



Aspen Global Change Institute

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Science Policy Interface: Water & Ecosystem Management

**Contributions from
Shannon McNeeley
Jefferey Morisette
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





2015



UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

Society setting targets and developing plans for
sustainability and
managing risks of global change



Decision Makers from multiple levels of society

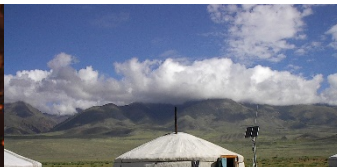
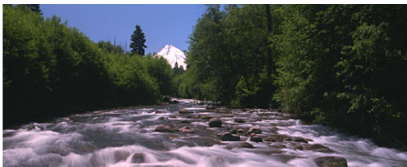


Mongolian herder
(Participant in focus group
survey)

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

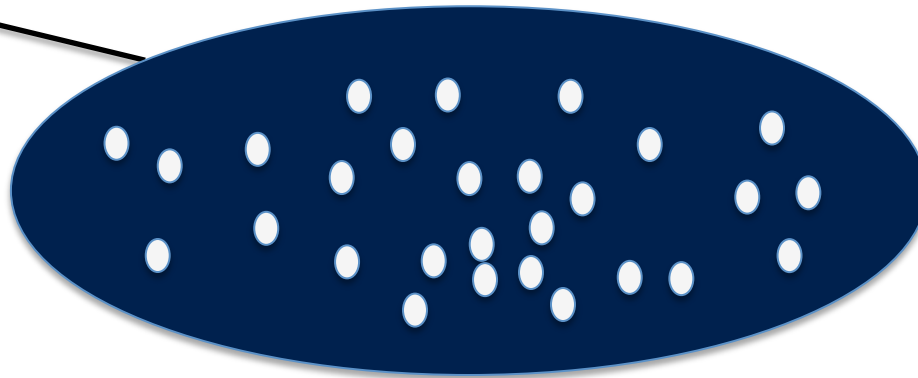
International coordination of research and interface
(with Sustainable Development Solutions Network)



