MultiSector Dynamics Community

Welcome to the newsletter of the **MultiSector Dynamics Community**

Hello MultiSector Dynamics (MSD) Community! In this issue we provide a summary of the session proposals submitted by our community to this year's AGU Fall Meeting and an update on our recent briefing to DOE. We are also featuring the work of four early-career researchers in our community and provide details on an upcoming community workshop organized by the Urban Systems Working Group.

www.multisectordynamics.org

@multi_sector

INSIDE THIS ISSUE

AGU 2021 Fall Meeting session proposals

Following the successful launch of the MSD Community at the AGU Fall Meeting 2020, the MSD Community of Practice coordinated and submitted 10 session proposals for the 2021 AGU Fall Meeting with the aim to bring together MSD researchers and highlight recent achievements of our community:

One Union session:

Modeling MultiSector Dynamics to Understand Adaptive Pathways

8 sessions submitted to the Global Environmental Change section:

MultiSector Dynamics: Science & Modeling for Societal Transformations
MultiSector Dynamics: Modeling Advances for Representing Adaptive Human Systems Response to Change
MultiSector Dynamics: Extreme Weather and Society
MultiSector Dynamics: MultiSector Impacts of Energy Transitions

MultiSector Dynamics: Uncertainty Characterization for Coupled Natural-Human Systems
MultiSector Dynamics: Convergent Approaches for Environmental Change, Resilience, and Society in Urban Areas
MultiSector Dynamics: Bridging systems modelling advances across socio-ecological domains
MultiSector Dynamics: Energy-Water-Land Interactions at Multiple Scales

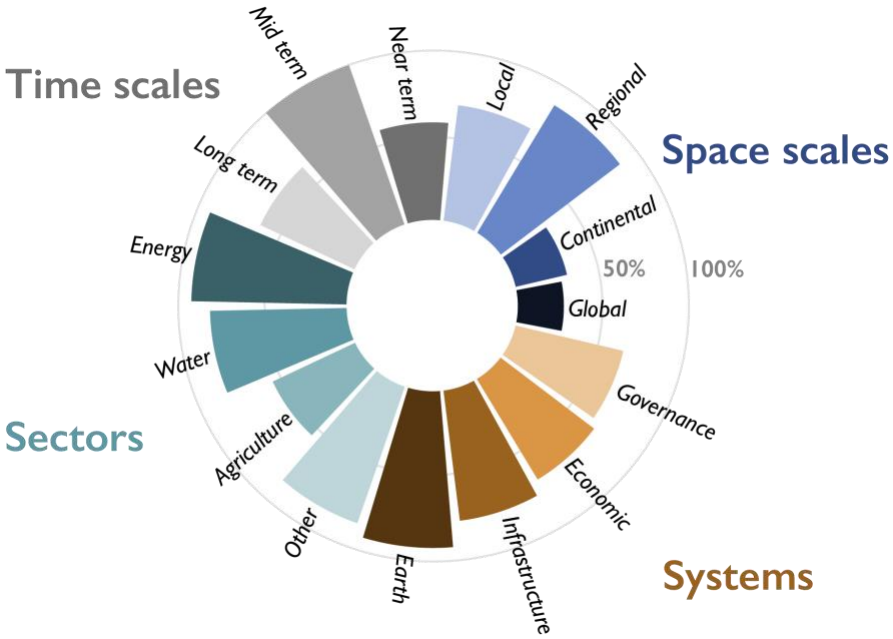
One session submitted to the Education section:

Preparing next generation researchers to meet the transdisciplinary challenges of climate change (including MultiSector Dynamics)

Also relevant to the MSD community is a proposed **townhall** on *DOE's Earth and Environmental System Modeling: Opportunities in Coastal Systems, Urban Resilience, and Extreme Events*

Abstract submission will open on June 9th, and we invite you to share your research with the MSD community.

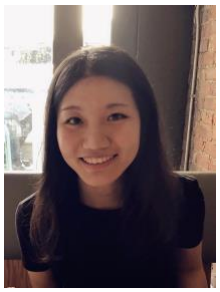
MSD Community briefing for DOE and USGCRP Program Leaders



On March 29, the MSD community provided a virtual briefing to leaders and managers at the DOE's Earth and Environmental Systems Modeling Program and the US Global Change Research Program. The briefing included an overview of MSD as an emerging research field, including short introductions from the MSD working groups. In addition, each of the seven DOE-supported MSD projects gave a brief overview of how their projects are addressing broader interactions of human and natural systems in a fuller EESM framing—and how they are positioned to address BER priorities and contribute to cross-cutting activities of the CoP. The briefing included analysis of the percentage of major research tasks reported by the programs that were focused on different sectors, systems, spatial, and time scales. Roughly 70 participants joined the call including Gary Geernaert, Director of the DOE Office of Science's Climate and Environmental Sciences Division and Betsy Weatherhead, Director of the National Climate Assessment.

