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 featuring two researchers in our community: Sean Turner (PNNL) and Jen Morris (MIT).

We are also including some information on the current request for working group proposals, as well as new content on our website.

www.multisectordynamics.org

Community engagement through our website

We would like to remind you that the website for our community of practice is now fully functional at www.multisectordynamics.org.

We will be transitioning all our future communications and distributed materials to this website. In an effort to simplify operations as our community grows, **the current mailing list is being phased out so we invite everyone to register with the website to continue to receive future communications from us.** By joining, you can also register your interest with our current and future working groups.

Register here

Update on Request for Working Group Proposals

As previously announced in the April community webinar and newsletter, the Scientific Steering Group (SSG) is soliciting proposals for new MSD working groups. Three letters of intent have been received and SSG members are providing feedback to help the submitting teams strengthen their proposals.

The deadline for full proposals has been extended to **June 5, 2020, 6:00pm Pacific Time**. The proposals should be submitted through **this form**.

Questions regarding MSD WG proposals and letters of intent should be addressed to Erwan Monier (emonier@ucdavis.edu) and Antonia Hadjimichael (ah986@cornell.edu).

Researcher Highlight: **Jennifer Morris**

By Jennifer Morris

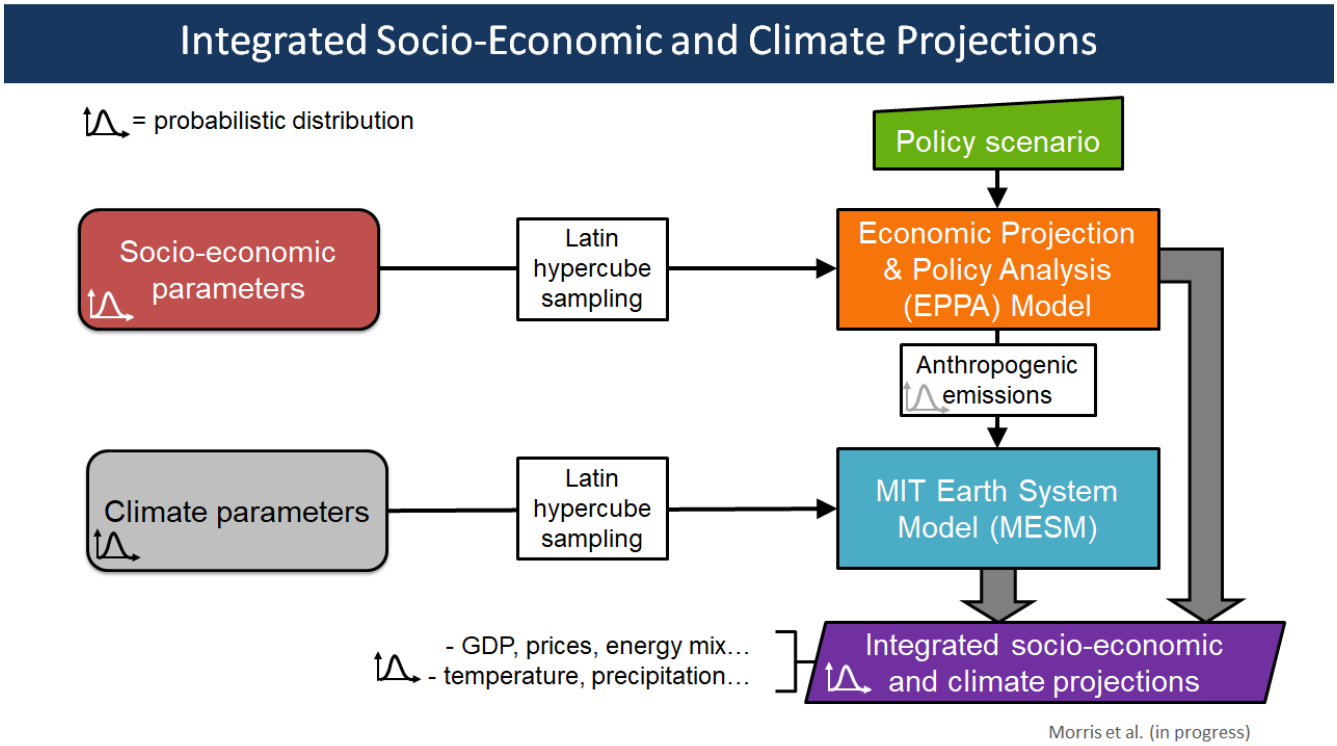
I am a research scientist at the MIT Joint Program on the Science and Policy of Global Change, where an integrated team of natural scientists, economists, engineers and political scientists studies the complex interactions among co-evolving human and natural systems. Prior to this role, I earned my PhD in Engineering Systems and a M.S. in Technology and Policy from MIT, and a B.A. in Public Policy from UNC Chapel Hill. This interdisciplinary background draws me to the Multi-Sector Dynamics (MSD) community, which aligns well with my research. I am excited to serve as a member of the MSD Scientific Steering Committee.