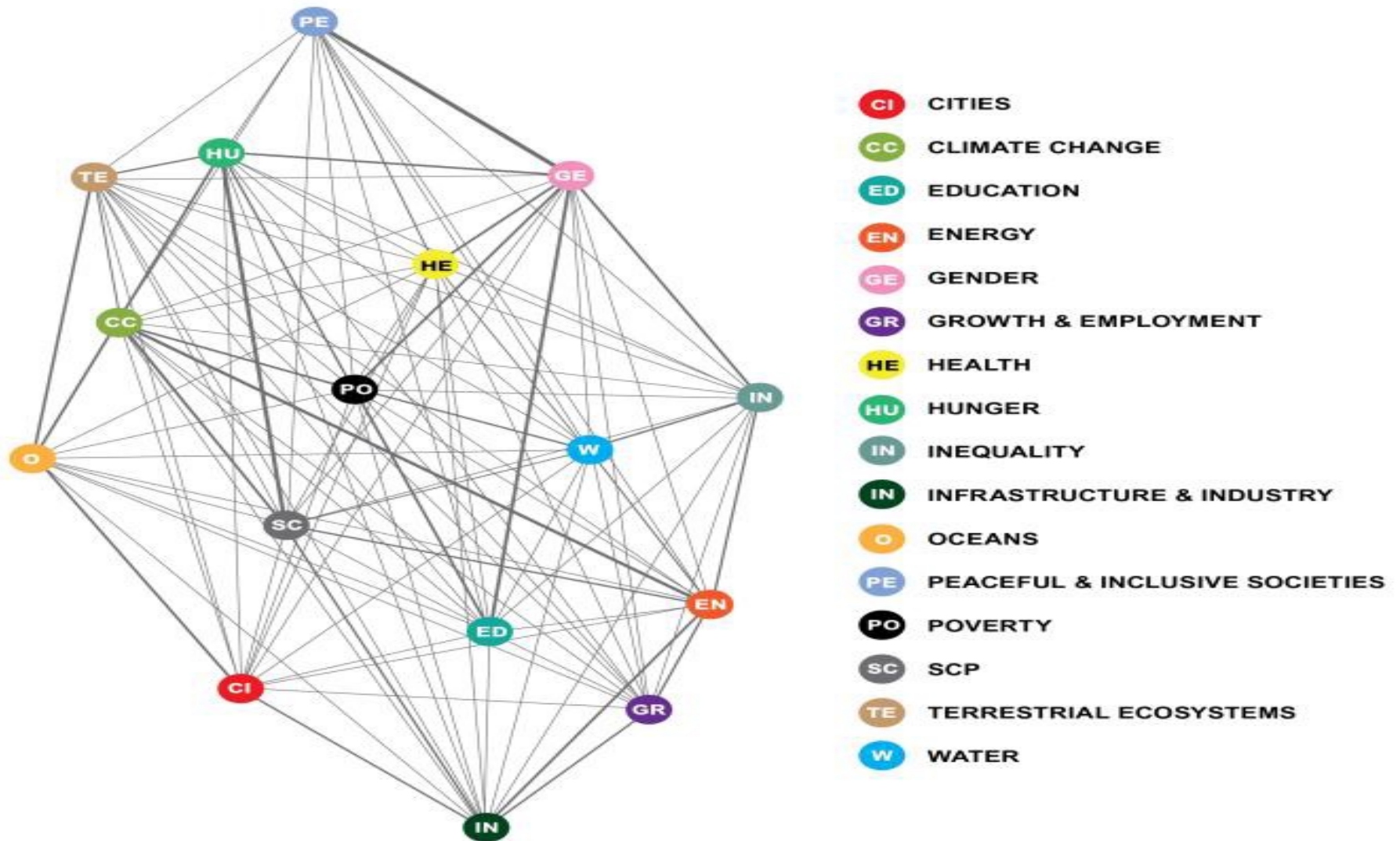
Knowledge Action Networks



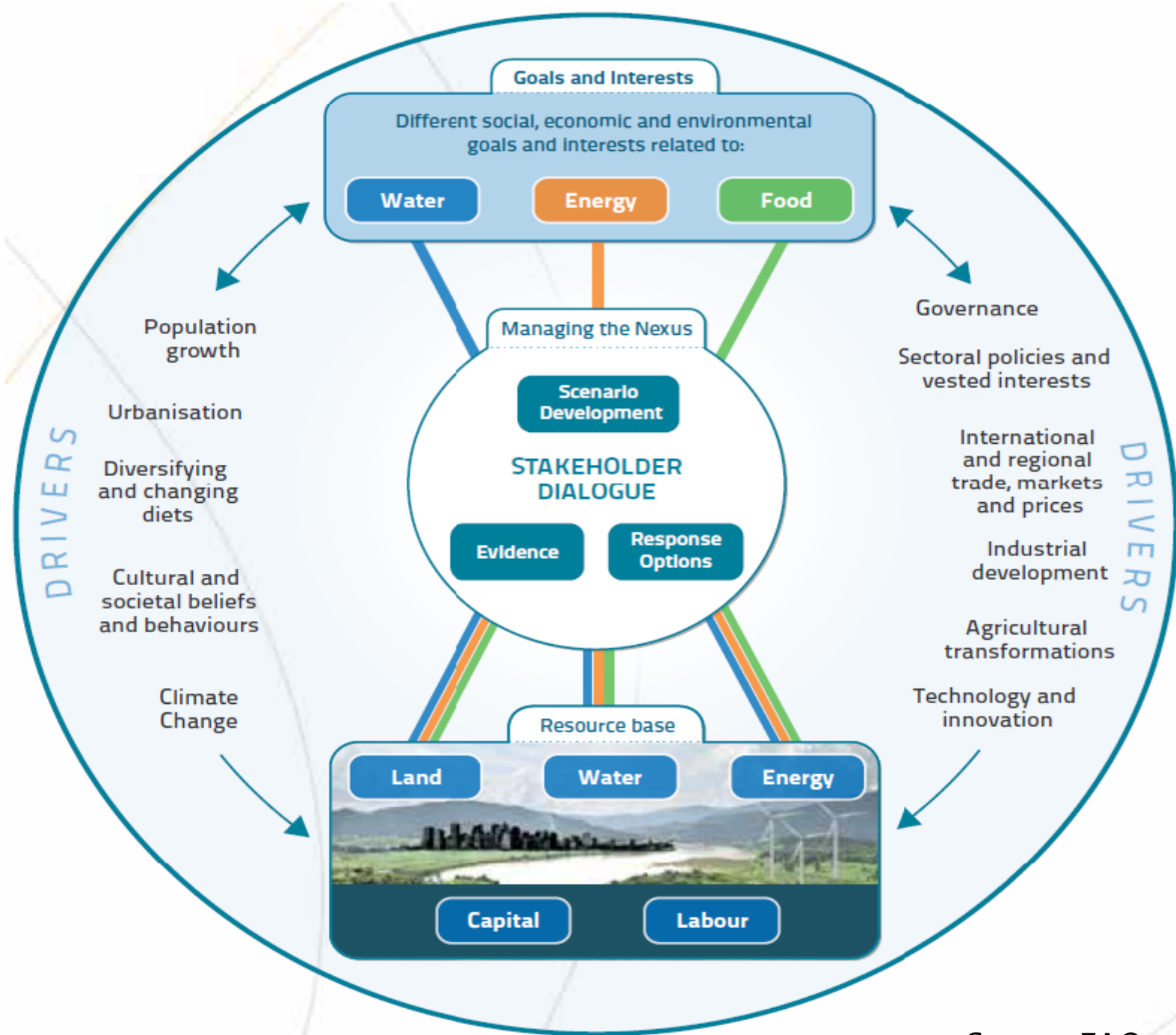
Network
of core
projects



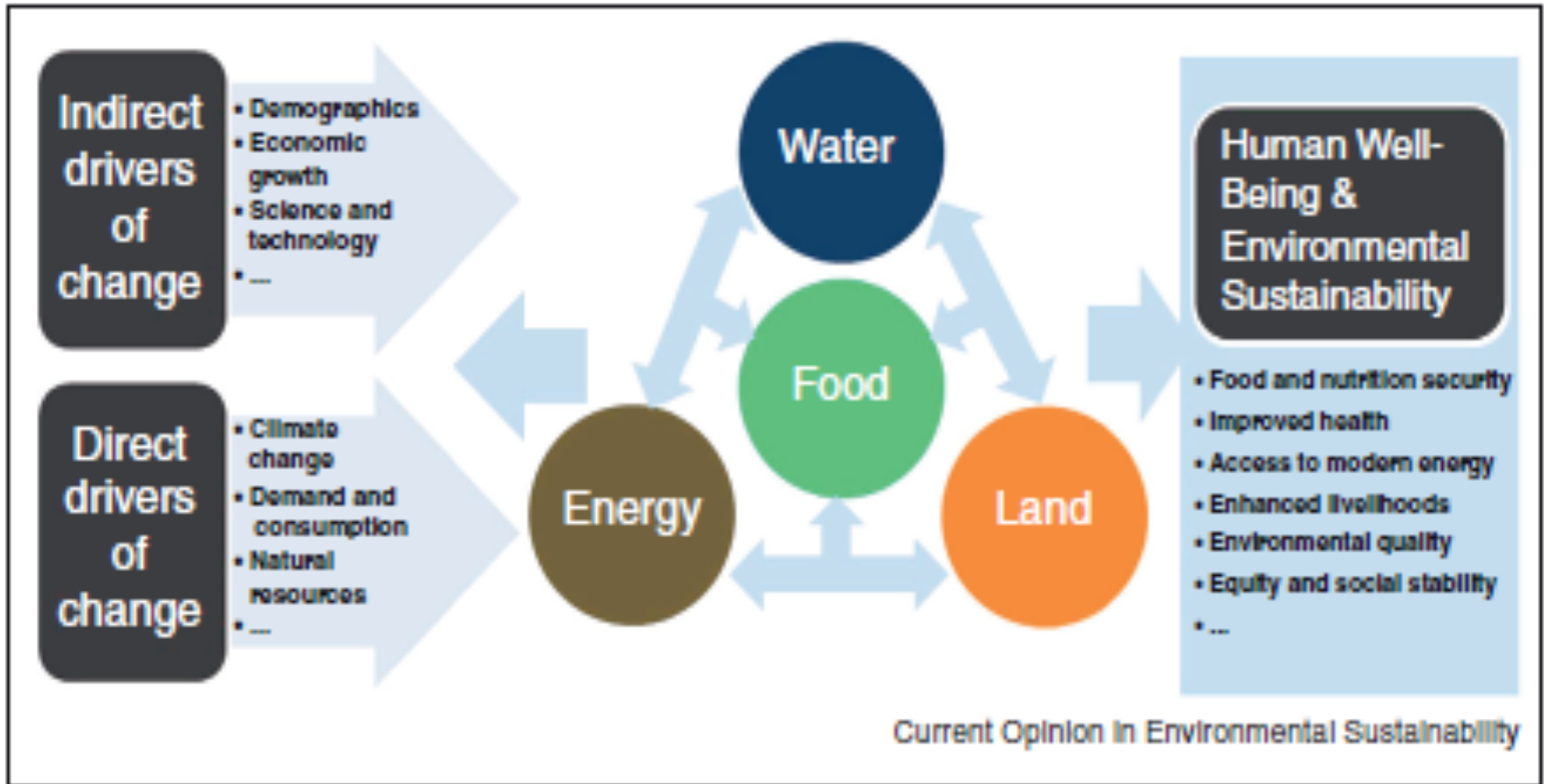
Links among SDG's



GSDR 2015



Connecting land in the Nexus...



SCIENCE-POLICY INTERFACE

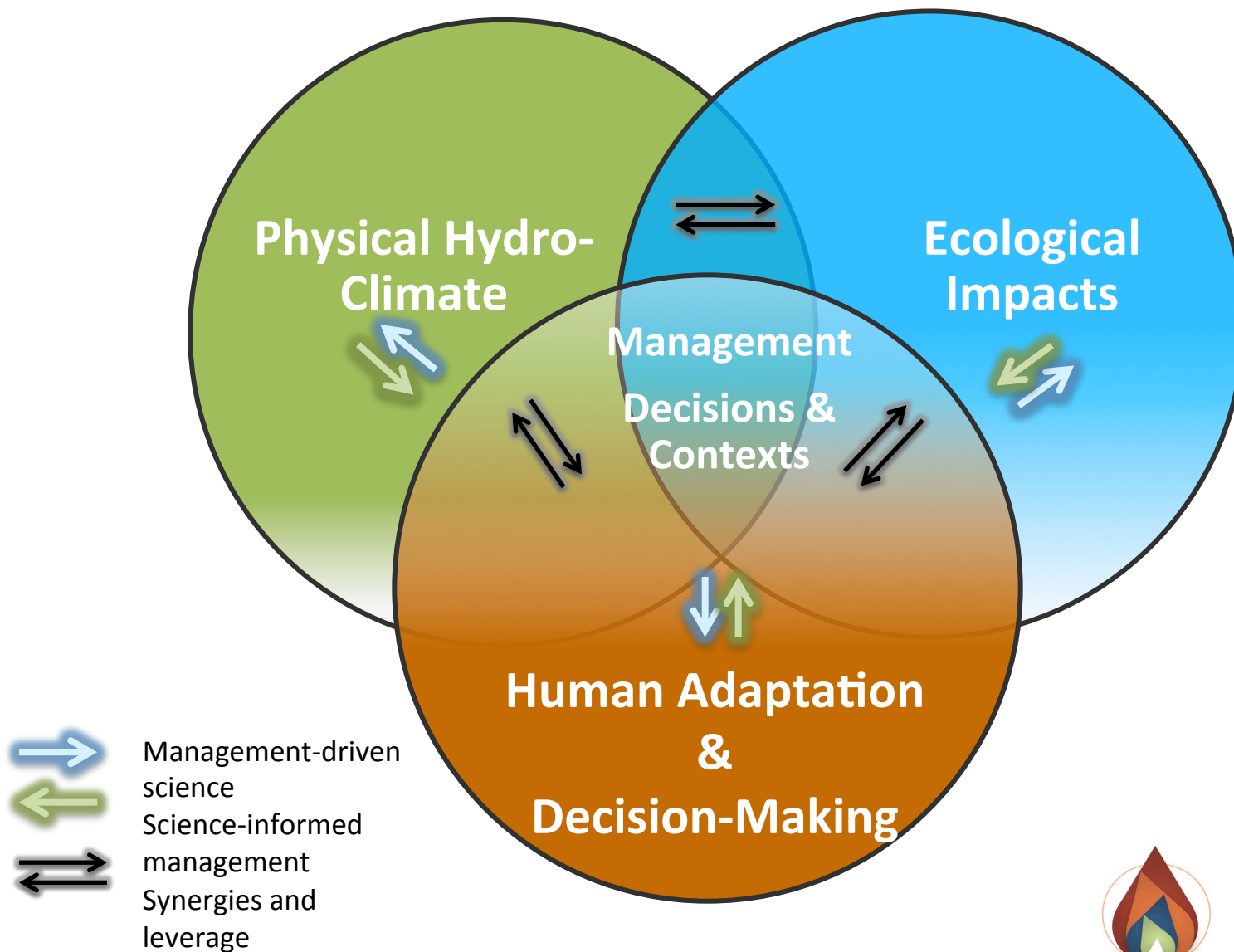
SPIs are the many ways in which scientists, policy-makers and others link up to communicate, exchange ideas, and jointly develop knowledge to enrich policy and decision-making processes and/or research.

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



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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



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Social Ecological Context

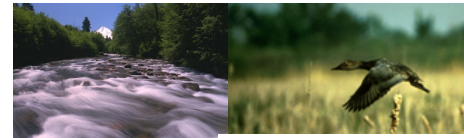
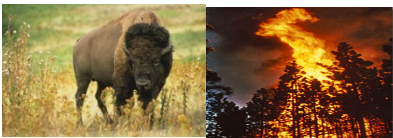
- Cross-jurisdictional vulnerabilities and differential adaptive capacity
- Multiple Objectives associated with natural resource and conservation goals
 - Water-Energy-Land-Conservation needs
 - Land use – climate impacts on species and other natural resources



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?



