MultiSector Dynamics Community

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

Inside This Issue

Hello MultiSector Dynamics (MSD) Community!

In this issue, we provide summaries of recent successful MSD working group webinars and information on key upcoming MSD events! Check out our feature profile on Dr. Antonia Hadjimichael, an Assistant Professor at Penn State. You will also find some recent publications and job postings.

www.multisectordynamics.org

MSD Sessions at AGU

Keep MSD in mind as you start planning your attendance at the 2022 AGU Fall Meeting. We will be convening the 6 sessions listed below. Details on the timing of the sessions will be released shortly.

- MultiSector Dynamics: Environmental Change, Resilience, and Society in Urban Areas Under a Changing Climate
- MultiSector Dynamics: Adapting Energy Systems to a Changing Climate by Overcoming Disconnects between Energy System and Climate Modeling
- MultiSector Dynamics: Energy-Water-Land Interactions at Multiple Scales
- MultiSector Dynamics: Extreme Weather, Society and Uncertainty Characterization
- MultiSector Dynamics: MultiSector Impacts of Energy Transitions
- MultiSector Dynamics: Science & Modeling for Societal Transformation

MSD Panel at DMDU

MSD will also have a presence at the 2022 Annual Meeting hosted by the Society for Decision Making Under Deep Uncertainty taking place in Mexico City from November 9th-11th. The theme of this year's annual meeting is "Transformative Recovery and Forging Anew". Day 3 of the conference will feature a panel on "Understanding Complex Adaptive Human-Earth Systems through Multisector Dynamics and DMDU. The full program for the conference can be found **here**.

Working Group Organized Event: MSD-LIVE v1.0 Release

The MSD-LIVE project held a community-wide webinar on August 23rd, 2022 to celebrate the initial release of the MSD-LIVE platform. MSD-LIVE (**https://msdlive.org/**) is a cloud-based data management and advanced computing 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. During the webinar the team gave an overview of the core features in v1 of MSD-LIVE including a detailed walk-through of how to use the MSD-LIVE data repository to manage and get DOIs for your data. The webinar was attended by 35+ individuals from across the MSD community. You can watch the recording of the webinar on MSD-LIVE's YouTube channel: **https://youtu.be/AfKbd7TUGaU**. Information about future training and informational events from the MSD-LIVE team can be found on their News and Events page: **https://msdlive.org/news-and-events**.

Working Group Organized Event: Human Systems Webinar

The MSD Human Systems Modeling Working Group recently hosted an interactive webinar on "Charting the State & Frontier of Human Systems Modeling for MSD Research." The webinar utilized the recent **human systems modeling typology** developed by the working group as a means to facilitate discussion around current approaches for human systems modeling in MSD, and to chart promising research frontiers for advancing the representation of adaptive human action in MSD models. During interactive discussions with 52 attendees from the US and several other countries, a variety of approaches for representing human systems were illustrated, with a substantial focus on agent-based and computable general equilibrium approaches. While several of these examples are applied to context or sector specific case studies, it was noted that human systems modeling approaches that holistically bridge across sectors and systems remains a major gap. Recent examples were highlighted that suggest to promising paths of development towards such holistic modeling, such as efforts to couple regional or global computable general equilibrium models with local sector-specific models. Throughout the discussions and responses, the challenge for identifying appropriate methodologies, theories, and data for specifying adaptive human response in MSD models was noted. Towards this end, attention was called to approaches that combine optimization-based or genetic algorithms alongside observed data to infer actor behavior in MSD systems. Emergent data from satellite imagery, smart meters (e.g., smart water meters), and mobile data, alongside such data-driven approaches, offer further opportunity to operationalize and parameterize adaptive human action in MSD models. The workshop was attended by a diverse audience

of nearly fifty participants across U.S. national labs and universities, as well as international participation from researchers in the U.K. and Germany. A recording of the workshop is available **here**.

Upcoming Community Events

The Uncertainty Quantification and Scenario Development Working Group will be holding a webinar on October 25th at 1:00 PM ET.

Title: Identifying Challenges and Opportunities for Uncertainty Analysis in MSD Research

Abstract: Analyzing relevant uncertainties for multisector systems is complicated by several factors. These include differing methods and terminology across sectoral disciplines and the number of ways in which similar uncertainties can be treated. During this workshop, we will discuss one approach to a systematic classification of uncertainties and how they might be represented. We will use this classification to facilitate discussion of current challenges for uncertainty analyses in MSD research and opportunities to advance how MSD-relevant uncertainties are treated and communicated.

