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# Food-Energy-Water Nexus for Multi-scale Sustainable Development

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Food, energy, and water (FEW) resources are all basic human needs. With population increase and economic growth, challenges on securing sufficient food, energy, and water to meet human demand are amplifying. A recent sustainable development report indicates that in 2017 there were ~700 million people practicing open defecation, ~785 million people lacking basic drinking water services, ~820 million people undernourished (including 770 million people with severe food insecurity), and ~840 million people without access to electricity (https://www.sdgindex.org/reports/sustainable-development-report-2019/). Billions of people are suffering from water and energy insecurity. Specifically, 3 billion people lacked basic handwashing facilities at home in 2017, ~3 billion people had no access to clean cooking fuels and technologies in 2017, and ~4.8 billion people experienced either human water security or biodiversity threats.

Among the 17 Sustainable Development Goals (SDGs) approved by the United Nations in 2015, "zero hunger" (Goal 2), "affordable and clean energy" (Goal 7), and "clean water and sanitation" (Goal 6) are specifically set for food, energy, and water, respectively, while other goals are closely linked to these three resources. Food production and processing sectors are the largest water users and important energy consumers. Quantifying the complicated interdependencies among food, energy, and water is critical to achieve the SDGs (Liu et al., 2018). The FEW nexus has a large impact on human adaptation to various grand challenges, such as climate extremes and change, population growth, and water scarcity. (Fig. 1)

Considerable progress has been made on identifying the grand challenges of FEW nexus and developing new approaches to managing limited FEW resources (e.g. Conway et al., 2015, Liu et al., 2017). However, effective implementation of those approaches is limited by insufficient understanding of FEW nexus tradeoffs in the context of science-policy-stakeholder interactions (Liu et al., 2017). The lack of scientific understanding further precludes development of system-level tools for overcoming policy barriers and facilitating stakeholder acceptance (Liu et al., 2018). The assessment of FEW nexus needs to move from a linear "tree" model that emphasizes disciplinary research to a "web" model that addresses interdisciplinary complexity (Liu et al., 2019).

Building upon a previous special issue on FEW Nexus (Khanna et al., 2017), this virtual special issue (VSI) calls for contributions that will include data collection, tool development, and management policies for the FEW nexus. The scope includes database development, FEW interactions and modeling at various scales, comparative analysis of FEW challenges and approaches among regions/countries, FEW linkages to climate extremes and change, and practical implications for FEW policies and sustainable development. This VSI aims to catalyze information integration, develop system modeling techniques, and explore management strategies and practices for nexus-based sustainability. The papers in the VSI should fill substantial knowledge gaps in the FEW nexus and provide a roadmap for improving life-cycle management of FEW resources. Submissions that provide innovative insights into FEW research directions are encouraged. Original research articles and review papers are invited to address the following topics:

- FEW nexus database development at watershed, city, regional, national, and global scales
- FEW nexus case studies at watershed, city, regional, national, and global scales
- Modeling and tool development for synthesis/tradeoff analysis, input-output tables, and management software of the FEW nexus
- FEW nexus policies for water resources management, agricultural production, energy consumption, adaptation to climate extremes and change, ecosystem services, and greenhouse gas emissions
- Impacts of supply chain management on the FEW nexus
- FEW nexus technologies for recycled utilization of waste resources and improved FEW production efficiencies
- FEW nexus and ecological restoration
- FEW nexus for sustainable development

## 1. Manuscript Preparation and Submission

Authors are invited to submit extended abstracts of 1000-1500 words of their proposed papers to Dr. Junguo Liu (junguo.liu@gmail.com; liujg@sustech.edu.cn). The editorial team will review all

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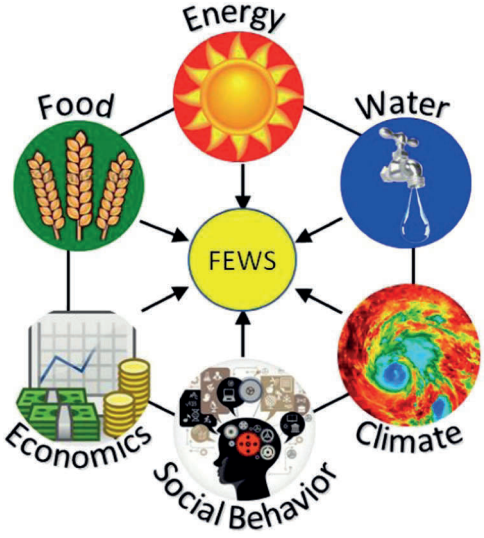


**Fig. 1.** The Food-Energy-Water Nexus.

submissions and provide prompt feedback to authors for preparation of high-quality manuscripts.

After the extended abstracts have been reviewed, all authors will be notified whether their abstracts are acceptable as submitted or amendments should be made as the authors develop their full, peer-review ready manuscripts. The authors invited to develop their full papers are kindly requested to access and to follow the "Guide for Authors" at: http://www.journals.elsevier.com/resources-conservation-and-recycling. All manuscripts and any supplementary material should be submitted through Elsevier Editorial System (http://ees.elsevier.com/recycl). The authors must select "VSI: Food-Energy-Water Nexus" in the submission process.

## 2. Important Dates

- Submission of extended abstracts: December 1, 2019
- Feedback of extended abstracts: January 1, 2020
- Full paper submission deadline: May 1, 2020
- Final decision notification: September, 2020
- Publication: As soon as accepted

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