MICHIGAN STATE UNIVERSITY | Center for European, Russian, and Eurasian Studies
International Studies and Programs

SAVE THE DATES!

An International Workshop on

Land Use, Policy and Water-Energy-Food Nexus: Putting science to work for collaboration and problem solving

November 13 - 15, 2018

Michigan State University, East Lansing, MI USA

Hosted by

The Center for European, Russian and Eurasian Studies and the Center for Global Change and Earth Observations/MSU

Registration will open in September 2018

BACKGROUND

Food production, and thus food security, is inherently linked to land use, as well as to energy and water resources, whether the food is produced from grains from croplands, livestock from rangelands, or seafood from aquaculture. Therefore, competition of land use for urban development and other non-agricultural uses has significant implications for food security. Food production relies on water availability and its temporal dynamics as crop growth and rangeland forage relies on soil moisture in root systems. This is changing as temperature and precipitation dynamics shift as local manifestations of climate change, and as a result of competition for water from other uses such as hydropower, residential and industrial demand, and other uses. Over the past decades, climate patterns have noticeably changed, leading to more frequent floods and severe droughts that devastate crops, affected fisheries and altered ecosystem services. At the same time, food production, processing and delivery continued relying heavily on the energy that provides power for agricultural irrigation, fertilization and transport. Furthermore, farmland is increasingly devoted to the production of biofuels, creating additional competition for land and complicating tradeoffs between water, energy and food security.

This entanglement affects domestic farmers both directly – through their ability to produce crops – and less directly through global competition (e.g., with soybean farmers in Brazil and tilapia farmers in Vietnam). Farmers, ranchers and fish farmers have responded to the intertwined issues of climate change and water and energy tradeoffs by altering their land use strategies, such as installing irrigation infrastructure, changing crop types, cultivating previously inundated wetlands, and/or abandoning agricultural lands. These land use changes have in turn altered the water cycle with feedbacks to water resources and thus food production systems, and at the same time affected the production and use of fossil and renewable energy.

Land use and policy also have significant impacts on environmental quality both within and in connected large water bodies such as Lake Michigan through the Muskegon and Kalamazoo Rivers, or the Gulf of Mexico through Mississippi River, or the South China Sea through the Mekong River. The complex interactions of land management for food production, bioenergy or hydropower production and water uses for different purposes have been addressed in the past but have so far not proved effective.

Previous research has mostly been very siloed in nature, where water management considers little to none of other food and energy needs and vice versa. For example, food production focuses on maximum yield potential

with as much as inputs (fertilizer, which is energy, and water). While this is a desired outcome of agriculture businesses, it raises concerns about non-point source pollution that cause eutrophication resulting from nutrient leaching. Excessive water withdrawal through irrigation not only consumes electric power but can also cause ground water depletion and subsidence.

Recent effort is focused on integrated watershed management (IWM) at watershed level. The concept of IWM involves the integration of science and technologies within the natural boundaries of a drainage area for sustainable management of soil, water and plant resources to ensure the flow of ecosystem services. The aim is to improve the livelihoods of communities by increasing their earning capacity through optimal crop, livestock and fish production. It involves controlling floods as well as reducing erosion and sediment accumulation. Specific land and water conservation practices include water harvesting in ponds, recharging of groundwater, crop diversification (through improved seed varieties), and integrated nutrient and pest management practices,

While IWM is a conceptually sound approach to pursuing sustainable management of natural resources within a watershed, it lacks a number of key elements from sustainable development and sustainability science perspectives. First, current IWM approaches are water-centric, with other sectors considered peripheral. It focuses on management to achieve maximum ecosystem services derived from water uses such as water use efficiency, water quality, availability as well as aesthetic values. Second, it does not consider the interactive nature of water and other key elements in sustainability such as food, energy and environment.

A systems approach is needed to address these global challenges that considers the nexus of water, energy, food and environment. The Water-Energy-Food Nexus (WEF Nexus) describes the complex and inter-related nature of global resource systems. It means that the three goals — water security, energy security and food security — are inextricably linked and that changes in one area have impacts in one or both of the others. In this context, the WEF Nexus has emerged as a useful way to address the complex and interrelated issues of sustainable natural resource management. It provides a conceptual approach to better understand and systematically analyze the interactions between the natural environment and human activities in order to achieve optimal management strategies to meet sustainable development goals. By identifying and balancing the trade-offs among different stakeholders (sectors, communities and individuals) synergy can be achieved, allowing for more integrated and cost-effective planning, decision-making, implementation, monitoring and evaluation.

WORKSHOP SUB-THEMES

The Rural-Urban Nexus
Governance
Finance
Linking WEF scientific analysis to policy formulation
Capacity for sustainable WEF decision making

WORKSHOP OBJECTIVES

A number of WEF Nexus frameworks have been proposed but practical implementation of these frameworks must be further refined and case studies must be conducted to demonstrate the benefits and effectiveness for sustainable watershed management. The workshop objectives, therefore, are:

1. To share experiences and knowledge of water-energy-food nexus research from different disciplines, institutions and nations;
2. To discuss current WEF Nexus frameworks and develop next steps to further validate and apply them to address practical issues related to water-energy-food securities;
3. To identify gaps and priorities in future research in the area of water-energy-food securities and land use policies and steps to pursue future funding.

EXPECTED OUTCOMES

1. Expanded / strengthened WEF Nexus network both on campus and internationally
2. Development of a white paper on current state and future research, funding and collaborations
3. Development of 2-3 preliminary proposal concepts with specific targeted funding agencies

Join top scientists from globally recognized consortiums to listen, learn, and actively work to develop new collaborative, multidisciplinary ideas to bridge the knowledge gaps in the WEF scientific, governance, and capacity building areas.

Global Challenge University Alliance (GCUA)
https://www.slu.se/en/collaboration/international/slu-global/global-challenges-university-alliance/about-gcua/?submenu=open

The Swedish University of Agricultural Sciences (SLU) has initiated the Global Challenges University Alliance planning to involve the world's leading "bio-economy" universities at all continents. Focus for the GCUA initiative is the agricultural research and educations issues in relation to the current Global Challenges. By 2050 the world's population will exceed nine billion, requiring agricultural, forest and fisheries systems to produce food, animal feed, fibres, energy and materials for another two billion people. The crucial issue is how to achieve this with very little new land to use, without causing unsustainable ecological consequences and during an on-going climate change.

Meeting these global challenges can only be done through obtaining greater scientific knowledge about the fundamental conditions for life – translating knowledge into relevant action – and through dedicated international co-operation. The partner universities should be strong in agricultural sciences (including food, veterinary, landscape architecture and forest sciences), environmental sciences and/or the life sciences.

Asian Hub – Agriculture
http://china.isp.msu.edu/programs-and-partnerships/msu-nau-initiative/
Led by Nanjing Agriculture University and Michigan State University and launched in 2017, this hub for collaborative research will bring the significant elements to bear on policy recommendations and viable solutions to global challenges involving water, food, and energy. NAU has awarded $800,000 to 11 research projects led by NAU and MSU faculty. NAU has also committed similar amount of research funding in each year for additional two years as the Asia Hub-Agriculture seed funding. In the second and third year, other Asia partner research institutions will be invited to join the funding application. It is expected that the collaborative research projects will reach a higher international level for more substantial funding after the first three initial years, especially funding from major international agencies. Water, food, and energy have been intensifying issues in Asia under the pressure of economic development and climate change. International collaboration is the key. Governments, industries, and societies are seeking ideas, making policies, finding strategies to meet the challenges. Research plays important roles in these processes. Their evidence and science-based findings may provide solid policy recommendations and viable solutions for many.

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