

MultiSector Dynamics Community

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Welcome to the newsletter of the MultiSector Dynamics Community

Hello MultiSector Dynamics (MSD) Community!

In this issue we're featuring the work of Christa Brelsford (ORNL) on improving the theory on the function of cities and urban water systems.

You can also find information about some of our upcoming community events, as well as the Special Issue organized by our Community of Practice for Earth's Future.

www.multisectordynamics.org

Register and join our three new working groups

Our community of practice is established at www.multisectordynamics.org and we will be conducting all our future communications and distributed materials from this website.

If you haven't already joined us, we invite you to click below to register. By registering you can also join (or update your subscription preferences) our newly established working groups: **Multisector Impacts of Energy Transitions, Urban Systems, Professional Development and Education for Early Career Scientists.**

[Register here](#)

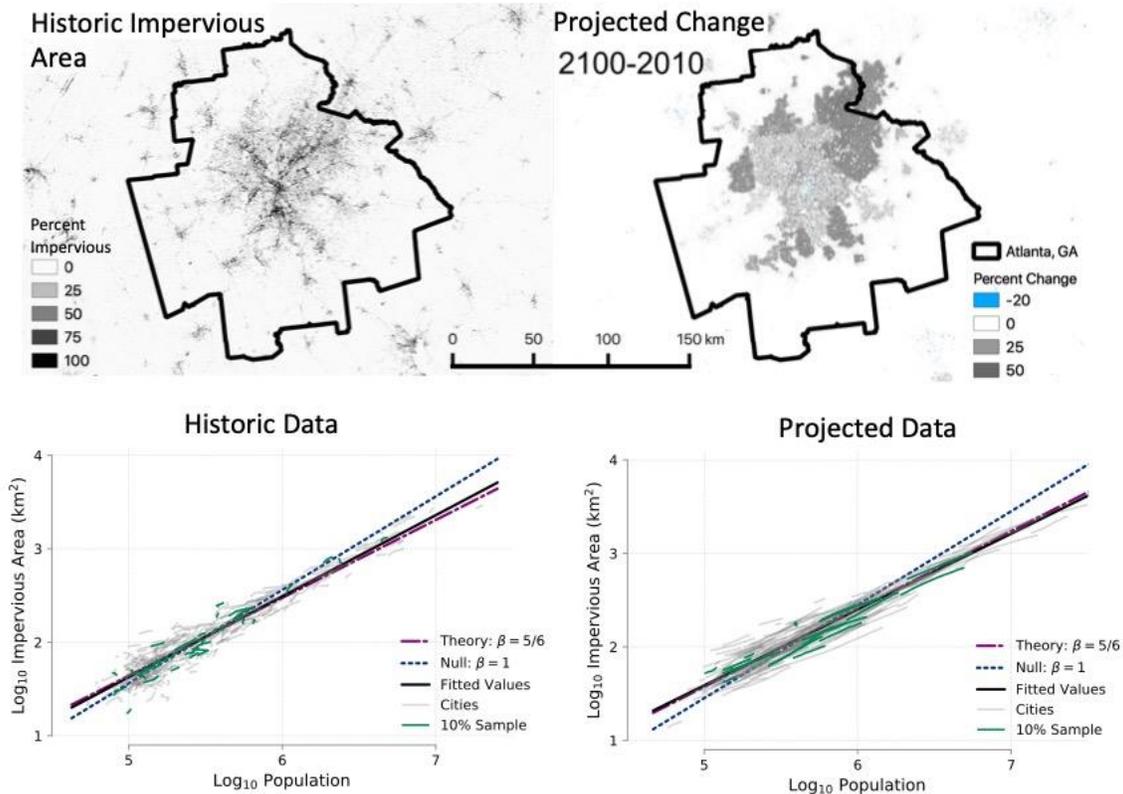
Researcher Highlight: Christa Brelsford



Christa Brelsford is a research scientist in the Human Dynamics group at Oak Ridge National Laboratory (ORNL). Prior to this role, Brelsford has been a Liane Russell Fellow at ORNL and a post-doctoral scholar at the Santa Fe Institute.

As the world's urban population doubles over the next century, the new infrastructure we expect to be built in order to house and care for all of these new urban dwellers will be almost equivalent to all of the urban infrastructure that has been built in the history of our species. We need to develop both a better empirical understanding of spatial patterns and the complex co-evolution of social and infrastructural characteristics in cities, and also better theories about urban function in order to cope with our rapidly growing urban population. Brelsford uses empirical methods, especially spatial analysis of novel data sources, to link individual choices to aggregate outcomes in order to build better theories about the function of cities and urban water systems.

Determining how and why a city's consumption patterns have changed is crucial for managing water scarcity in a context of rising water stress due to population growth, climate change, and increased variability in surface water flows. In her dissertation research, Brelsford used an extensive case study of the Las Vegas, Nevada water system to demonstrate the utility of two decomposition techniques for identifying drivers of change in residential water consumption. This enabled better predictions of Las Vegas' future water consumption and conservation portfolio.