Researcher Highlight:
Matthew Binsted, Ryna Cui, Kalyn Dorheim, Zarrar Khan


Matthew Binsted
matthew.binsted@pnnl.gov


Ryna Cui
@RynaCui


Kalyn Dorheim
@krdorheim


Zarrar Khan
zarrar.khan@pnnl.gov

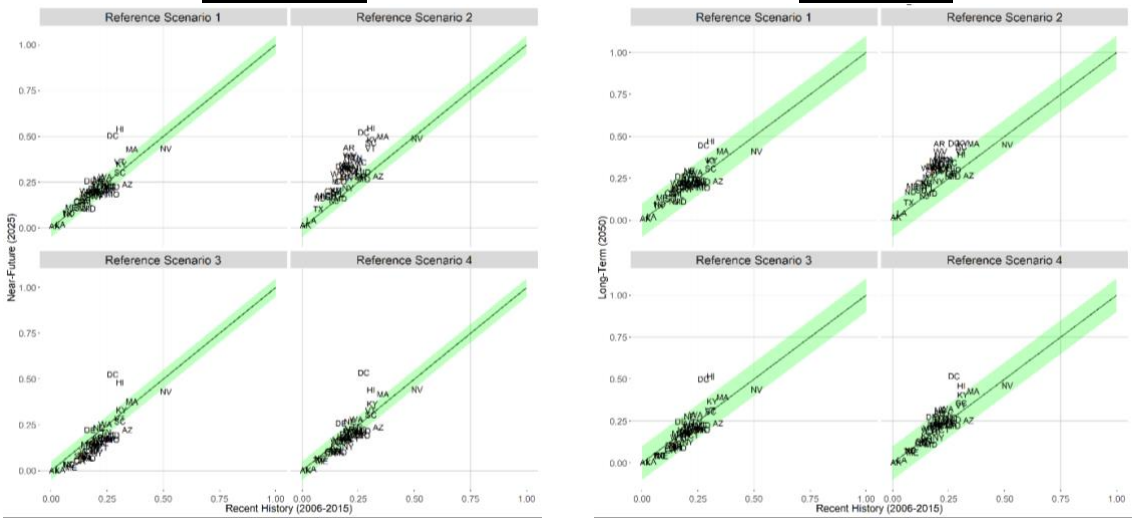
Researchers and analysts use computer-based mathematical models, such as multisector human-Earth systems models, to explore long-term changes to the energy system and its co-evolution with other systems. These tools support science-based decision-making in a variety of contexts; most studies utilizing multisector models employ scenarios to account for future uncertainty. At the Pacific Northwest National Laboratory's (PNNL) Joint Global Change Research Institute (JGCRI), an interdisciplinary group of researchers developed a three-part framework to evaluate and update the future energy system scenarios generated by these models. First, model users develop a qualitative description (narrative) of future changes to the energy system which informs choices about model structures and parameters. Second, metrics quantify model outcomes that correspond to key elements of the scenario narrative. Finally, evaluation criteria judge consistency between the numerical model results (metrics) and scenario storyline.

After developing this flexible framework, the research team applied it to the reference scenario in GCAM-USA, a version of the multisector Global Change Analysis Model with state-level detail in the United States, focusing on the electric power sector. With this novel approach, the researchers found that (1) having a well-defined set of criteria both simplified and improved the process of evaluating model developments; (2) it's possible for model developments to improve scenario consistency for some metrics but decrease it for others; and (3) some outlier results can be explained by unique regional dynamics and thus are not necessarily indicative of issues with model parameters or the scenario narrative. The paper also demonstrated how visualization techniques that simultaneously display results for many regions and automatically flag anomalous results can help streamline the scenario evaluation process.

This study makes several contributions to the MSD community. First, the structured evaluation framework developed by the researchers helps scientists identify and correct model deficiencies, refine their understanding of future changes in the energy system, and highlights interesting exceptions to anticipated trends. Additionally, as the spatial, temporal, and sectoral resolution of multisector models continues to increase, a systematic approach to scenario evaluation helps manage this increased complexity. The Binsted et al. scenario framework was designed to be flexible and can be applied to other regions and sectors. Finally, carefully evaluating multisector models and the scenarios they produce gives users more confidence in the analytical insights they generate and helps maintain their credibility as scientific tools.

