MultiSector Dynamics Community

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

INSIDE THIS ISSUE

Hello MultiSector Dynamics (MSD) Community!
In this issue we are discussing our past and future presence at the AGU Fall Meeting and our community-wide webinar on March 2nd. We are also featuring the work of Gokul Iyer (JGCRI).

🌐 www.multisectordynamics.org

🐦 @multi_sector

Community-wide webinar on March 2nd

Title: ***MSD: Shared Themes, Questions, and Methods — Update on Community Activities***

The next MSD Community webinar will be held on **March 2nd, 1-2:30 pm ET**. This webinar will be presented by members of the Scientific Steering Group and will focus on several aspects of our joint efforts to evolve a framework for MSD research, detailed in the community's upcoming white paper.

Specific topics will include:
1. **Reflections on AGU 2020 and initial planning for AGU 2021**
2. **White paper outline and development process**
3. **Updates on activities from our Working Groups**

To join the webinar please register here:
https://cornell.zoom.us/meeting/register/tJcrfuipqjgoGtIoDSRJmhhe0V1ejocKxyl9

Reflections on AGU 2020 and initial planning for AGU 2021

MSD science had a major presence at the Fall 2020 AGU meeting. In spite of the challenges posed by the ongoing pandemic, the community hosted a DOE Town Hall, an MSD Union Session, six oral sessions, and five poster sessions (more information on the topics can be found <u>here</u>). The MSD CoP sessions attracted approximately 10% of the total number of submitted abstracts to the entire Global Environmental Change section, making it one of the largest coordinated topical areas overall. Over 30% of the 483 authors of accepted presentations and posters came from countries other than the United States—a respectable showing for our first year even as we hope to improve in the future. Consistent with the MSD's commitment to advance early career researchers, 38% of presenters were students.
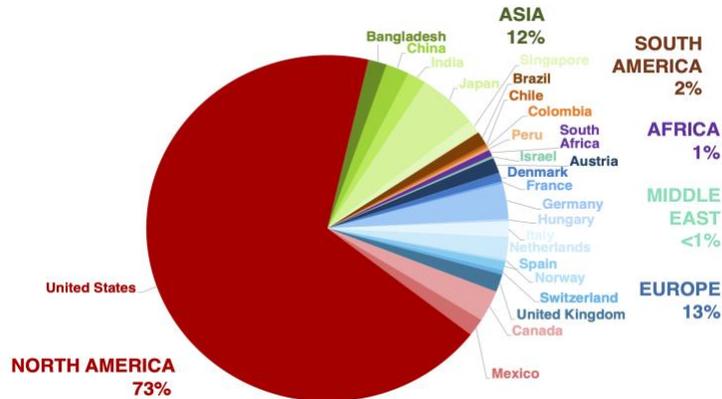
Overall, the 2020 AGU Fall Meeting MSD CoP program sparked many rich discussions and highlighted the value of research focused on exploring the complex, multi-scale co-evolution of natural, engineered, and socioeconomic systems and sectors. Across the sessions, a number of key themes and questions emerged that are relevant to advancing MSD research objectives including how extreme events affect the trajectory and interactions of sectors, the effects of different types of governance institutions on adaptation, and new methods for computationally representing changing perceptions and behaviors in coupled human-natural system models.
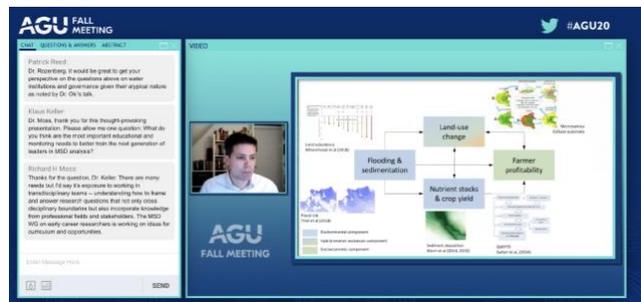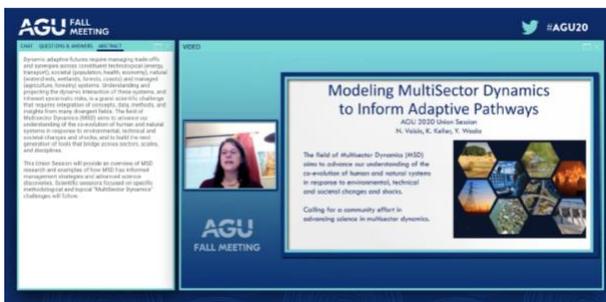
Following the 2020 AGU Fall Meeting success, we will again coordinate a number of MSD session proposals for the 2021 AGU Fall Meeting, aimed at bringing together researchers from around the world, present compelling MSD research and accelerate the development of the MSD community. If you wish to contribute to this effort, please follow the <u>instructions to submit a 2021 AGU Fall Meeting MSD session proposals</u>.

