Introduction

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This issue of *JESS* is devoted to the food-energy-water nexus. The papers included advance thinking on the relationship between scholarly research on the effective management of food, energy, and water systems in a more integrated manner.

Researchers have long noted that food, energy, and water systems are each complex coupled natural and human systems (for example, Liu et al. 2007) and those studying each system have included increasing numbers of feedbacks related to the other two systems (for example, Alcamo et al. 2003; Bredehoeft 2011; Strzepek and Boehlert 2010, and Nonhebel 2005). In recent years, progress on many fronts has enabled corresponding advances in applying systems science to food, energy and water challenges, such that it is now productive to integrate all three when addressing major challenges to human society (Liu et al. 2015). Areas of advancement include environmental sensors and remote sensing (Thenkabail 2015), cyber infrastructure (DOE 2015), and modelling (Wainwright and Mulligan 2013).

In recognition of this, many groups have begun to develop strategies for research at the nexus (ACERE—Advisory Committee for Environmental Research and Education 2015) and explore integrated solutions at the nexus (The World Economic Forum Water Initiative 2011). In 2015, the US National Science Foundation (NSF) supported approximately 22 workshops which explored diverse aspects of the

nexus (NCSE 2016a) in advance of launching a new initiative on Innovations at the Nexus of Food, Energy and Water Systems (INFEWS) in partnership with the US Department of Agriculture (USDA) National Institute of Food and Agriculture (NSF 2016).

On January 19–21, 2016, the National Council for Science and the Environment's (NCSE) 16th National Conference and Global Forum on Science, Policy and the Environment engaged approximately 1200 individuals from diverse disciplines and sectors to explore the opportunities and challenges of advancing and applying science on the *Food-Energy-Water Nexus* (NCSE 2016b). This special issue of *JESS* draws upon that event, the NSF workshops, and other endeavors supported by NSF, USDA, NASA, the US Forest Service, NOAA, the US Geological Survey, the Environmental Protection Agency, and others.

The Association of Environmental Studies and Sciences (AEES) has partnered with NCSE and the conference to produce this special issue because of the topic's significance, timeliness, and relevance the scholarship to its members. The editorial leadership of *JESS* has provided considerable support and flexibility in compiling this issue, for which the Editor and the authors express their gratitude.

This issue contains a diversity of papers that we hope will prove useful to those embarking on new initiatives at the nexus, including papers that review particular areas of the nexus, report on workshops, present original research, connect science to resource management and policy, and comment on desirable directions for nexus research and its application.

Other papers in this issue assess the nature of the human and scientific challenges raised by considering food, energy, and water systems together at scales from cities, to aquifers and river basins, to the entire globe. Many of the papers identify research agendas or address specific critical research challenges such as identifying appropriate questions, developing

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and using analytical tools, spatial computing, *sensing and monitoring*, and defining metrics at appropriate scales.

Additional papers approach the nexus through a lens focussed on specific human or environmental challenges such as resilience and human adaptations, engineering, infrastructure, sustainable ecosystems, nutrients, aquifer depletion, public values and mediating human conflicts, sustainable energy systems, engineering solutions, and integrative systems management. One paper argues persuasively for advancing a “Community of Practice” that develops the cross-cutting tools and skills for those working on the very diverse set of initiatives described in this issue. It is appropriate after reviewing so many challenges that the issue ends with a commentary providing “A Positive Vision of Sustainability.”

This issue of *JESS*, the NCSE conference and NSF workshops, and these diverse projects demonstrate that scholarly advances in many areas are expanding our fundamental understanding of how the three systems interact and leading to solutions to the challenge of providing food, energy, and water to the world’s growing population sustainably.

JESS and its editors wish to particularly thank the reviewers of the papers. They are anonymous but their contributions to improving the quality of papers and maintaining the quality of journals like *JESS* cannot be underestimated. They deserve a special “Thank You” from authors, editors, and readers alike.

We hope that you find this issue helpful and encourage you to submit your own work on the food-energy-water nexus to *JESS* in the future.

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