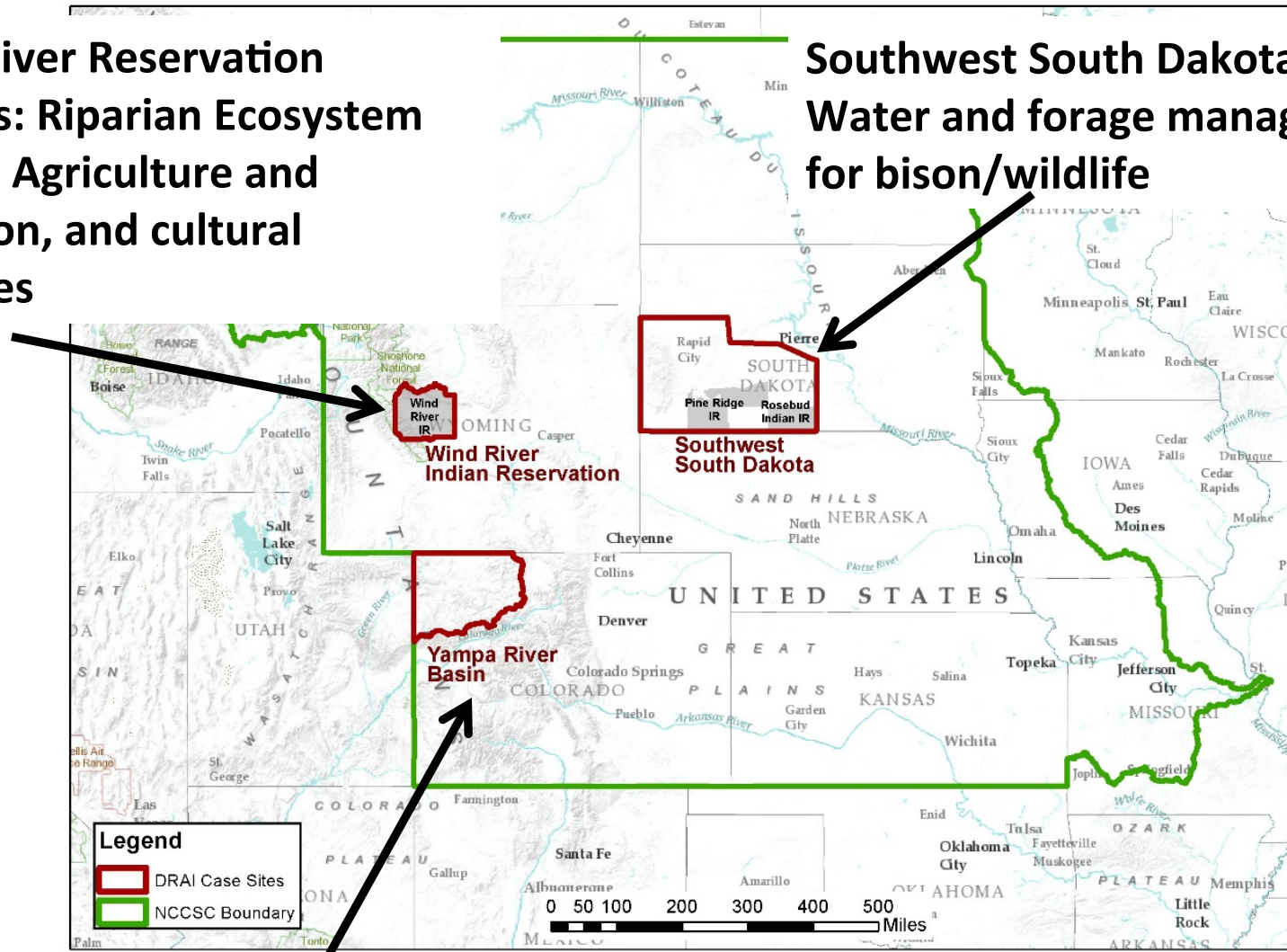


Drought Risk and Adaptation in the Interior

Wind River Reservation

Themes: Riparian Ecosystem Health, Agriculture and Irrigation, and cultural activities

Southwest South Dakota Water and forage management for bison/wildlife



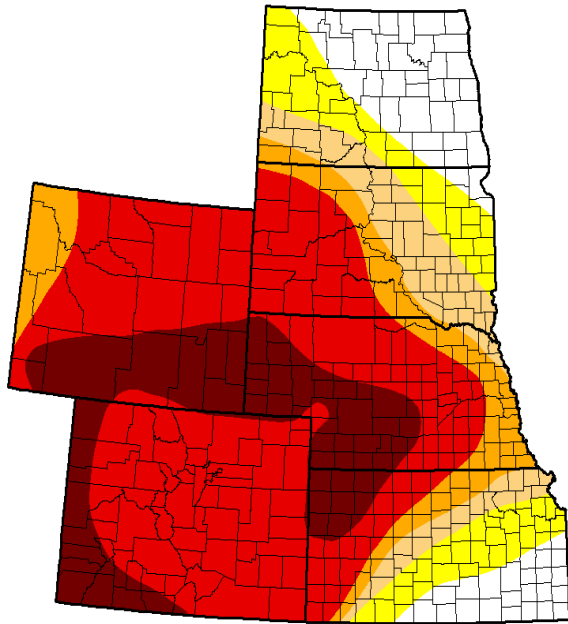
Northwest CO Yampa River Basin FWS Upper Colorado River Fish Recovery



