

# MultiSector Dynamics Community

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

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Hello MultiSector Dynamics (MSD) Community!

In this issue, we share a summary of our excellent discussions in the MSD February Community Building Webinar, highlight upcoming MSD events, and provide a convenient summary of the papers published so far in our Earth's Future Special Section. We are also featuring the work of Sanjib Sharma, an Assistant Research Professor at Penn State. Below you will also find information about recent publications, job postings, and new funding opportunities.

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## Takeaways from our February Community Building Webinar

The February 22, 2022 MultiSector Dynamics Vision Report and Community Building Webinar followed the MSD CoP's January release of the [Vision Report](#). The two hour webinar was split approximately evenly between presentations and interactive discussions with attendees. The presentations provided a brief summary of the vision report as well as other major MSD CoP activities (e.g., [Multi-Sectoral Urban Interactions Workshop](#), [Coastal Integrated Hydro-Terrestrial Modeling Workshop](#), [MSD focused special section in the Earth's Future journal](#), and [recent AGU sessions](#)). We received valuable feedback on interests for future community and outreach events, as well as on opportunities for growing the MSD community. The 98 registrants came from the US, Canada, UK, Italy, Germany, Mexico, and more. Attendees represented many DOE labs, academic/research institutions, and agencies. Early career researchers represented a significant proportion of the overall audience. Interactive discussions generated excellent ideas for MSD events, creating opportunities for junior researchers, and for collaborating across research communities, agencies, and institutions at regional, federal, and international levels. The webinar will shape the MSD CoP's next steps: (1) develop a calendar of webinar events related to key MSD science challenges, (2) questionnaires to help prioritize suggested

options for meetings, collaborations, and networking, and (3) prepare for the next call for working group proposals for Summer 2022.

## AGU Fall Meeting 2022: Call for Proposals

Following the success of the MSD CoP program at the 2020 and 2021 AGU Fall Meetings, we will again coordinate several MSD session proposals for the 2022 AGU Fall Meeting, aimed at bringing together researchers from around the world, present compelling MSD research and accelerate the development of the MSD community. The AGU Fall Meeting 2022 will be in Chicago, IL and online everywhere 12-16 December 2022. If you wish to contribute to this effort, please follow the [instructions to submit a 2022 AGU Fall Meeting MSD session proposal](#). Session proposals are due by April 20.

## MSD Research Spotlight: Sanjib Sharma

*In his ICoM- sponsored work, Sanjib collaborates with Earth scientists, engineers, social scientists, and decision makers to design new risk management strategies that have potential to enable infrastructure robustness against deep uncertainties.*



Sanjib Sharma is an assistant research professor in the Earth and Environmental Systems Institute at Penn State. He graduated from Penn State with a Ph.D. in Civil and Environmental Engineering. Sharma received a master's degree from Southern Illinois University and a bachelor's degree in civil engineering from Tribhuvan University in Nepal. His research focuses on advancing the fundamental understanding of the interactions and nonlinear feedbacks between water and other systems (such as climate, urban, and infrastructure). He integrates methods from Earth science, engineering, and data science to inform decisions addressing critical environmental challenges. Example applications include water resources planning, flood risk management, and critical infrastructure design.

One key challenge Sharma tackles is the deep and dynamic uncertainties surrounding projected flood risks. These deep uncertainties can stem, for example, from choice of model structures, model parameters, and unresolved processes related to human decisions and biophysical processes. Neglecting deep uncertainties can drastically underestimate the tails of hazard probability distribution and can result in poor decisions as well as outcomes. Sharma integrates land surface models with methods for Bayesian data-model fusion and model diagnostics to better understand multi-sector dynamics and to inform the design of risk management strategies. As part of the U. S. Department of Energy (DOE) supported multi-institutional effort on Integrated Coastal Modeling (ICoM), Sharma is collaborating with hydrologists from Pacific Northwest National Laboratory to apply novel methods for urban flood hazard characterizations. These new methods can improve (i) the diagnosis of the underlying hydrodynamic models, (ii) the uncertainty characterization, and (iii) the understanding of the multisector dynamics.

Sharma explores new approaches to designing urban infrastructure in a changing climate. Traditional strategies for flood-sensitive infrastructure design typically assume a stationary rainfall distribution and neglect the deep uncertainties surrounding projections of the coupled natural-human systems. Designing infrastructure in the face of dynamic climate, land-use and socioeconomic uncertainties poses highly complex decision problems. Sharma studies robust decision-making and infrastructure design under

deep uncertainty approaches that have potential to enable infrastructure robustness under dynamic conditions.