My research focuses on energy-economic modeling, coupled human-natural systems, and uncertainty and risk analysis. I contribute to the development of the MIT Integrated Global System Model (IGSM), focusing on the human system component, the Economic Projection and Policy Analysis (EPPA) model. I employ this modeling framework for a wide range of studies. I design and conduct large ensembles of the model to investigate uncertainties, explore energy transitions and economic development pathways for meeting long-term societal goals, examine regional and sectoral interactions, and investigate avenues for capturing important dynamics in the model (such as climate impacts on human systems, the speed of energy transitions, and changing consumer preferences).

A large part of my research focuses on uncertainty— quantifying key uncertainties, assessing risks and their coevolution, and applying different methodological approaches to models in order to formally represent uncertainties and explore how they impact near-term decisions. A key focus is evaluating risks to different investment options in energy, water and coastal adaptation.

Recent work has focused on representing uncertain influences and stressors in human and natural systems. I have quantified key socio-economic uncertainties (e.g. economic and population growth, the cost of technologies, resource availability, etc.) and conducted probabilistic ensembles with the EPPA model. I have worked closely with the climate scientists undertaking parallel tasks with the MIT Earth System Model (MESM). Together, we developed integrated ensembles for various climate stabilization futures (see figure below of our framework), and use the results in a wide variety of studies of coupled human-natural systems. We take a telescopic approach from global to regional to sectoral or sub-

regional, harmonizing scenarios and assumptions across models of different levels of resolution and coupling.



I aim to continue this type of work that combines human and natural systems models of different scales in a consistent framework to inform more local decision-making under uncertainty. To that end, my group at the MIT Joint Program has started an exciting a new DOE-funded project focused on the Mississippi River Basin region. We will explore compounding risks in the region (including those related to extreme events, demographics, economic and energy transitions, etc.), resilience and tipping points in the face of co-evolving natural, built and human systems, teleconnections between sub-regions, and local vs. system-level decision-making.

My work fits well with the MSD themes of adaptive human actions, model coupling, sectoral interactions and dependencies, and stressors and uncertainties. I very much look forward to helping to grow the MSD community and expanding collaborations in these important research areas.

Highlighted articles:

- Chen, Y.-H.H. et al. (2016): Long-term economic modeling for climate change assessment. Economic Modelling, 52 (Part B): 867–883.
- Monier, E. et al.(2018): Toward a consistent modeling framework to assess multi-sectoral climate impacts
- Morris, J.F. et al. (2019): Advanced Technologies in Energy-Economy Models for Climate Change Assessment. Energy Economics, 80 (476-490)
- Morris, J. et al. (2018): Hedging Strategies: Electricity Investment Decisions under Policy Uncertainty. Energy Journal, 39(1)

Researcher Highlight: **Sean Turner**

By Sean Turner

I came to the United States to join PNNL in 2016. In my earlier research years, I immersed myself in water reservoir system planning and management, starting with utility company placements in the UK and Australia, then turning fully to academia with a postdoc in Singapore. Understanding how to simulate a reservoir has turned out to be a remarkably productive skill—one that's applicable across a range of multisectoral research activities.

My research has branched out into three broad categories. First, if you can model reservoirs, you can simulate hydropower generation. And if you can project change in hydropower generation, you can start to investigate secondary effects on power grids—including impacts to production costs, future investment needs, emissions, and reliability of electricity supply. We've studied these effects at range of spatial scales (global, western power grid, Pacific Northwest, Texas) and using a variety of tools, including capacity expansion models, integrated assessment models, and production cost models.

