Science Policy Interface: Water & Ecosystem Management

Aspen Global Change Institute
14 October 2015

Contributions from
Shannon McNeeley
Jefferey Morissette
Gabriel Senay
(NCCSC)

Dennis Ojima
North Central Climate Science Center
Future Earth Secretariat
Colorado State University
Roadmap

• 2015 Highlights of Science-Policy Interactions
• Research – Practitioner Platforms
• Example: Drought is not experienced the same by all peoples or ecosystems
Society setting targets and developing plans for sustainability and managing risks of global change
Decision Makers from multiple levels of society

Mongolian herder
(Participant in focus group survey)

Mayor of our cities
(Mayor of Fort Collins and CSU President)

Heads of State
(UN General Assembly)
SUSTAINABLE DEVELOPMENT GOALS

- GOAL 1: poverty
- GOAL 2: hunger
- GOAL 3: healthy lives
- GOAL 4: quality education
- GOAL 5: gender equality
- GOAL 6: sustainable management of water
- GOAL 7: sustainable and modern energy
- GOAL 8: sustainable economic growth
- GOAL 9: resilient infrastructure
- GOAL 10: reduce inequality
- GOAL 11: resilient cities
- GOAL 12: sustainable consumption and production
- GOAL 13: combat climate change and its impacts
- GOAL 14: sustainably use the oceans
- GOAL 15: sustainable use of terrestrial ecosystems,
- GOAL 16: peaceful and inclusive societies
- GOAL 17: global partnership
Future Earth
2025 Vision Challenges
Science 4 SDGs

International coordination of research and interface (with Sustainable Development Solutions Network)

Knowledge Action Networks

Network of core projects
Links among SDG’s

GSDR 2015
Connecting land in the Nexus…

Future Earth FTI on **Sustainability for water, food and energy through integrated water information and improved governance**: Anik Bhaduri, Richard Lawford and Claudia Pahl-Wostl
SCIENCE-POLICY INTERFACE

SPIs are the many ways in which scientists, policy-makers and others link up to communicate, exchange ideas, and jointly develop knowledge to enrich policy and decision-making processes and/or research.
Roadmap

• 2015 Highlights of Science-Policy Interactions
• Research – Practitioner Platforms within a social-ecological system framing
• Example: Drought is not experienced the same by all peoples or ecosystems
NC CSCs Foundational Science Areas

Physical Hydro-Climate

Ecological Impacts

Human Adaptation & Decision-Making

Management Decisions & Contexts

Synergies and leverage

Management-driven science
Science-informed management
Drought Risk and Adaptation in the Interior (DRAI)

AIMS

- Understand how DOI and tribal natural resource managers experience and respond to drought on their landscapes
- Integrate between social-ecological-climatological foundational areas

APPROACH

- Bottom-up empirical process that grounds science in context of DOI and tribal resource management for salient and actionable science
Social Ecological Context

• Cross-jurisdictional vulnerabilities and differential adaptive capacity
• Multiple Objectives associated with natural resource and conservation goals
  – Water-Energy-Land-Conservation needs
  – Land use – climate impacts on species and other natural resources
Key Questions of the NCCSC

1. How do DOI and tribal managers frame (definitions and perceptions) drought risk for the land and resources they manage?

2. How are public and tribal lands impacted by drought?

3. Management decisions affected by drought?

4. Drought indicators used?

5. What are adaptive capacities federal agencies have utilized to cope with drought in their systems?

Barriers?
Drought Risk and Adaptation in the Interior

Wind River Reservation
Themes: Riparian Ecosystem Health, Agriculture and Irrigation, and cultural activities

Southwest South Dakota
Water and forage management for bison/wildlife

Northwest CO Yampa River Basin
FWS Upper Colorado River Fish Recovery
Regional Map
US Drought Monitor High Plains Region
Including 01,05
ANPP=17.85821 + 3.97074 x AET
R²=0.3526

Excluding 01,05
ANPP=6.668659 + 5.00878 x AET
R²=0.4780
Regional Perspectives: Similarities and Differences

Similarities

• All 3 case sites were affected by early 2000’s (2002) and 2012-2013 drought
• 2012 drought onset and intensity similar across the region
• All deal with multiple needs and uses (i.e., ag, wildlife, riparian ecosystem health, fisheries, and energy sectors)