Another branch of Brelsford's research has used a complexity science lens to understand urban form, casting urban infrastructure provisioning as a topological, rather than geometric, optimization problem. This perspective enables us to mathematically describe the topological transformations that are necessary for a slum neighborhood to physically integrate into the broader city. This integration is an important step towards ensuring the safety and security of all urban residents, and thus building resilient cities in a changing and uncertain world (<https://youtu.be/YuRjeUkNf9o>).

Most recently, Brelsford has sought an integrated and theoretical perspective on the coevolution of human, engineered, and natural systems, particularly in urban contexts. She has tested a general theory about the relationship between urban population and a set of aggregate socio-economic and infrastructural characteristics, and used it to validate other models predicting the future evolution of urban population and infrastructure.

This work contributes to the MSD community by using an explicitly empirical and theoretical perspective to build fundamental and generalizable knowledge about how the interacting sectors of land, energy, water, and human actions may evolve in a dynamic and changing world.

Highlighted articles:

1. Brelsford, C., Dumas, M., Schlager, E., Dermody, B. J., Aiuvalasit, M., Allen-Dumas, M. R., Beecher, J., Bhatia, U., D'Odorico, P., Garcia, M., Gober, P., Groenfeldt, D., Lansing, S., Madani, K., Méndez-Barrientos, L. E., Mondino, E., Müller, M. F., O'Donnell, F. C., Owuor, P. M., ... Zipper, S. C. (2020). Developing a sustainability science approach for water systems. *Ecology and Society*, 25(2), art23. <https://doi.org/10.5751/ES-11515-250223>
2. Brelsford, C., Martin, T., Hand, J., & Bettencourt, L. M. A. (2018). Toward cities without slums: Topology and the spatial evolution of neighborhoods. *Science Advances*, 4(8), eaar4644. <https://doi.org/10.1126/sciadv.aar4644>
3. Brelsford C., E. Coon, E. Moran. M. Allen-Dumas. Urban Scaling as Validation for Predictions of Imperviousness from Population. *In review*.

Upcoming community events this Fall and AGU Fall Meeting

There are several events organized by our working groups this fall, which you can find on our [website calendar](#).

The *Uncertainty Quantification and Scenario Development* working group will be organizing monthly webinars this fall, starting **October 2nd**, with David Lafferty (University of Illinois at Urbana-Champaign).

The *Human Systems* working group is organizing a community webinar on **November 2nd**, to update the wider MSD community on the working group's efforts on developing a typology of human systems in MSD models.

To find out more about these and other events, make sure to [register through our website](#) and sign up for working group updates.

AGU Fall Meeting 2020

This year's AGU meeting will be taking place between December 1-17 and will be largely virtual with prerecorded presentations.

Our community has organized its first set of sessions for this year's AGU Fall Meeting, which received 140 abstract submissions collectively, making up approximately 10% of all submissions to the Global Environmental Change Section.

The MSD community will be convening a Town Hall, a Union Session, several Oral sessions and at least two poster sessions, details on which will be shared when the program is released.

You can find registration information at the [AGU Fall Meeting website](#).



MSD Special Issue at Earths' Future



Modeling MultiSector Dynamics to Inform Adaptive Pathways

We are proud to announce that our Community of Practice is leading a [Call for Papers at Earth's Future](#).

Submission Open: 1 October 2020

Submission Deadline: 1 October 2021

Special Section 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)

Special Issue 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.

We would like to encourage the members of our community to submit their contributions to this Special Issue.



Career opportunities

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:

[Assistant/Associate/Full Professor – Climate Equity and Environmental Justice – University of California, Berkeley](#)

Cluster Hire at UC Berkeley in the area of Climate Equity and Environmental Justice. The Cluster Hire includes 5 positions, 4 tenure-track and 1 tenured. Successful candidates will be invited to join one or more of the following units. [Read more ...](#)

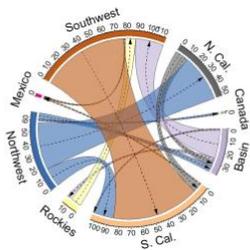
[Climate Resilience Analyst: Energy Systems and Climate Analysis Group \(EPRI\)](#)

We are hiring a Climate Resilience Analyst to join the Energy Systems and Climate Analysis research team at EPRI. [Read more ...](#)

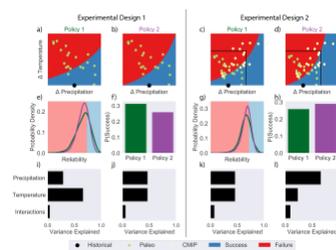
Publications

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.

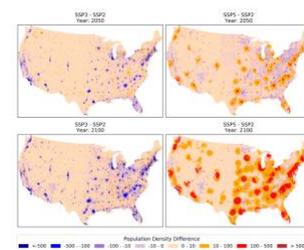
Below you can find some of the publications posted most recently:



[Impact of climate change on water availability and its propagation through the Western U.S. power grid](#)



[Can exploratory modeling of water scarcity vulnerabilities and robustness be scenario neutral?](#)



[U.S. State-level Projections of the Spatial Distribution of Population Consistent with 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.