

Infrastructure to Document Local Hydroclimatic Vulnerabilities to Climate Variation and Change*

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Overview

- We live in a stressed and rapidly changing world
- There is a need to better understand the human dimensions of global change
 - complex and coupled human-natural system
- Our experience with **Global Change in Local Places** demonstrated a need to develop infrastructure to facilitate collaborative work across multiple sites
- People experience and respond to climate variations and change in local places
- Inadequate infrastructure exists for documenting local human adjustments to and consequences of climate change
- NSF/NOAA funded **Human-Environment Regional Observatory (HERO) project**

- Developing protocols for
 - Collecting and Storing Data
 - Reporting and Sharing Data
 - Analyzing and Synthesizing Data
- **Intelligent Networking Environment (HERO Collaboratory)**

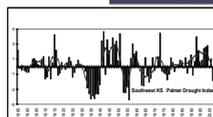
- Web-based access
- Data Management
- Electronic Collaboration
- Documenting that the infrastructure works by applying the protocols and intelligent networking environment at four diverse HERO study sites
 - Arizona-Mexico border region (SoMBRHERO)
 - High Plains of southwestern Kansas (HPO-HERO)
 - Ridge and Valley Province of central Pennsylvania (SRB-HERO)
 - Restructuring manufacturing belt in central Massachusetts (CM-HERO)
- Focus of **"proof of concept"** activities at HERO sites:

- How does **decision making** affect the **vulnerabilities** of these **places to hydroclimatic variation and change?**
- Three essential components of vulnerability:
 - Exposure
 - Sensitivity
 - Adaptive Capacity

- This five-year project has developed ways to gather and preserve precious qualitative and quantitative data
 - REU activity (four years) benefited project activities and the students involved
 - Now possible to answer critical, cross-site, integrative questions about complex relationships among individuals, communities, and their climatic environment over time and space
 - We are currently writing a book to document the successes of the HERO effort.



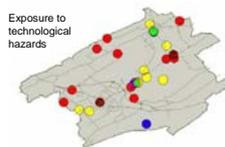
HERO's e-Delphi system enables research groups and other organizations to collaborate through online Delphi activities that facilitate group decision making.



Adaptive capacity in central Massachusetts

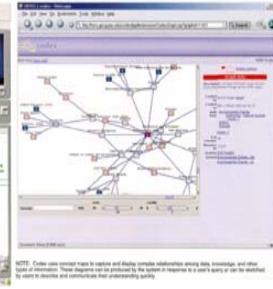


Groundwater-based irrigation in southwest KS minimizes sensitivity to hydroclimatic variation



HERO Collaboratory

- Intelligent networking environments (collaboratories) will greatly benefit future integrative assessments that deal with the fundamental and complex issues linking nature and society
- Collaboratories assist those involved in the necessary process of learning the working language of other groups of people



Major Results/Findings

- Through activities like web-meetings, e-Delphi activities, and concept mapping efforts, the HERO Collaboratory demonstrated a technological means to 'virtually' bring people together from across the country to make research progress
- Hydroclimatic vulnerability differs substantially among the four HERO sites:
 - Long-term drought is the major exposure threat in KS and AZ whereas floods and short-term droughts present a significant risk in PA and MA
 - Water quality issues are a major sensitivity in the humid eastern areas, but water availability (quantity) is the primary concern at the semi-arid/arid western sites
 - Access to natural or financial resources tends to increase adaptive capacity across all sites
- Protocols are being developed and tested to:
 - Quantitatively assess exposures using standard statistical data
 - Qualitatively assess sensitivities and adaptive capacities using data from community decision-maker interviews
- Protocols are also being established to enable comparative analysis of research findings across the sites



- A HERO (Human-Environment Regional Observatory) is the social science equivalent of a Long-Term Ecological Research (LTER) site. At a HERO location, the primary questions address how the human dimensions of global change play out at the local level. By their very nature, HEROs must deal with the complex linkages between humans and natural systems or the Social Ecological System (SES). Topics of study include: demographic change, land change science, resource utilization and consumption, vulnerability science, sustainability science, the roles of structure and agency as drivers of local change, and issues related to scale changes from local to regional to global.

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 WHERE DISCOVERIES BEGIN