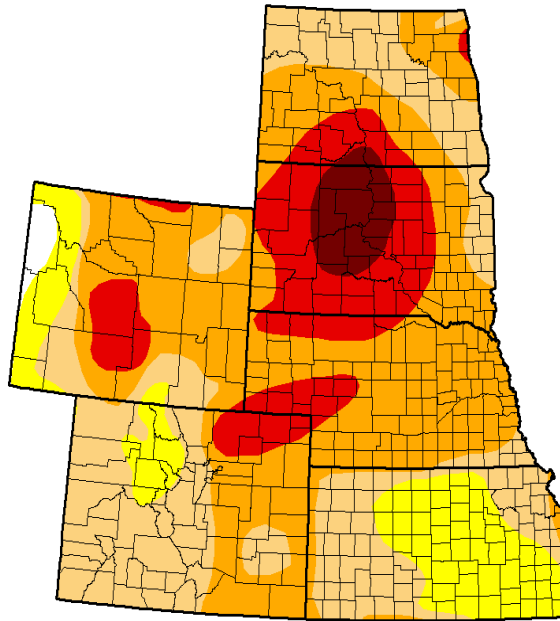
Regional Map

US Drought Monitor High Plains Region

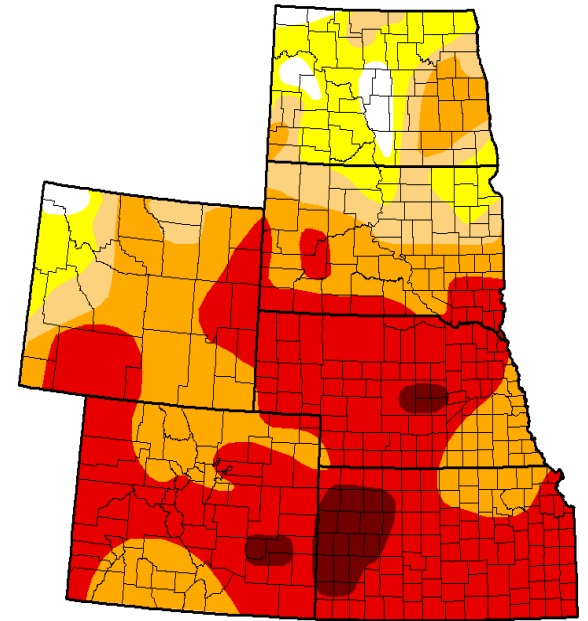
July 30, 2002



August 1, 2006



July 31, 2012

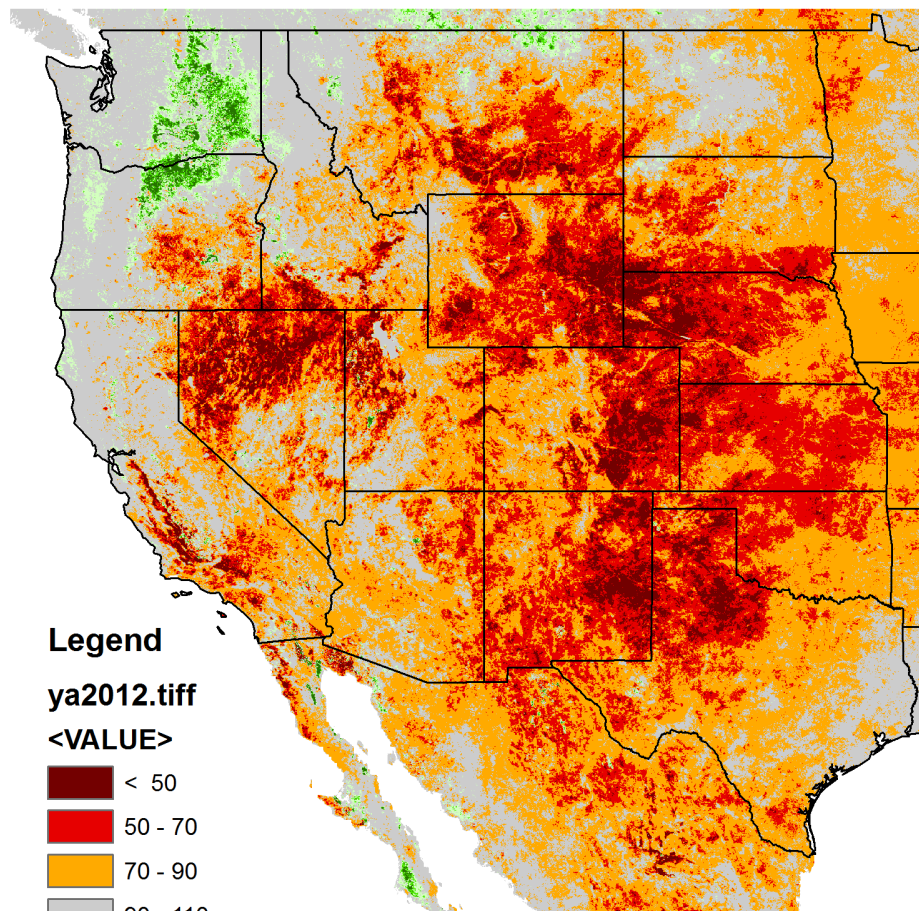


COLLABORATION. INNOVATION. CHANGE.

ET Yearly Anomaly 2012

MODIS based

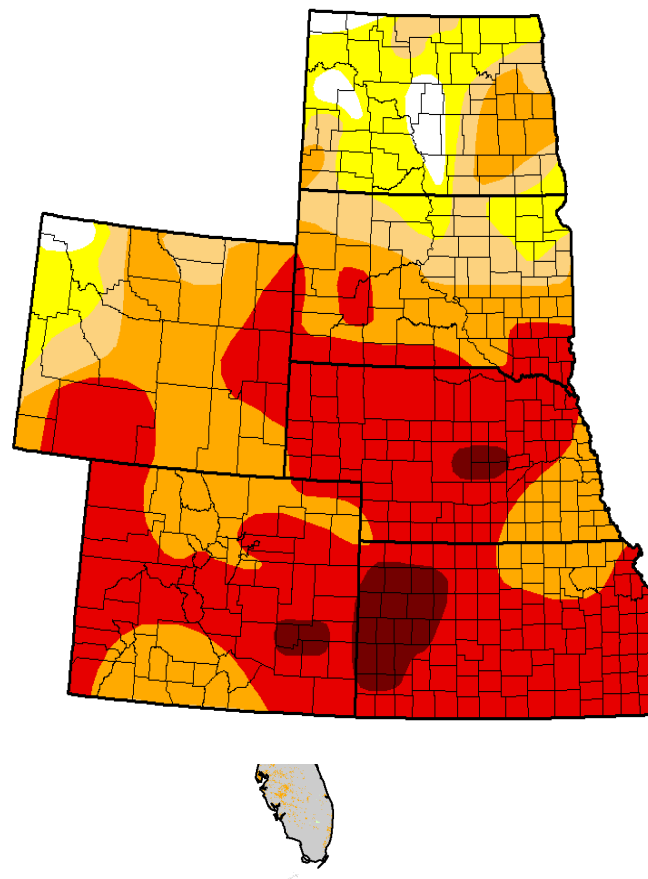
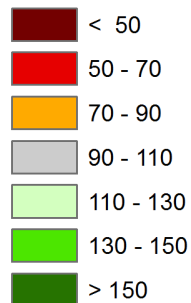
July 31, 2012