For more details and to share your perspective or offer suggestions for the 2021 AGU Fall meeting, join the conversation <u>here</u>.

Researcher Highlight: **Gokul Iyer**

Gokul Iyer is a scientist working in the Joint Global Change Research Institute at the Pacific Northwest National Laboratory. Gokul's research broadly focuses on interactions across energy, economic, water, land, and climate systems, technology, and institutions at regional to global scales. Gokul has an interdisciplinary background with a Bachelor of Technology degree in Electrical and Electronics Engineering from Visvesvaraya National Institute of Technology, Nagpur, India (2009), a Master of Technology degree in Energy Systems Engineering from the Indian Institute of Technology Bombay, India (2011), and a PhD in Policy Studies from the University of Maryland College Park, USA (2015).

Gokul's contribution and leadership roles in the multisector dynamics community include his role as a Major Experiment lead within the Global Change Intersectoral Modeling System (GCIMS) project, and a capability lead for the Global Change Analysis Model (GCAM) within the Integrated Multi-sector Multi-scale Modeling (IM3) project. Traditionally, multisector models of similar class and scope as GCAM have been used to study human-Earth system interactions at coarse geographic and temporal scales, dividing the world into one to three dozen geopolitical regions and running in half-decade increments. In response to the needs of understanding human-Earth system interactions at finer spatial and temporal scales, modeling efforts have begun to incorporate more detail into such models., Gokul has been coordinating multi-year, multi-researcher efforts to improve the representation of subnational energy-water-land dynamics within GCAM by developing GCAM-USA - the version of GCAM with state-level details in the USA. His work pushes the boundary in terms of spatial, temporal, sectoral, and technological detail for models of GCAM's scope and class.

Recently, Gokul—along with Neal Graham, Mohamad Hejazi, and Son H. Kim—coordinated the improved representation of water supplies and demands within GCAM-USA. As a result, GCAM-USA now includes state-level representations of energy, state- and basin- level representations of water and land systems, and interactions across them. Since GCAM-USA also represents the rest of the world in

the same regions as GCAM, these improvements allow users to run a broad range of multi-decadal scenarios of human and natural systems with subnational details in a consistent, integrated framework that simultaneously accounts for subnational dynamics within the USA while also capturing key interactions in the rest of the globe.

In addition, Gokul led a team of researchers including Marshall Wise, Pralit Patel, Matthew Binsted, Son Kim, Yang Ou, and Zarrar Khan to incorporate improved state-level technology, resource, and socioeconomic assumptions in GCAM-USA. More recently, the team incorporated information about sub-annual (monthly day/night) electricity load profiles, and separate markets for electric capacity and electricity demand in GCAM-USA. In addition, the team implemented dynamically and endogenously changing load profiles in response to future temperature changes and associated investment and operation decisions within GCAM-USA. The improved model also includes representations of key structural elements of the power sector such as electricity trade across multi-state grids and between states within a grid. Ongoing efforts at JGCRI are focused on expanding this capability to the rest of the globe and including representations of electric storage.

Gokul's current research also focuses on better understanding how regional teleconnections through trade and resource supply networks can affect the co-evolution of energy-water-land systems within the USA and globally. As part of this effort, Gokul is coordinating efforts across JGCRI to improve representation of water resources and energy trade, incorporate mineral resources and trade, and implement forest trade in GCAM. His work is expected to provide a quantification and mapping of regional teleconnections across the globe for energy, water, land systems in the 21st century.

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

New MSD Data and Code Platform Funded

The development of MSD-LIVE, the MultiSector Dynamics – Living, Intuitive, Value-adding, Environment, was recently greenlighted for funding by the MSD program area in the Department of Energy. MSD-LIVE will be a flexible and scalable data and code management system combined with a distributed computational platform that will enable MSD researchers to document and archive their data, run their models and analysis tools, and share their data, software, and multi-model workflows within the MSD Community of Practice.