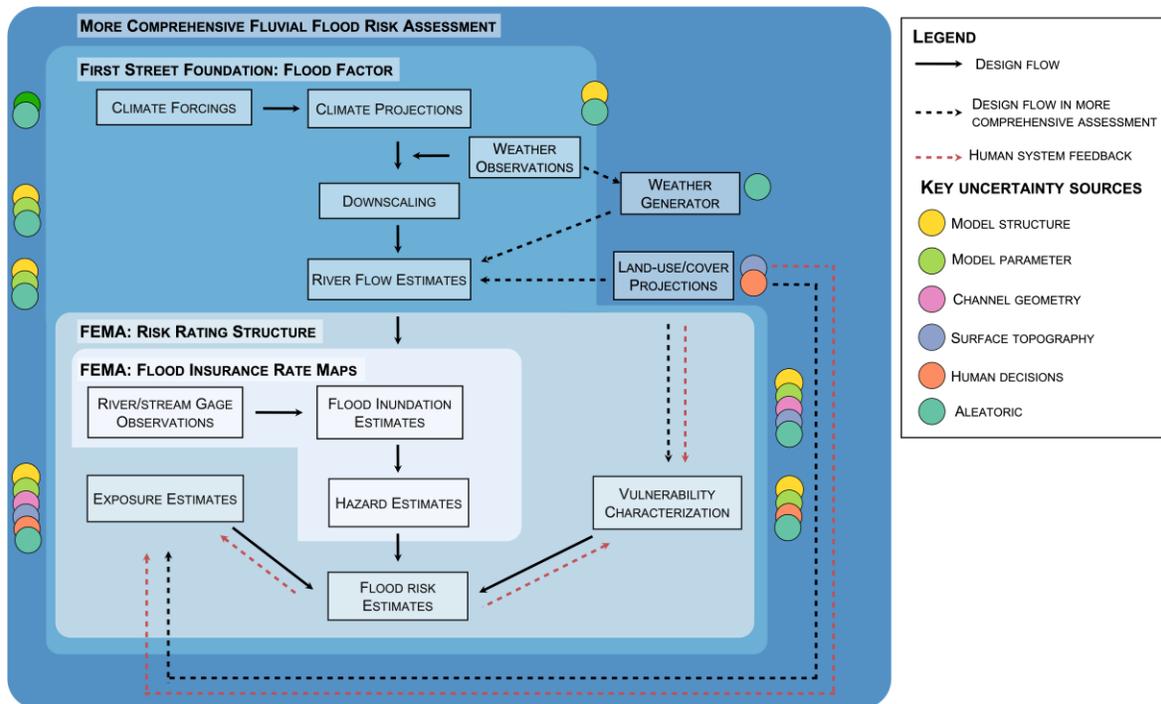


Figure 1: Flow diagram illustrating key decision-relevant uncertainties and components for a comprehensive flood-risk characterization. Figure adapted from Cooper et al. (2022) (<https://doi.org/10.48550/arXiv.2201.01254>) under a CC BY 4.0 license (<https://creativecommons.org/licenses/by/4.0/>).

### Highlighted Articles:

- [1] Cooper C.M., S. Sharma, R. Nicholas, K. Keller, 2022. Trade-offs in the design and communication of flood-risk information. Under Review. Preprint available: [arXiv:2201.01254](https://arxiv.org/abs/2201.01254)
- [2] Sharma, S., B.S. Lee, R. Nicholas, and K. Keller, 2021. A safety factor approach to designing urban infrastructure for dynamic conditions. *Earth's Future*, 9, e2021EF002118. <https://doi.org/10.1029/2021EF002118>.
- [3] Sharma, S., B. S. Lee, H. S. Iman, M. Haran, and K. Keller, 2022. Neglecting uncertainties surrounding model parameters can drastically underestimate flood risks. Under Review. Preprint available: <https://doi.org/10.1002/essoar.10510275.1>
- [4] Sharma, S., M. Gomez, K. Keller, R. Nicholas, and A. Mejia, 2021. Regional flood risk projections under climate change. *Journal of Hydrometeorology*, 22(9), pp.2259-2274, <https://doi.org/10.1175/JHM-D-20-0238.1>

## Upcoming MSD CoP Activities & Events

The MSD CoP is currently coordinating and planning a 2022 calendar of community events that will kick off this upcoming summer.

- **April 2022:** Keep a look out for the Professional Development and Education for Early Career Scientists Working Group's survey to better understand the backgrounds, demographics, and interests of the MSD Community. The survey requests will be made by email.