Legend

ya2012.tiff

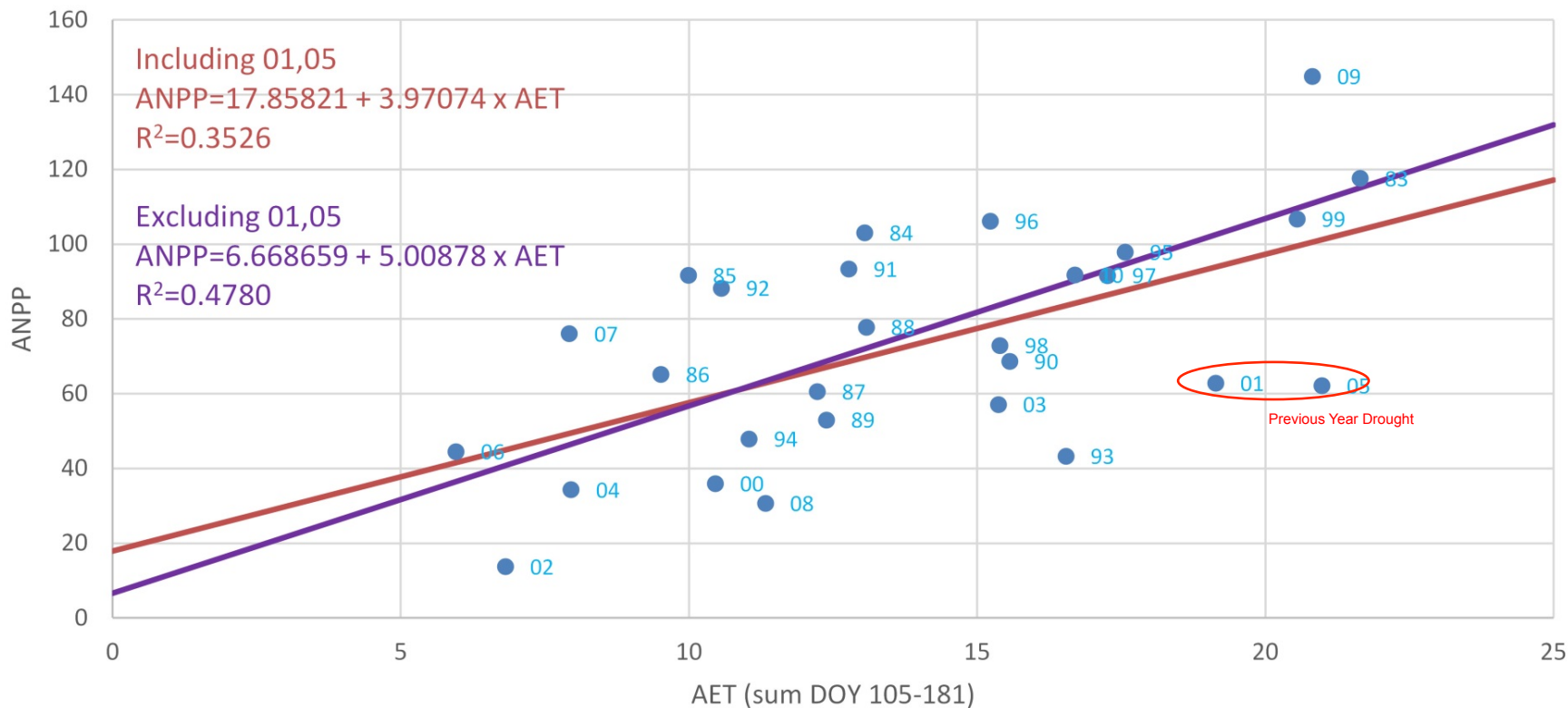
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Courtesy of Gabriel Senay, USGS/NC-CSC