Differences

• CO and WY experienced similar drought episodes (2002 & 2012); WY and SD 2006
• Dakota experience additional drought period from 2005-2007 (though some talk about 2002-2007)
• Differences in nuances of onset, duration/persistence, and lag/recovery time
Preliminary Findings

• Understanding decision making context at the scale of managers and community perspectives are critical for guiding appropriate drought response strategies
• Appropriate attention to spatial and temporal scales of analysis to better inform management
• Incorporating system level surrogates for predicting droughts effects
• Research must integrate local ways of knowing and observations with regional approaches to climate and ecosystems processes.
Managing Challenges for Drought across Multiple Sectors

• Understand scale and timing of decisions related to social-ecological dynamics of the system of interest
• Understand the non-linear and cascading nature of impacts
• Adaptive strategies may simultaneously ameliorate and exacerbate water and other natural resource management goals (Trade-offs)
• Seek robust and resilient response options under a dynamic social-ecological system framework
THANK YOU

http://revampclimate.colostate.edu/
North Central Climate Science Center
Identifying Drivers of Change

• Changes
  – What environmental changes are occurring, both in terms of vegetation and water?
  – What do you do differently as a result of these changes?

• Causes
  – What are the causes of these changes?
Challenges to Managing for Drought across Multiple Sectors

• Complexity and unpredictable nature of impacts on water and other natural resources
• Non-linear and chaotic nature of impacts
• Adaptive strategies may simultaneously ameliorate and exacerbate water and other natural resource management goals
• Finding resilient response options under changing climate and social-ecological system
Criteria for Future Earth Research

- Fundamental to use-inspired Earth system research for global sustainability
- Answer complex questions that require international collaboration
- Regional to global scale
- Integrates natural, economic, engineering, arts, humanities and social sciences
- Co-design and co-production of knowledge
THANK YOU

Website: www.futureearth.org
Facebook: www.facebook.com/futureearth.org
Twitter: @FutureEarth
2025 Vision Challenges

- Nexus of Sustainable water, energy, and food systems
- Low carbon socio-economic systems
- Safeguard the terrestrial, freshwater and marine natural assets
- Build healthy, resilient and productive cities
- Promote sustainable rural futures
- Improve human health by understanding complex environmental interactions
- Encourage sustainable consumption and production patterns
- Increase social resilience to future natural threats

Co-Design Co-Develop Co-Production
Enhancing Research Activities

• Maintaining interdisciplinary and trans-disciplinary research to further our understanding of the dynamic earth system

• Provide knowledge sharing and translation of findings between research communities, practitioners, and decision makers

• Establish mechanism for co-development of research strategies with user community
Science Policy

Connections

• Organize research input into IPCC and IPBES, and other regional assessments

• Contribute to defining and evaluating Sustainable Development Goals (SDG’s)

• Co-develop studies to identify vulnerabilities, risks, and opportunities related to reducing emissions and responding to global environmental changes
Managing the Nexus

Scenario Development

Stakeholder Dialogue

Evidence Response Options

Resource base

Goals and Interests

Different social, economic and environmental goals and interests related to:

- Water
- Energy
- Food

Drivers

- Population growth
- Urbanisation
- Diversifying and changing diets
- Cultural and societal beliefs and behaviours
- Climate Change

Governance

Sectoral policies and vested interests

International and regional trade, markets and prices

Industrial development

Agricultural transformations

Technology and innovation

Source FAO 2014
Future Earth FTI on **Sustainability for water, food and energy through integrated water information and improved governance**: Anik Bhaduri, Richard Lawford and Claudia Pahl-Wostl
Climate Preparedness and Resilience

CLIMATE HAZARDS FACING FORT COLLINS

- Forest Stress
- Increase in Severe Storms
- Infectious Disease
- Declining Water Quality
- Wildfires
- Extreme Temperatures
- Declining Water Availability

LEVEL OF SEVERITY OF POTENTIAL IMPACT

HIGH

VERY HIGH
Co-Design Co-Develop Co-Production

Thank you

Questions?

www.futureearth.info