The Binsted et al. 2020 paper counts four early-career MSD Community researchers among its co-authors. Matthew Binsted, Kalyn Dorheim, and Zarrar Khan are scientists at the Joint Global Change Research Institute. Ryna Cui is an Assistant Research Professor at the Center for Global Sustainability at the University of Maryland School of Public Policy; she holds a joint appointment at JGCRI and is a member of the MSD Working Group on Professional Development and Education for Early Career Scientists. Each brought unique expertise to the development of this scenario evaluation framework.

Near Future **Long-Term**



Matthew's research has explored energy system transitions with a focus on the electric power sector; he is also a lead developer of GCAM-USA and has collaborated with Canadian and Indian researchers working to develop subnational versions of GCAM for their respective countries. Ryna's current research focuses on energy transitions, global and national low-carbon development pathways, and the interaction between national and subnational policy decisions. Kalyn's work focuses on developing and using climate emulators to provide computationally inexpensive climate information to the MSD community; recently she has focused on calibrating Hector, an open-source climate model, to emulate more complex Earth System Models. Zarrar's research focuses on developing tools and methodologies to promote stakeholder engagement and facilitating the analysis of global modeling outputs in the context of local issues. His recent work focuses on the analysis and visualization of global modeling outputs at finer decision relevant spatial and temporal scales. Collectively, their work contributes to advancing the development, evaluation, application, and accessibility of multisector human-Earth system models.

Highlighted Articles:

- M. Binsted, et al., 2020. Evaluating long-term model-based scenarios of the energy system. https://doi.org/10.1016/j.esr.2020.100551
- Cui, R.Y. et al., 2018. Regional responses to future, demand-driven water scarcity. https://doi.org/10.1088/1748-9326/aad8f7
- Dorheim, K., Link, R., Hartin, C., Kravitz, B., & Snyder, A. (2020). Calibrating simple climate models to individual Earth system models: Lessons learned from calibrating Hector. https://doi.org/10. 1029/2019EA000980
- Khan, Z., Wise, M., Patel, P., Kim, S.H., Hejazi, M., Burleyson, C., and Iyer, G., 2021. Impacts of long-term temperature change and variability on electricity investments. https://doi.org/10.1038/s41467-021-21785-1

This and all previous features can now be accessed in a dedicated page on our website:
https://multisectordynamics.org/research-highlights/

Working Group organized event: **Multi-Sectoral Urban Interactions**

The urban working group co-chairs are planning a virtual, summer 2021 workshop. We'd like your involvement in planning workshop breakout groups. We're holding a coordinating meeting on **Friday June 4th, from 2-3pm Eastern time** on Teams and anyone interested in the urban working group is invited to join us.

Multi-Sectoral Urban Interactions: Fundamental Science Needs to Inform Pathways to More Resilient Communities in a Changing Climate

Christa Brelsford, Oak Ridge National Lab
Andrew Jones, Lawrence Berkeley National Lab
Co-chairs, Working Group on Urban Systems

Workshop Motivation

Urban areas and the supply networks that support their resource use are inherently multisectoral systems composed of infrastructural, environmental, and socio-institutional components. These systems are vulnerable to accelerating and interacting stresses from climate change, population growth, resource scarcity, and land-use pressure at the same time as they have a major influence on regional and global systems. For instance, a majority of the world's greenhouse gas emissions, food consumption, and economic activity can be attributed to urban areas. Urban areas are highly heterogenous, both across and within cities in terms of their socio-demographic, environmental, and infrastructural characteristics. This heterogeneity shapes how urban systems interact and co-evolve and contributes to different economic, environmental, and health outcomes for communities within urban areas. Urban heterogeneity also generates differential vulnerabilities to stressors and differential capacity for adapting to change. The evolution of urban space is thus critical in shaping how human societies respond to global change as they seek to improve resilience to stressors, support prosperous and equitable communities, and use natural resources in a sustainable manner. Developing fundamental scientific understanding of urban heterogeneity and system interactions across sectors and scales is critical for mapping the resilience, sustainability, and equity implications of alternative future pathways.

Log-in information

Microsoft Teams meeting: June 4th 2-3pm Eastern Time.
Join on your computer or mobile app
Click here to join the meeting
Or call in (audio only)
+1 865-276-6990,,998725477# United States, Knoxville
Phone Conference ID: 998 725 477#
Find a local number | Reset PIN
Learn More | Meeting options

MSD Special Issue at Earths' Future

Our Community of Practice is leading a Call for Papers at Earth's Future and encourages the members of our community to submit their contributions.

