNIVERSITY
WEF NEXUS INITIATIVE

Course Objectives:

1) Study: Principles and application of the Water-Energy-Food (WEF) Nexus to state, national, and international Water-Energy-Food securities and the interlinkages between them.

2) Explore: Quantitative frameworks to develop and assess the trade-offs among different resources allocation strategies.

3) Hands on: Follow subject matter fundamentals by working on relevant, real world projects or case studies.

Upon Completion of the Course, Student will be Able to:

Describe: Global risks & how adopting a Nexus approach can drive sustainable resources management and allocation

Quantify: Inter-linkages of the Water, Energy, Food systems

Identify: WEF Nexus hot spots for a specific condition

Apply: Nexus Tools to assess possible scenarios and conduct trade-off analysis

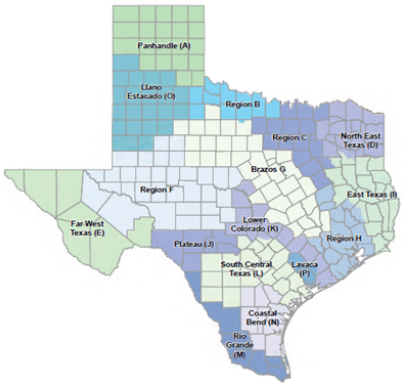
Explain: How engineering and analytics interface with economics, policy and supply chain at local and global scale.

Devise: Nexus friendly solutions for a specific case study towards a more sustainable resource allocation

Project Examples

Addressing the Water Gap in Texas: A WEF Nexus Approach *Kaushik, Blake, Zamaripa, Shafiezadeh, Askariyeh, Daher, Lee*

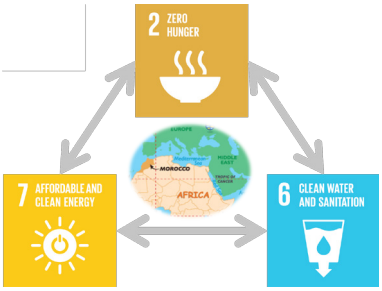
Texas Development Water Board State Water Plan for 2012 anticipates that Texas will face a 40% water gap by 2060. This reflects an overall projection for the state, but the water gap will impact each of the 16 regional water planning zones of Texas differently, depending upon the specific population growth, water needs, and existing water supplies.



Agricultural activity, energy development (particularly hydraulic fracturing), and urban growth will represent multiple competing demands for water. As a result of the great variability in resource distribution across the State, as well as the dynamic of competing demands, different hotspots with unique characteristics emerge. Successfully bridging the Texas water gap, as well as the similarly predicted gaps in locations around the globe, will depend upon our ability to adapt and adopt localized interventions that effectively respond to and address the particular local hotspot. Any assessment of projected trends, and understanding of potential impact of possible interventions must be holistic, yet localized, in order to capture the interconnections between the resource systems.

The Role of the WEF Nexus in Implementing Sustainable Development Goals in Morocco *Daher, Hallmark and Olayiwola*

In September 2015, member States of the United Nations committed to working towards a list of 17 Sustainable Development Goals (SDGs) by 2030. This study focuses on highlighting the interactions and potential competition that exists among the Water, Energy, and Food Goals (SDGs 2, 6, and 7). The State of Morocco will be used as a pilot demonstration case study. A quantitative methodology and tool which highlights trade-offs among different pathways associated with achieving a set of targets under the three goals will be presented.



GET INVOLVED: If you would like to bring a challenge for a team to investigate your specific WEF issues and offer tradeoff recommendations for sustainable management, please contact: Rabi H. Mohtar, mohtar@tamu.edu

Water-Energy-Food Tradeoffs for the Matagorda County *Buescher and Kulat*

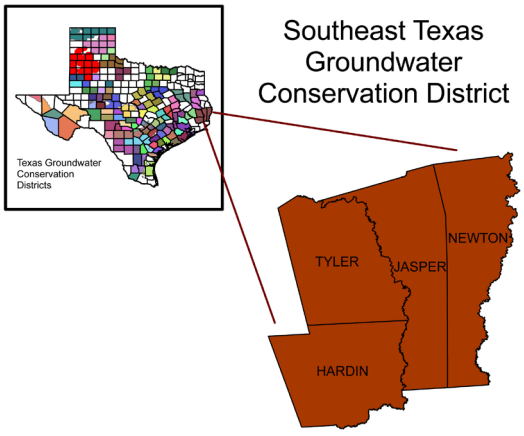
The project goal was to build a water-energy-food nexus based analytical framework to quantify the trade-offs between the various tenants of the nexus, under multiple scenarios and across different ranges of water consumers in Matagorda County. The intent was to aid in addressing current and projected gaps between available water supply and annual demand for water. Scenarios were tested using the nexus model to determine the combinations which most effectively close the water gap. Minimized water demands were taken as input for evaluation of the sustainability of each combination of scenarios. A sustainability index was developed and studied scenario combinations were ranked according to their sustainability. The most sustainable water, energy, and cost centric scenario combinations were determined. Recommendations for future water allocation practices in the County were based on the results of the study, the nexus framework, and each of the major water use sectors.

Using Water-Energy-Food Nexus to Promote Sustainable Development and Combat Climate Change in the Mekong River Basin *Garibay and Yang*

The Mekong River is of great significance to the people of Southeast Asia and highly valued for its role in culture throughout history. The basins are seen as the engines behind energy infrastructure, regional transportation grids, and tourism development (Asian Development Bank's Greater Mekong Sub-Region (GMS) initiatives). However, competing demand of water, energy and food, and threats posed by climate change, constrain the region's future development. This study used the Resilience Index (RI), a tool to gauge the level of a country's combined food water and energy securities, to analyze the effects of potential policy change scenarios of the individual countries in the Basin. It demonstrates the potential of the RI to assist policy makers in informed decision making. Treating water, food, and energy security as an integrated whole is crucial to the creation of an optimal strategy for future development.

Groundwater Pumping Projections for Energy and Agriculture: Energy-Water Nexus in South Texas *Nata*

Hydraulic fracturing (HF) is a water-energy hotspot for south-central Texas. While HF usually relies on fresh groundwater, its use for mining is a fraction of overall groundwater used in Texas as a whole, but the share and intensity is significant in some countries of south central Texas, intensifying the water-energy nexus. This may increase the tradeoff between types of groundwater used. Using Texas Water Development Board data, time series data for groundwater was collected from 2001-14. Two econometric models were used to estimate the irrigation and mining use, and see the extent of the tradeoffs between them.



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