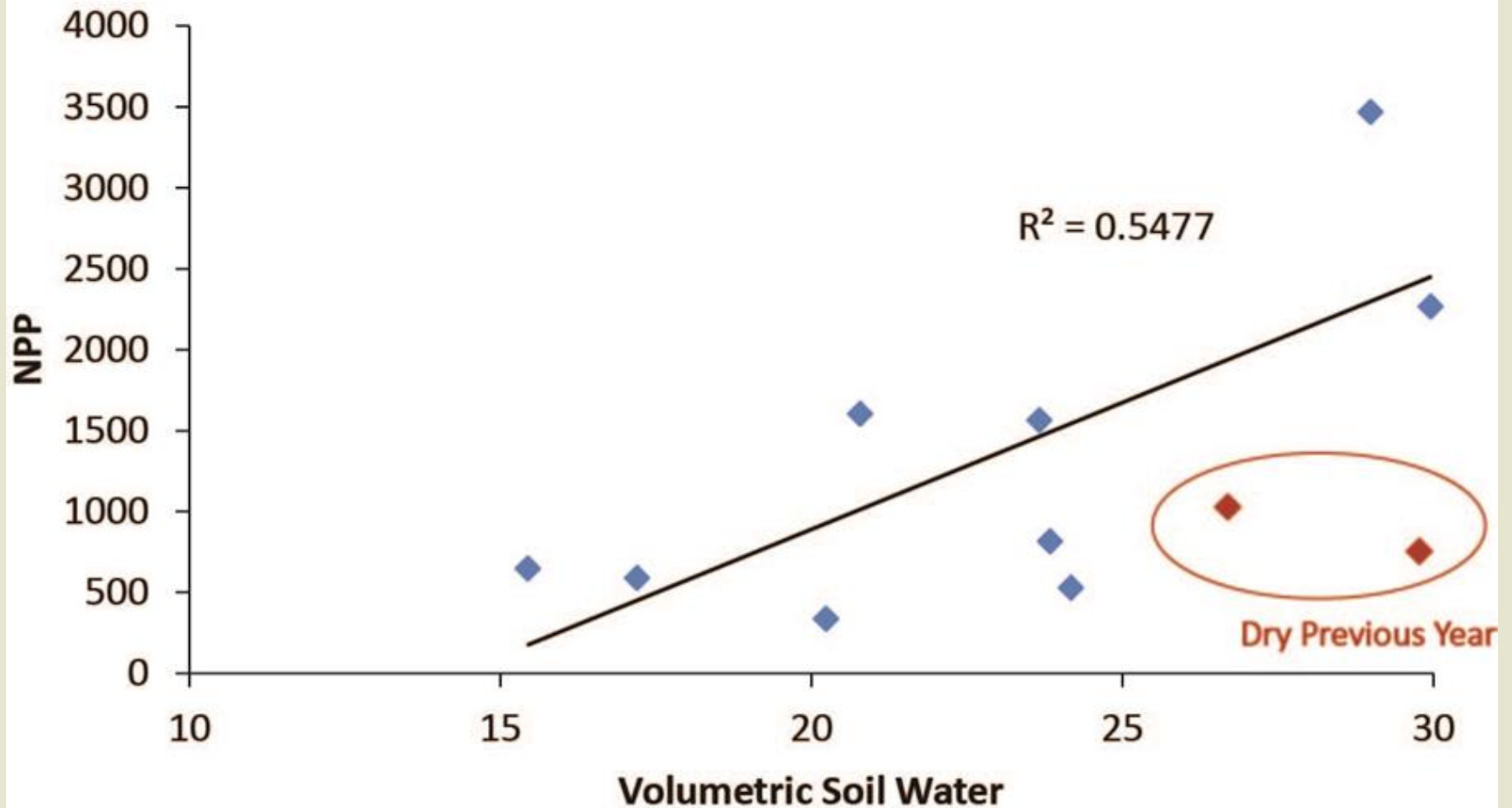
AET (sum DOY 105-181) vs ANPP



Bill Parton et al. in prep



Last 2 weeks April and 1st week May



COLLABORATION. INNOVATION. CHANGE.

Bill Parton et al. in prep



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

COLLABORATION. INNOVATION. CHANGE.



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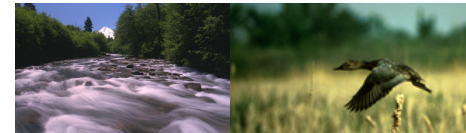
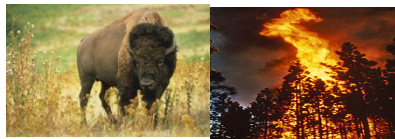
Preliminary Findings



- 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





Colorado
State
University



THANK YOU

<http://revampclimate.colostate.edu/>
North Central Climate Science Center



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UNIVERSITY CONSORTIUM





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?



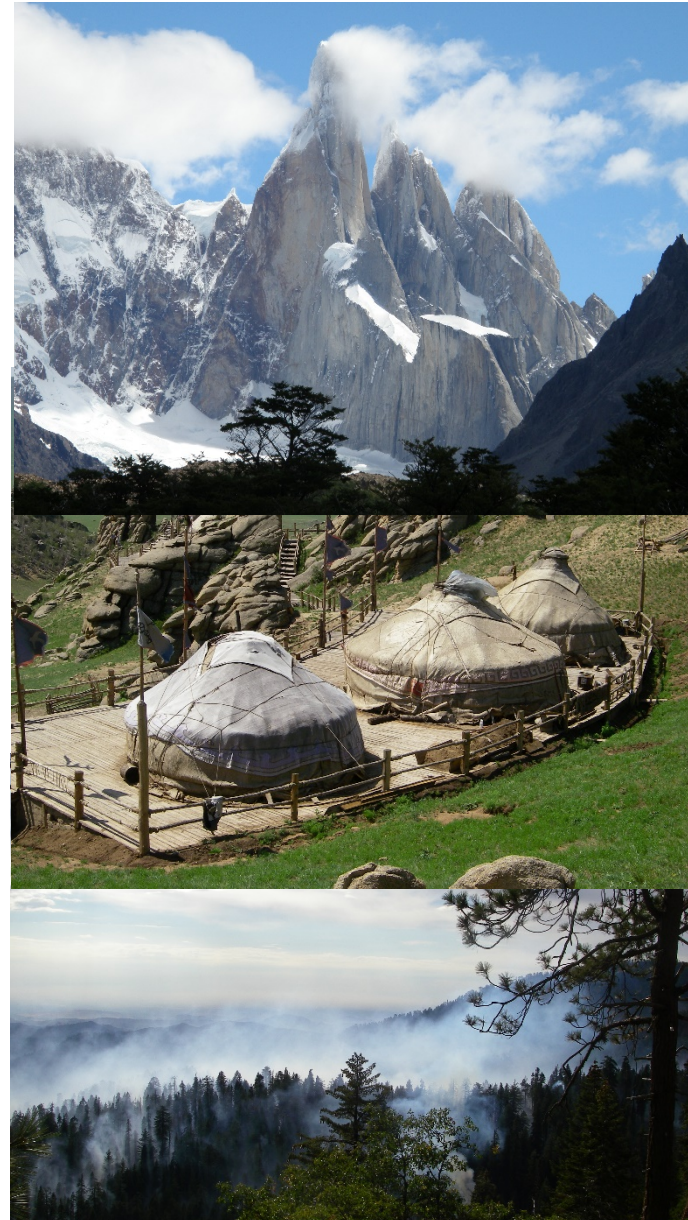


Challenges to Managing for Drought across Multiple Sectors

- 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](https://twitter.com/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