Please use the button below to register in advance for the webinar.

Register Here

MSD Research Spotlight: **Dr. Antonia Hadjimichael**

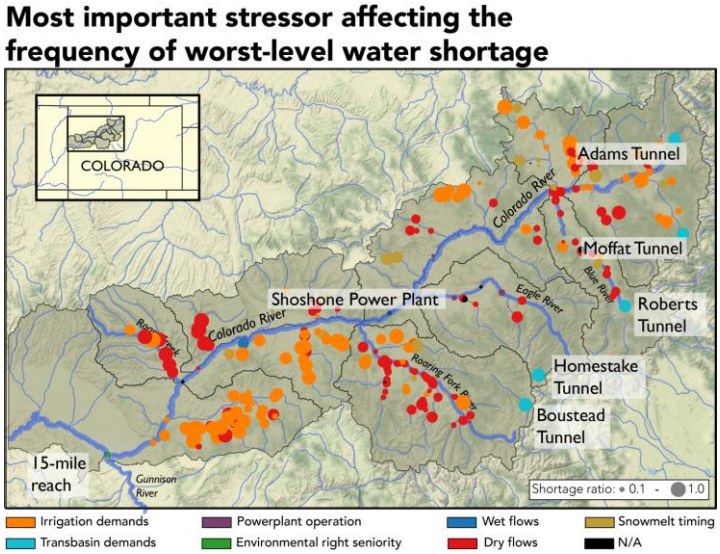
Dr. Hadjimichael uses MSD methods to investigate how water allocation might interact with and be affected by hydroclimatic, social, infrastructural, and institutional changes in the Upper Colorado River Basin within the state of Colorado. In the Integrated Multisector Multiscale Modeling (IM3) project, she is currently exploring how dynamic water demand adaptation might act to dampen the impacts of some of these stressors.

Antonia Hadjimichael is an interdisciplinary scientist working at Penn State University as an Assistant Professor. Antonia's research focuses on understanding the dynamic relationships between human and natural systems, with a particular emphasis on climate impacts on water and their implications for human use. Her work contributes to literature on decision making under deep uncertainty, model diagnostics, water resources management, and multisector dynamics. Outside her research, she is a member of the MultiSector Dynamics Community of Practice Facilitation Team, Chair of Communications for the Society for Decision Making under Deep Uncertainty and serves on Penn State's Water Council.

Socio-environmental systems face rapid and profound transitions induced by human and natural changes. Water resources systems specifically are confronted with evolving and deeply uncertain stressors driven by climate, resource limitations and societal demands which necessitate the use of diverse exploratory modeling methods and advanced diagnostics to inform the identification of sustainable adaptive pathways. Antonia's work in this area has focused on the advancement and application of bottom-up approaches to vulnerability and resilience assessment for water resources systems. These frameworks employ exploratory modeling to simulate large ensembles of plausible future scenarios and thereupon identify those with consequential effects on the system. Paired with high-performance computing, and

data and visual analytics, Antonia's work clarifies tradeoffs between system goals, and identifies dominant stressors for sectors and stakeholders.

Working with collaborators, Antonia has applied these methods to investigate how water allocation might interact with and be affected by hydroclimatic, social, infrastructural, and institutional changes in the Upper Colorado River Basin within the state of Colorado (UCRB) [1]. This is a system with a strong presence of social institutions, dictating water allocation based on prior appropriation. Consequently, these institutions also determine how vulnerabilities are distributed among stakeholders, as senior-right holders always get their full entitlement before any junior right holders. By coupling the State's own water supply and allocation model with this exploratory approach, the team examined how hundreds of users in the UCRB might be affected. Their results demonstrated the strong effect of human institutions in shaping user vulnerabilities as, under the same ensemble of scenarios, stakeholders may experience vastly different impacts to their water supply. Using sensitivity analysis methods and visual analytics, they also showed that the drivers and uncertainties controlling these impacts also differ across users [2].



