



# Understanding and Responding to Climate Change in the Great Plains: Source, Impact, and Mitigation

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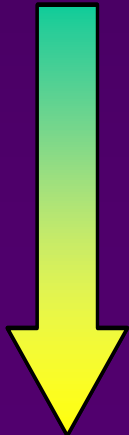
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# Climate Change and Energy: Basic Science, Impacts, and Mitigation

Bio



## ***BASIC SCIENCE***

*meso*-Scale Modeling of  
Regional Climate Change  
Feddema (KU)/Ma (WSU)

Food/Fuel Crop  
Decisions/Projections  
Earnhart (KU)/Peterson (KSU)

Biomass → Biofuels

## ***IMPACTS***

Kansas Farmlands  
Harrington (KSU)/Gibson (KU)

Indigenous Lands  
Wildcat (HINU)/Nagel (KU)

## ***MITIGATION***

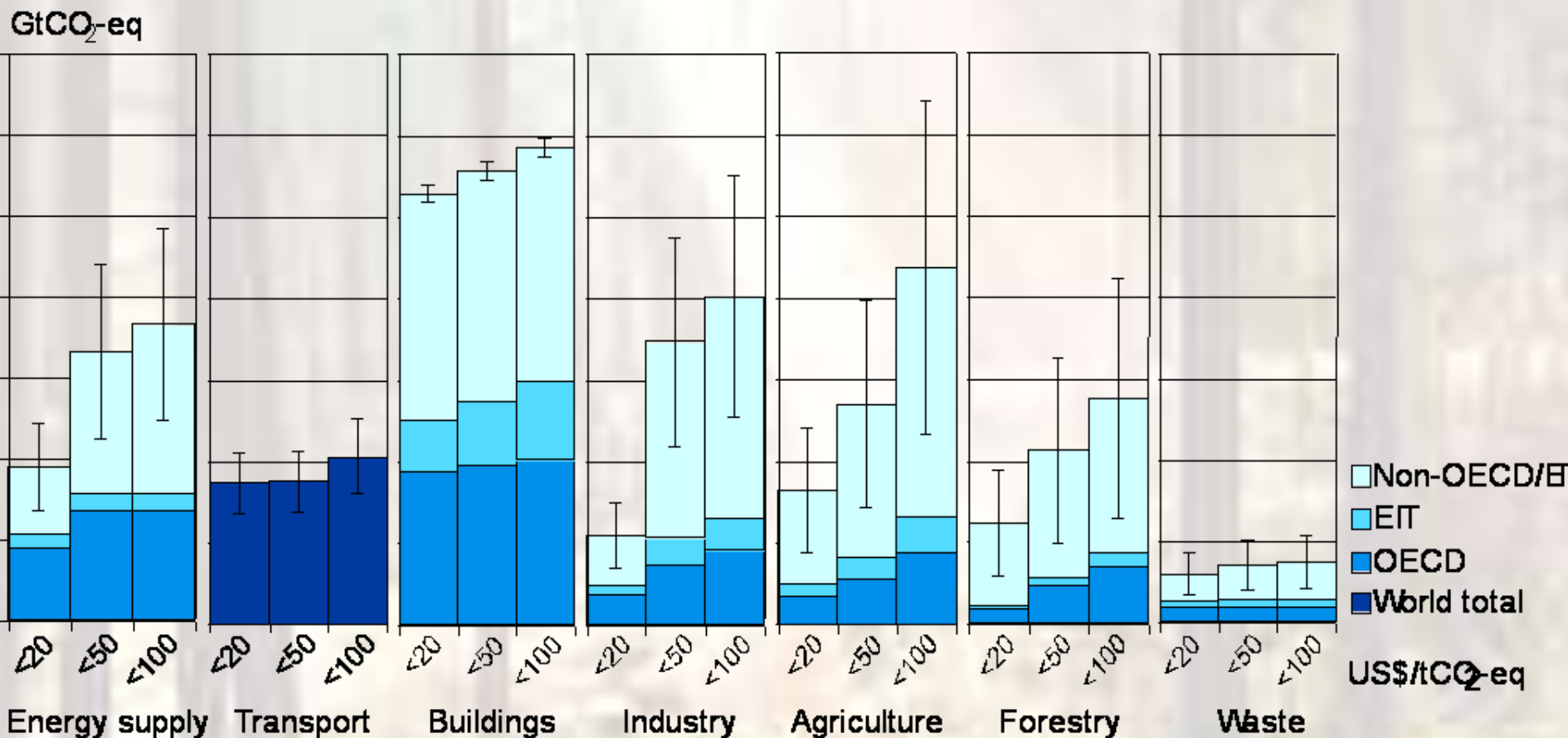
C-Sequestration  
Rice (KSU)/Rille

Biomass → Biof  
Williams (KU)/W

# Challenges for Kansas and the central Great Plains

- What will be the local temporal and spatial expression of temperature and precipitation change? How will these changes impact local water resources?
- How will the combined impacts of changes in temperature and precipitation impact natural agricultural systems and thus the economy of Kansas and the Great Plains?
- What are the necessary adaptation strategies for climate change for Great Plains natural resources and agricultural systems?
- To what extent can the efforts of those in Kansas and the Great Plains be used to offset GHG emissions?
- How might extensive biofuel production impact climate change and water resources availability in Kansas and the central Great Plains?

# Global economic mitigation potential for different sectors at different carbon prices



# Mitigation

- Objective: Identification of possible management (adaption or mitigation) strategies to minimize the impact of climate variability and change on stability and productivity.
- Enhance our understanding of the long-term success of soil carbon sequestration and N<sub>2</sub>O emissions as mitigation efforts.
    - Employ new technologies to enhance our understanding of the biological, biogeochemical, and physical processes involved in mitigation
    - Feedbacks of climate change on the capacity of terrestrial ecosystems to mitigate
  - If biofuels are to provide a mitigation option and an alternate energy source then it is important to understand the feedbacks on other agricultural mitigation (Soil C, N<sub>2</sub>O) strategies.

# Agriculture

- A large proportion of the mitigation potential of agriculture (excluding bioenergy) arises from soil C sequestration.
- Soil C sequestration
  - has strong synergies with sustainable agriculture and
  - generally reduces vulnerability to climate change.

# Education

- Educate a new generation of environmental scientists across disciplinary domains
  - Inter-institutional Activities
    - Annual symposia and semi-annual workshops
    - Seminars and colloquia with national and international scholars.
    - Monthly journal clubs, shared via video conferencing.
  - Institutional Activities
    - Integrated activities with faculty, post-docs, graduate students and undergraduate students

# International Opportunities

- International agreements are already in place for institutional collaboration.
  - For example, KSU and the Federal University of Santa Maria in Brazil have a signed MOU to share research, undergraduate and graduate students, and faculty with the focus on adapting to and mitigating climate change.
- Global Research Alliance on Agricultural Greenhouse Gases, an international research collaborative to combat climate change. Includes 20 countries.
  - will focus on research, development, and extension of technologies and practices to grow more food (and more climate-resilient food systems) without growing greenhouse gas emissions



# Mitigation and Energy

- Management of natural resources has a significant role to play in climate mitigation (ENVIRONMENTAL SECURITY) while still producing food (FOOD SECURITY)
- Improved energy efficiency in agriculture can contribute to further climate mitigation and reduce energy use. (ENERGY SECURITY)
- Transformation in education