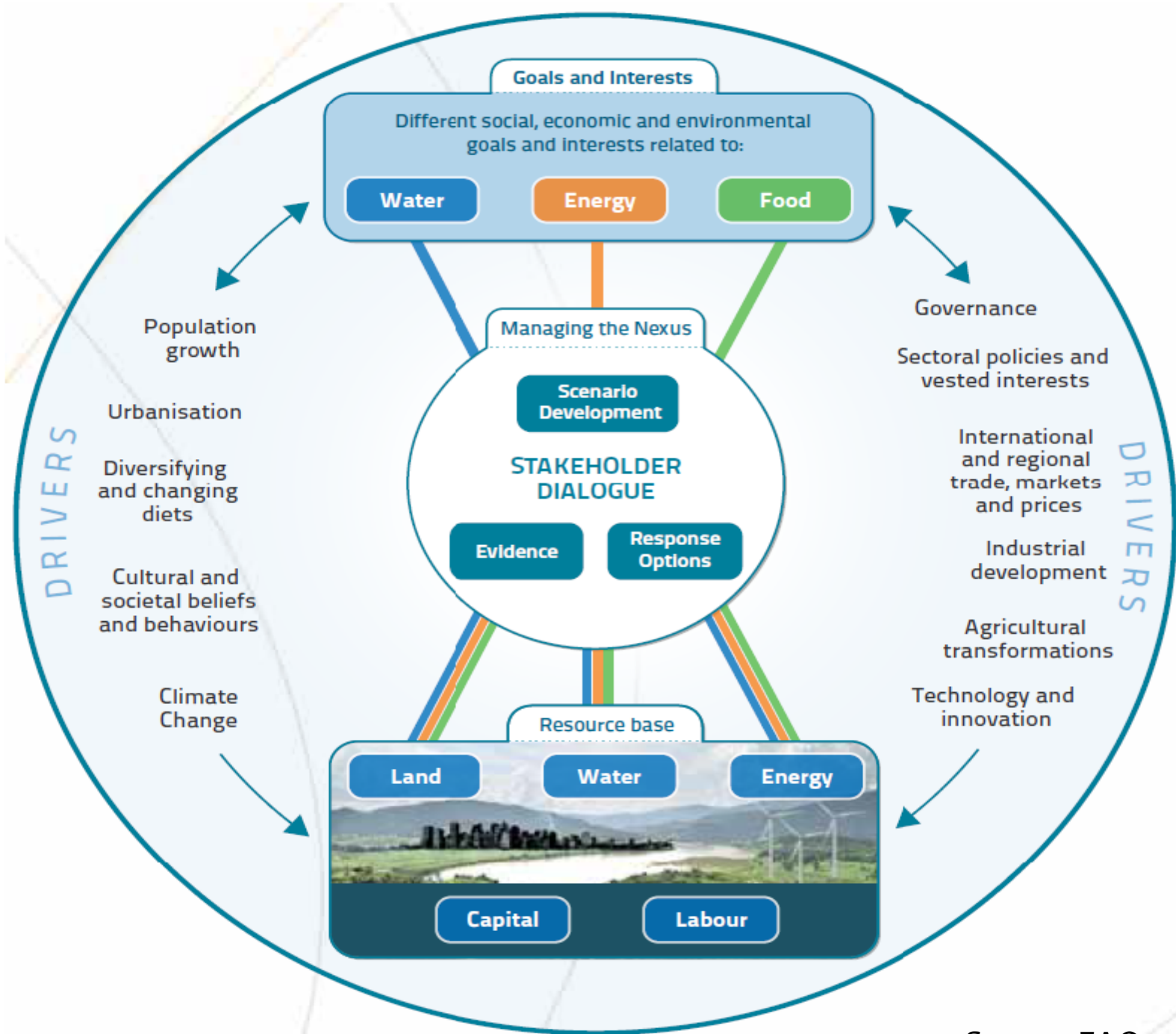
Enhancing Research Activities

- 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



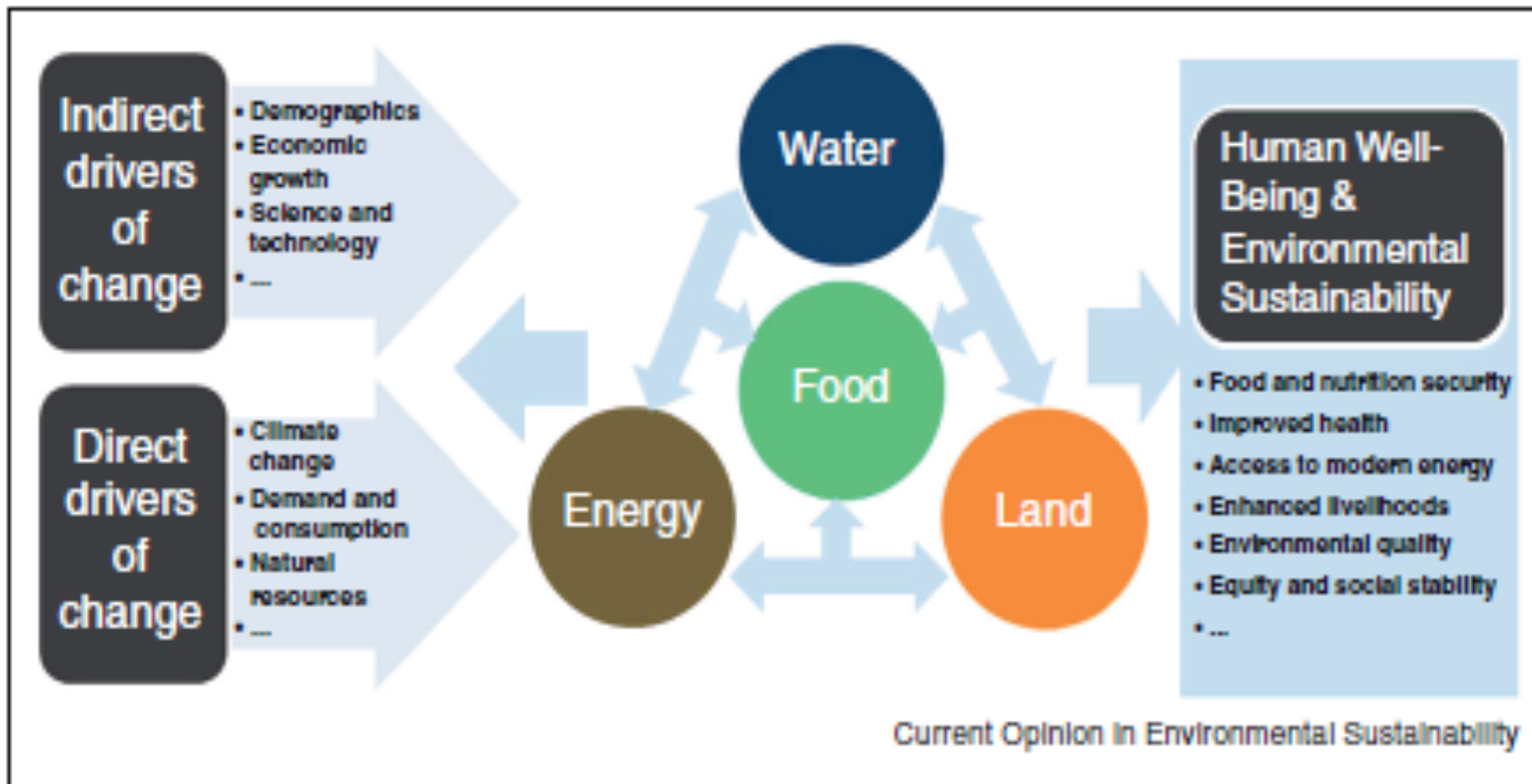
Science Policy Connections

- 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





Connecting land in the Nexus...











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

HIGH

VERY HIGH

LEVEL OF SEVERITY OF POTENTIAL IMPACT



Thank
you

Questions?

www.futureearth.info

Co-Design Co-Develop Co-Production