Continuing this work under the Integrated Multisector Multiscale Modeling (IM3) project, she is currently exploring how dynamic water demand adaptation might act to dampen the impacts of some of these stressors. Given the complexity of this system and the scale of this experiment, Antonia has been working with collaborators Patrick Reed (Cornell University), and Chris Vernon and Travis Thurber (PNNL) to innovate on how such large exploratory experiments can be performed to remain tractable and reproducible. Outside IM3, Antonia is also leading the MultiSector Dynamics area under the COMPASS-GLM project. Working with Jim Yoon, Jill Deines (PNNL), Laura Johnson (Heidelberg University) and others, they aim to better understand interactions between agricultural practices and natural systems in the Great Lakes. To do so, they are developing an agricultural agent-based model to capture uncertainties and feedbacks between human actions and the watershed they operate in.

Highlighted Articles:

A. Hadjimichael et al., "Defining Robustness, Vulnerabilities, and Consequential Scenarios for Diverse Stakeholder Interests in Institutionally Complex River Basins," Earths Future, vol. 8, no. 7, p. e2020EF001503, 2020, doi: 10.1029/2020EF001503.

A. Hadjimichael, J. Quinn, and P. Reed, "Advancing Diagnostic Model Evaluation to Better Understand Water Shortage Mechanisms in Institutionally Complex River Basins," Water Resour. Res., vol. 56, no. 10, p. e2020WR028079, 2020, doi: 10.1029/2020WR028079.

Website: ***hadjimichael.info***
Twitter: ***@a_hadjimichael***

MSD Job Listings

Our website features a **careers page** that lists available MSD-focused positions at all levels. If you'd like to post a position to be featured in this page, please email us at: contact@multisectordynamics.org. Here are some of our latest postings:

Tenure Track Faculty Positions in Civil, Construction and Environmental Engineering: North Carolina State University

The Department of Civil, Construction, and Environmental Engineering (CCEE) at North Carolina State University (NCSU) expects to hire three to five new faculty over the next two years. CCEE has seven core research areas: (1) Computing and Systems (2) Construction Engineering (3) Environmental, Water Resources, and Coastal Engineering (4) Geotechnical and Geoenvironmental Engineering (5) Mechanics and Materials (6) Structural Engineering and Mechanics (7) Transportation Systems and Materials

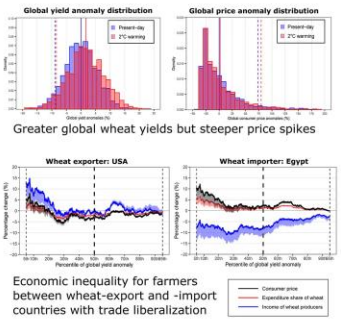
We invite applications from scholars with expertise in any of these areas.

Postdoctoral Scholar Position in Representing Political Economy Insights in Integrated Assessment Models

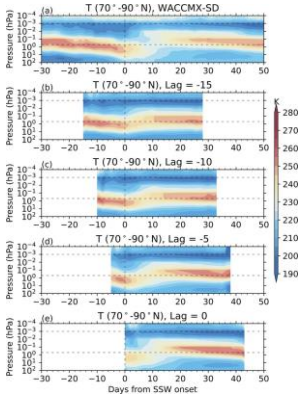
The School of International Affairs (SIA) and the Department of Civil and Environmental Engineering (CEE) at the Pennsylvania State University offer an outstanding opportunity for a postdoc position in Representing Political Economy Insights in Integrated Assessment Models. We are looking for an enthusiastic, self-motivated postdoctoral scholar to join a new project funded by the Alfred P. Sloan Foundation to incorporate political economy insights into the quantitative modeling of decarbonization policies.

MSD Publications

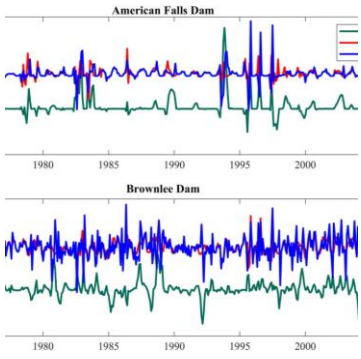
We have been posting and will be regularly updating select MSD publications on the website, under the Publications page. If you have any publications you would like us to highlight, please email contact@multisectordynamics.org.
Below you can find some of the publications posted most recently:



Increased wheat price spikes and larger economic inequality with 2°C global warming



Subseasonal Earth System Prediction with CESM2



The Role of Groundwater Withdrawals on River Regulation: Example From the Columbia River Basin

This newsletter has been edited by Rohini Gupta 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.