Second, if you can model surface water reservoirs, you can also capture a lot of the basics of groundwater storage—enough to develop a simple water supply component for an Integrated Assessment Model. Using the Global Change Assessment Model with nonrenewable water embedded, we projected groundwater depletion across the world's major river basins, and then studied the impacts on agricultural land use. We found that the increasing costs of water extraction in heavily exploited basins could cause marked regional shifts in the mode and locations of crop growth across the world this century.

Third, reservoir models are an increasingly important component of large-scale hydrological and water resource models. These models—initially conceived for earth systems research—are increasingly expected to inform MSD research applications, and thus require refinement and enhancement to capture important local nuances, such as the use of seasonal forecasting in reservoir management. We've been experimenting with new methods for simulating reservoir operator behaviors at a large scale; current results provide some hope that we might ultimately enhance simulation performance under extreme hydrological conditions, such as flood and drought. Capturing these effects will be essential for later propagating realistic water availability scenarios to energy and land impact models.

A final research activity I've been involved in is the collection and processing of dozens of geospatial datasets describing land, energy, water, and economic systems throughout the United States. By masking these data to the water supply catchments serving major US cities, we've begun to characterize and categorize cities according to their distal connections across sectors. Although at an early stage, this research is envisioned as a key capability that can inform the selection of case study cities for ongoing MSD projects.

Highlighted articles:

- Turner, S. W. et al., (2020) Inferred inflow forecast horizons guiding reservoir release decisions across the United States, Hydrol. Earth Syst. Sci., 24, 1275–1291
- Turner, S. W. et al. (2019). Compound climate events transform electrical power shortfall risk in the Pacific Northwest. *Nature communications*, 10(1), pp.1-8.
- Turner, S. W. et al. (2019). A pathway of global food supply adaptation in a world with increasingly constrained groundwater. *Science of the total environment*, 673, pp.165-176.

MSD job listings

Our website is now featuring a **careers page** that will list available MSD-focused positions at all ranks. If you'd like to post a position to be featured in this page, please email us at: contact@multisectordynamics.org.

Currently, we have the following position posted:

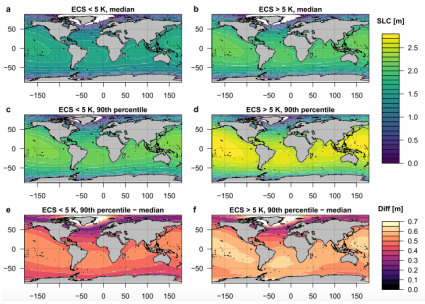
Postdoctoral Scholar: Risk- and Decision-Analysis to Inform Flood-Risk Management

The Earth and Environmental Systems Institute (EESI) at The Pennsylvania State University invites applications for a Postdoctoral Scholar position focusing on the analysis of flood risks and strategies to manage these risks. The successful candidate will join a transdisciplinary research team supported by funding from sponsors such as The Department of Energy (DOE) and The National Oceanic and Atmospheric Administration (NOAA). The ideal candidate will have a strong background in a relevant discipline such as applied mathematics, statistics, atmospheric science, geosciences, civil and environmental engineering, or operations research. A Ph.D. in a relevant field is required by the start date.
Read more ….

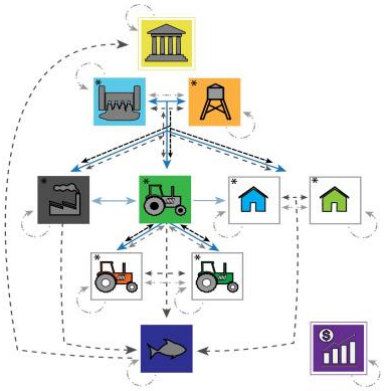
MSD publications

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.

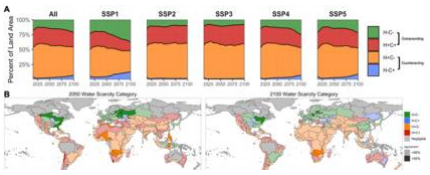
Below you can find some of the publications posted most recently:



The Role of Climate Sensitivity in Upper-Tail Sea Level Rise Projections



Identifying emergent agent types and effective practices for portability, scalability, and intercomparison in water resource agent-based models



Humans drive future water scarcity changes across all Shared Socioeconomic Pathways

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.