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

Three major research subprojects:
1. Biofuels and Climate Change (BCC)
2. Climate Change and Mitigation (CCM)
3. Nanotechnology for Renewable Energy (NRE)

These three research initiatives are linked with a diversity/workforce development project:
4. Climate Change in Indigenous Communities (Pathways)

We are creating: Climate and Energy Central

A unique platform for broad collaborations related to:
Sustaining the Planet, Powering the World

PI: Kristin Bowman-James
$20M from NSF
10/1/2009-9/30/2014
Overall Objective

Provide policy- and management-relevant information for adaptation and mitigation that will advance Kansas citizens’ and Kansas agriculture enterprise’s understanding and response to climate change.

Team of 14 researchers including biologists, geographers, agronomists, agricultural engineers, physicists, mathematicians, and computer scientists.
Biofuels and Climate Change

Overall Objective

Employ qualitative and quantitative analysis to understand farmers’
- decisions to cultivate biofuel crops and
- responses to changing climate.

Team 15 economists, sociologists, geographers, anthropologists, and a civil engineer.

Corn Acreage and Bio-Refineries in Operation or Under Construction

2006

- Avg Price $2.98/bu.
- Avg county acreage lower than 2000-2009 mean.

2007

- Avg Price increased to $4.14/bu.
- Congress passed Energy Independence and Security Act of 2007, mandating increase in biofuel production.
Climate Change in Indigenous Communities

Overall Objectives
Develop pathway for native students into STEM disciplines in collaboration with Haskell’s American Indian/Alaska Native Climate Change Working Group.

- Summer Research Experience for Undergraduates (REU) for tribal college students at Haskell.
- Graduate Research Assistantships for tribal college REU graduates pursuing STEM graduate studies.

In collaboration with the Haskell Environmental Research Studies Center
HERS Institute

Dan Wildcat
Haskell Indian Nations University
Professor of American Indian Studies

Joane Nagel
KU
University Distinguished Professor of Sociology
Advanced solar cells--electricity:
- Cost-performance balanced solar cells
- Energy storage and distribution

Biomass to biofuel
- To improve environment
- To reduce reliance on fossil fuels
- To produce 36 Billions gal by 2022

Algae production
(Schneegurt-WSU, Smith, Sturm-KU)

Catalysts for hydrolysis
(Wang & Hohn-KSU)

NRE team
www.solarenergy.ku.edu

Team of 29 biologists, chemists, engineers, and physicists

Algae
(Smith-KU)

Biodiesel
(Williams-KU)
Opportunities - an example

SCIENCE, ENGINEERING AND EDUCATION FOR SUSTAINABILITY (SEES)-initiated in 2010, to be expanded in 2012 (+$337.45 million expected)

Fundamental to all sustainability research is the simultaneous consideration of social, economic, and environmental systems and the long-term viability of those systems.

SEES--entire range of scientific domains at NSF and aim to:
1) support interdisciplinary research and education that can facilitate the move towards global sustainability;
2) build linkages among existing projects and partners and add new participants in the sustainability research enterprise; and
3) develop a workforce trained in the interdisciplinary scholarshipd needed to understand and address the complex issues of sustainability.

Everyone is needed and we must work together!