MSD Special Issue at Earths' Future

Our Community of Practice is leading a <u>Call for Papers at Earth's Future</u> 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:
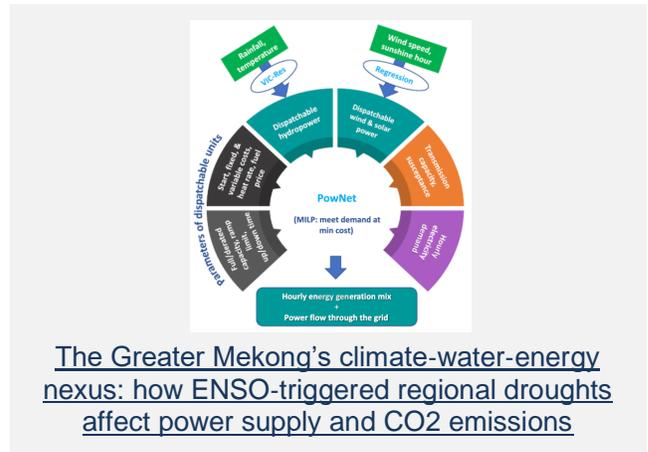
<u>The Greater Mekong's climate-water-energy nexus: how ENSO-triggered regional droughts affect power supply and CO2 emissions</u>
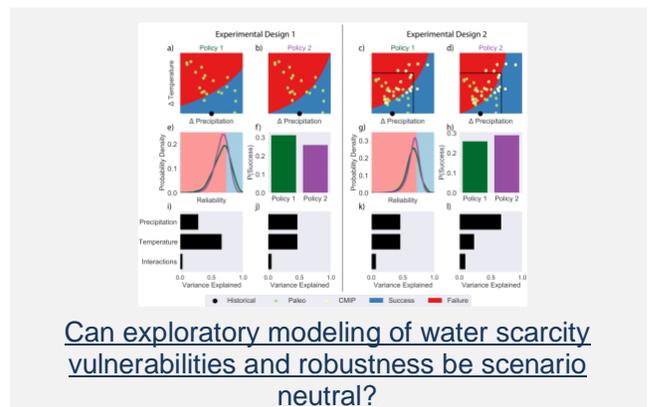
<u>Can exploratory modeling of water scarcity vulnerabilities and robustness be scenario neutral?</u>

MultiSector Dynamics

Career opportunities

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

M.S. or PhD funded student positions available – Mechanical Engineering – Interdisciplinary topics in energy, water, and climate change
Seeking motivated students interested in applying engineering skills to solve interdisciplinary and transdisciplinary questions related to energy systems. Topics include renewable energy, energy efficiency, grid integration, energy-water-climate nexus, and energy transitions in the Great Lakes region of the U.S. Dr. Dyreson's lab is in the Department of Mechanical Engineering.

Senior Postdoc position: Integrated energy-land-economy-climate modeling
The Potsdam Institute for Climate Impact Research (PIK) is offering a PostDoc position for advancing the Potsdam Integrated Assessment Modeling Framework (PIAM). Key responsibilities: Scenario analysis with PIAM to inform climate and sustainable development policies.

**Dynamic Land-Use Ecosystem Modeler Postdoctoral Scholar**
Berkeley Lab's Climate & Ecosystems Division has an opening for a Dynamic Land-Use Ecosystem Modeler. In this exciting role, you will model land-use land-cover change (LULCC) impacts to the carbon-water-energy nexus using a unique integrated modeling framework, and predict feedbacks to climate at global and societally-relevant scales.


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:
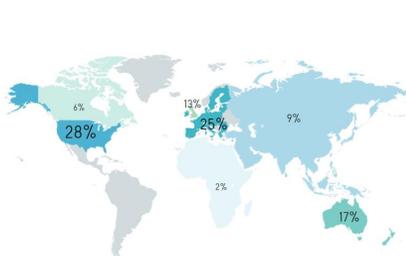
Urban Water Consumption at Multiple Spatial and Temporal Scales. A Review of Existing Datasets
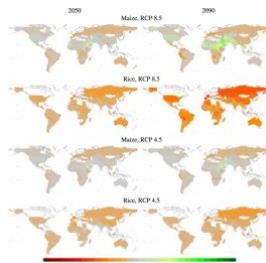
Future climate impacts on global agricultural yields over the 21st century
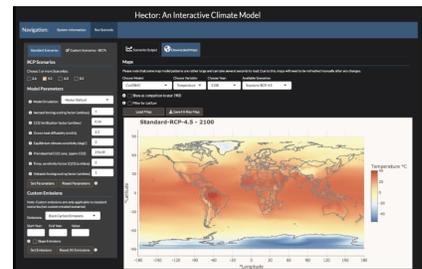
hectorui: A web-based interactive scenario builder and visualization application for the Hector climate model

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