Mesoscale Data Fusion to Map and Model the U.S. Food-Energy-Water system

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Michael Hanneman, Kevin Gurney, others
Two-Part Presentation

I. Intro: The U.S. food-energy-water system: A blueprint to fill the mesoscale gap for science and decision-making

(Ambio, 2019 DOI: 10.1007/s13280-018-1077-0)

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John Sabo, Arizona State
Tara Troy, Lehigh

II. Work in Progress: Human appropriation of net primary productivity: a critical component of the U.S. food-energy-water system

Suman Paudel, Christopher Lant, Utah State
Stanley Mubako, University of Texas El Paso
FEWSION: A big data blueprint

I. Resource footprinting:
Water footprint (blue, green)
Nutrient footprint (in lieu of grey)
Carbon footprint
Embedded energy
Human appr. net primary prod. (HANPP)

II. Examination of supply chains:
Trade, transfer over highways, railroads, pipelines, power lines, barges
Virtual water; embodied HANPP (eHANPP)

III. Network Analysis:
Vulnerability vs. resilience
Response to shocks and stresses
Evolution of the FEW system over decades

Mesoscale analysis:
Neither too aggregate to be operational nor unnecessarily detailed and dependent on privileged information:
Counties, cities, small watersheds

NSF INFEWS:
Innovations in Food, Energy, Water Systems
$3 million for 2016-2020
Resource footprints come from both inputs and emissions and at various stages in the supply chain. Given trade patterns, this occurs in various locations.
How do we define a Food-Energy-Water system?
Food flows among 48 states

A network of ecological inter-dependency through trade

Virtual water flows among 48 states


The “mesoscale” best captured by counties, but also by small watersheds and metro areas reveals most of the trade patterns that drive the FEW system. At that meso-scale, most food, energy and virtual water are “exported/imported.”
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Questions?