- **May 2022:** Request for proposals (RFPs) for up to 3 new working groups will be released in early May and will be due in June. The MSD CoP will host a webinar informational webinar to provide more details and allow current working groups to share their experiences.
- **June 2022:** Open Science and FAIR Data Working Group will providing an MSD-LIVE demonstration and training. For more information email Casey Burleyson ([casey.burleyson@pnnl.gov](mailto:casey.burleyson@pnnl.gov))
- May 11<sup>th</sup> 1pm PST US: Human Systems Working Group webinar featuring Marc Muller (Notre Dame) focused on Game Theory in MSD. For more information email **Jim Yoon** ([jim.yoon@pnnl.gov](mailto:jim.yoon@pnnl.gov))
- **June 2022:** the Professional Development and Education for Early Career Scientists Working Group is planning a virtual Early Career Researchers Panel & Discussion. This webinar is for early career researchers to learn about MSD career experiences. A diverse panel of professionals will contribute to a moderated discussion followed by an open Q&A session. For more information email **Mengqi Zhao** ([mengqiz@umd.edu](mailto:mengqiz@umd.edu))
- **Summer and Fall 2022:** MSD Uncertainty Tools & Training Sessions will be hosted by the Uncertainty Quantification and Scenario Development. The free online training sessions will build from the recently released open access [MSD UC eBook](#) and will provide guided tutorials. Scheduling and registration details will be provided in June 2022.

## Earth's Future Special Section Publication Highlights

The MSD Community received a special section in *Earth's Future* in September 2020: *Modeling MultiSector Dynamics to Inform Adaptive Pathways*. Since its inception, 11 papers have been published in this section and are highlighted in the table below. More information on submitting to this session can be found [here](#).

Title	Authors
<a href="#">Communicating Drivers of Environmental Change Through Transdisciplinary Human-Environment Modeling</a>	Andrew E. F. Allison, Mark E. Dickson, Karen T. Fisher, Simon F. Thrush
<a href="#">The Effects of Climate Change on Interregional Electricity Market Dynamics on the U.S. West Coast</a>	Joy Hill, Jordan Kern, David E. Rupp, Nathalie Voisin, Gregory Characklis
<a href="#">Modeling the Economic and Environmental Impacts of Land Scarcity Under Deep Uncertainty</a>	Flannery Dolan, Jonathan Lamontagne, Katherine Calvin, Abigail Snyder, Kanishka B. Narayan, Alan V. Di Vittorio, Chris R. Vernon
<a href="#">Power and Pathways: Exploring Robustness, Cooperative Stability, and Power Relationships in Regional Infrastructure Investment and Water Supply Management Portfolio Pathways</a>	David F. Gold, Patrick M. Reed, David E. Gorelick, Gregory W. Characklis
<a href="#">Multisector Dynamics: Advancing the Science of Complex Adaptive Human-Earth Systems</a>	Patrick M. Reed, Antonia Hadjimichael, Richard H. Moss, Christa Brelsford, Casey D. Burleyson, Stuart Cohen, Ana Dyreson, David F. Gold, Rohini S. Gupta, Klaus Keller, Megan Konar, Erwan Monier, Jennifer Morris, Vivek Srikrishnan, Nathalie Voisin, Jim Yoon

<a href="#"><u>Representing Socio-Economic Uncertainty in Human System Models</u></a>	Jennifer Morris, John Reilly, Sergey Paltsev, Andrei Sokolov, Kenneth Cox
<a href="#"><u>Technology Pathways Could Help Drive the U.S. West Coast Grid's Exposure to Hydrometeorological Uncertainty</u></a>	Jacob Wessel, Jordan D. Kern, Nathalie Voisin, Konstantinos Oikonomou, Jannik Haas
<a href="#"><u>The Implications of Global Change for the Co-Evolution of Argentina's Integrated Energy-Water-Land Systems</u></a>	Thomas B. Wild, Zarrar Khan, Mengqi Zhao, Micaela Suriano, Julia L. Bereslawski, Paula Roberts, Jose Casado, Marcelo Gaviño-Novillo, Leon Clarke, Mohamad Hejazi, Fernando Miralles-Wilhelm, Raul Muñoz-Castillo, Chris Vernon, Abigail Snyder, Brinda Yarlagadda, Abigail Birnbaum, Jonathan Lamontagne, Dave White, Glorynel Ojeda-Matos
<a href="#"><u>Accounting for Multisectoral Dynamics in Supporting Equitable Adaptation Planning: A Case Study on the Rice Agriculture in the Vietnam Mekong Delta</u></a>	Bramka Arga Jafino, Jan H. Kwakkel, Frans Klijn, Nguyen Viet Dung, Hedwig van Delden, Marjolijn Haasnoot, Edwin H. Sutanudjaja
<a href="#"><u>The Greater Mekong's Climate-Water-Energy Nexus: How ENSO-Triggered Regional Droughts Affect Power Supply and CO2 Emissions</u></a>	A. F. M. Kamal Chowdhury, Thanh Duc Dang, Hung T. T. Nguyen, Rachel Koh, Stefano Galelli
<a href="#"><u>Can Exploratory Modeling of Water Scarcity Vulnerabilities and Robustness Be Scenario Neutral?</u></a>	J. D. Quinn, A. Hadjimichael, P. M. Reed, S. Steinschneider