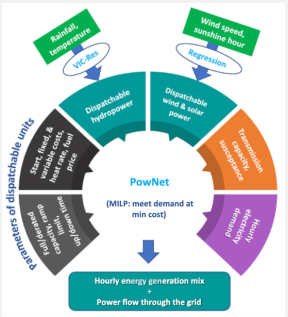
Submission Deadline: 1 October 2021

Special Issue Organizers:
Patrick Reed, Cornell University
Jan Kwakkel, Technical University at Delft
Julie Rozenberg, World Bank
Jennifer Morris, Massachusetts Institute of Technology
Jordan Macknick, National Renewable Energy Laboratory (NREL)

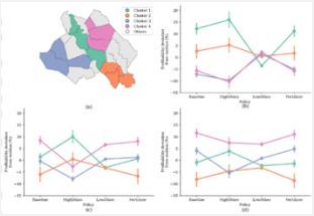
Abstract:

Designing dynamic and adaptive strategies for navigating the challenges of the Anthropocene hinges on a sound understanding of the interdependent co-evolution of our technological (e.g., water supply, energy, transport, etc.), societal (population, health, economy), natural (watersheds, wetlands, forests, coasts) and managed (water resources, agriculture, forestry) systems. Understanding and projecting the dynamic interaction of these systems, and inherent systematic risks, is a grand scientific challenge that requires integration of concepts, data, methods, and insights from many disciplines in novel ways. The field of Multisector Dynamics (MSD) aims to advance our understanding of the co-evolution of human and natural systems in response to environmental, technological and societal changes and shocks; and to build the next generation of tools that bridge across sectors, scales, and disciplines. This special issue seeks state-of-the-art contributions that provide new insights and technical innovations that advance the emerging field of MSD.

Recently published in this issue:



The Greater Mekong's climate-water-energy nexus: how ENSO-triggered regional droughts affect power supply and CO2 emissions



Accounting for multisectoral dynamics in supporting equitable adaptation planning: A case study on the rice agriculture in the Vietnam Mekong Delta

Career opportunities

Our website features a **Careers** page that lists available MSD-focused positions at all levels. Here are some of our latest postings:

2 PhD positions on multi-hazard risk assessment
The Institute for Environmental Studies of the Vrije Universiteit Amsterdam is advertising two PhD positions to work on the upcoming H2020-funded MYRIAD-EU project, which focuses on multi-hazard risk assessment and decision-making in the EU.

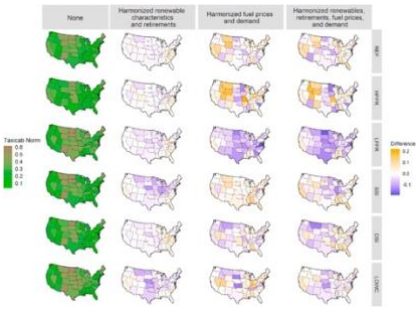
Postdoctoral Fellow: Distributed Energy Solutions for Wildfire-Prone Communities
The Western Forest and Fire Initiative (WFFI) invites applications for a one-year Postdoctoral Research Fellowship to explore distributed energy architectures and solutions, including wood-burning biomass facilities, that can increase the reliability of electric power for communities in wildfire-prone areas.

PhD position in Water, energy and food nexus modelling and decision-making across scales
The Environmental Intelligence for Global Change Lab at Politecnico di Milano invites applications for 1 PhD position (36 months) on “Water, energy and food nexus modelling and decision-making across scales”.

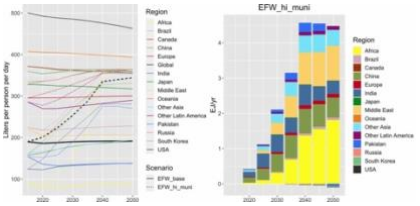
Tenure-track faculty position: Understanding Risk and Transformation in Critical Infrastructure Systems (Cornell University)
Cornell’s School of Civil and Environmental Engineering (CEE) invites applications for a tenure-track faculty position in the area of risk as related to infrastructure and the environment.

Publications

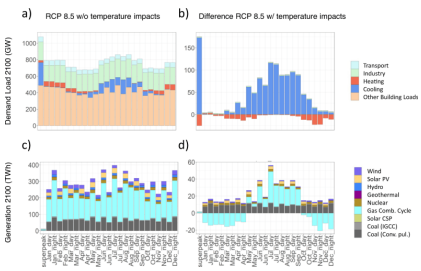
We have been posting and will be regularly updating select MSD publications on the website, under the **Publications** page. Below you can find some of the publications posted most recently:



How structural differences influence cross-model consistency: An electric sector case study



Assessing the future of global energy-for-water



Impacts of long-term temperature change and variability on electricity investments

This newsletter has been edited by Antonia Hadjimichael and the Community of Practice Facilitation Team. This and all previous newsletters can be accessed at the Newsletters page of our website. If you have any suggestions, concerns or other feedback about this newsletter or the MSD website, please email contact@multisectordynamics.org.