## Funding Opportunities

Our website now features a [funding opportunities](#) page that list community-submitted funding opportunities that have an MSD focus. If you would like to submit a funding opportunity to be advertised here, please email us at [contact@multisectordynamics.org](mailto:contact@multisectordynamics.org). Here are some of our latest postings:

### [DOE support for scientists impacted by the war in Ukraine](#)

Today, the Office of Science (SC) published a Dear Colleague letter encouraging university principal investigators who currently receive financial assistance from SC to consider requesting supplemental funds to host or collaborate with students or scientists who have been impacted by the war in the Ukraine. You can read the full letter [here](#)

### [Fiscal Year 2023 Department of Defense Multidisciplinary Research Program of the University Research Initiative \(MURI\)](#)

The Office of Naval Research (ONR) recently released a Funding Opportunity Announcement (FOA) for the Department of Defense Multidisciplinary Research Program of the University Research Initiative (MURI). Topic 12, Climate Change Risk and Decision Superiority, may be of interest to SERDP and ESTCP researchers, which addresses the need to understand how uncertainty in regional climate and earth system models interacts with the parallel uncertainty in human systems, impacting our ability to create actionable information tailored to local environments and specific decision-making priorities.

### [New Opportunity to Partner with MCC](#)

MCC seeks to partner with organizations that share our goal of achieving poverty reduction through economic growth. MCC's Partnership Annual Program Statement (APS) is the agency's primary mechanism to co-create, co-fund, and co-implement partnerships that support MCC's ability to achieve our mission and programmatic goals.

## 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](mailto:contact@multisectordynamics.org). Here are some of our latest postings:

### [Waterloo University: Indigenous Canada Research Chair \(Tier 1\) Opening](#)

The Faculty of Engineering at the University of Waterloo is seeking an exceptional scholar and researcher (internal or external to the University of Waterloo) to fill a Tier 1 Canada Research Chair (CRC), established by the Government of Canada to enable Canadian universities to foster research excellence

### [Postdoctoral Fellow: Coupling Decarbonization of the Power System with Advanced Planning for Integrating Negative Emission Technologies \(University of Michigan, School for Environment and Sustainability\)](#)

The ASSET Lab, based at the University of Michigan's School for Environment and Sustainability (SEAS), invites applications for a one-year Postdoctoral Research Fellowship on an NSF-funded two-year project. The fellow will develop and apply robust approaches to evaluate how CO2 removal technologies can be integrated into a decarbonizing electric power system

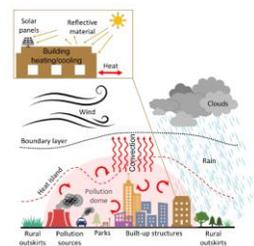
### [Postdoctoral Position: Uncertainty characterization of human-system responses to flood risk – Cornell University](#)

The Department of Biological & Environmental Engineering at Cornell University is seeking a Postdoctoral Research Associate to join the Srikrishnan research group. The successful candidate will co-lead a research project on uncertainty characterization for models of coupled natural-human system responses to evolving flood risk.

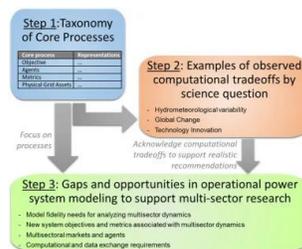
## Recent MSD Publications

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](mailto:contact@multisectordynamics.org).

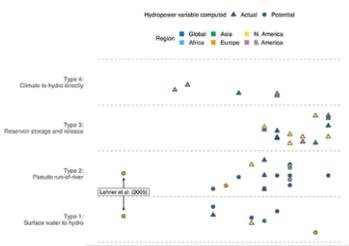
Below you can find some of the publications posted most recently:



[Urbanization Impact on Regional Climate and Extreme Weather: Current Understanding, Uncertainties, and Future Research Directions](#)



[Core process representation in power system operational models: Gaps, challenges, and opportunities for multisector dynamics research](#)



[Simulation of hydropower at subcontinental to global scales: a state-of-the-art review](#)

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](mailto:contact@multisectordynamics.org).