



Global-Local-Global Analysis of Systems Sustainability

GLASSNET

An International Network of Networks

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GLASSNET

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Message from the Director

Dear GLASSNET Community,

As we enter the second year of this NSF-funded, AccelNet initiative, I want to thank all of those individuals who have given selflessly of their time to advance this important endeavor.

Based on community interest, we have identified a set of GLASSNET use cases, initiated by network members. We will be highlighting this work in a series of workshops this summer during which we will seek to provide community input to these important initiatives taking place in Africa, Latin American and Europe. Another highlight is the upcoming GLASSNET Conference taking place on the Purdue University campus next week. This workshop will produce a set of papers for a special issue of Environmental Research Letters which will clearly outline the potential for Global-to-Local-to-Global Analysis of sustainability challenges. We will also be hosting a short course with this same theme in early May. Please read on to learn about the many other GLASSNET activities under way.

~ Tom Hertel

Use Case Study Winners

"NetZeroPlus – Creating the UK's new Woodlands"

Professor Ian Bateman and Dr. Sabrina Eisenbarth, University of Exeter, UK

The NetZeroPlus (NZ+) project team are delighted to have been selected as a GLASSNET use case project. NetZeroPlus combines natural and social science to demonstrate how to design afforestation in the UK to store carbon (SDG13) and deliver co-benefits for biodiversity (SDG15), water environments (SDG6) and recreation. The project is unusual in having an extremely close association with those senior policy makers in the UK Government charged with the massive expansion in forestry needed to deliver the greenhouse gas removal element of the Government's commitment to achieving 'net zero' greenhouse gas emissions by 2050. The innovative NZ+ Decision Support Tool being developed by the project will be used by the UK Government to guide that expansion of woodland while also helping landowners, farmers and other decision makers, with advice on the most effective places to create new woodlands (and manage existing woodlands). The NZ+ team is delighted to have the opportunity to be a part of GLASSNET, benefit from its expertise in computable general equilibrium (CGE) modelling and integrate into the GTAP user community. UK afforestation is likely to involve use of considerable areas of farmland and this may in turn both change and raise agricultural imports. The production of those imports is likely to increase greenhouse gas emissions abroad. Such offshoring ("leakage") of carbon emissions could undermine the global effectiveness of greenhouse gas removal in the UK. If emissions for agricultural production abroad are higher than in the UK, woodland creation might even increase global greenhouse gas emissions. Understanding carbon leakage is, thus, vital to the project. Collaborating with GLASSNET and world leading experts at Purdue University, NZ+ will use the GTAP-AEZ-GHG CGE trade model to link land use change in the UK to global greenhouse gas leakage via agricultural and forestry imports incorporating the effect of potential changes in UK diet and food technology as well as the effect of climate change on agricultural yields and tree growth.



Image from [Exeter.ac.uk](https://www.exeter.ac.uk)

**Stay tuned for more
information about this
June 2022 workshop!**

Use Case Study Winners

"Averting an Amazon Tipping Point: Viable Policy Options for Brazil"

Dr. Onil Banerjee, Integrated Economic-Environmental Modeling (IEEM) Platform

Dr. Martin Cicowiez, Universidad Nacional La Plata

Climate change and deforestation are changing the composition of Amazon forests and affecting hydrological cycles, pushing the system toward drier conditions, savannization and a potential tipping point after which damage is irreparable. The impacts of these phenomena are multi-scalar, with local, regional and global impacts. The tipping point literature has focused on the ecological and environmental impacts of reaching a tipping point. There is little consensus on what could be the most effective strategies for averting a tipping point and their costs which is critical information for orienting regional and national policy. This use case study builds on our [Amazon Tipping Point paper](#) which was a contribution to the [Dasgupta Review on the Economics of Biodiversity](#). We investigate public policy and investment strategies to avert a tipping point considering the opportunities that state-level political economies in Brazil present. We examine the impacts of these strategies from the perspective of wealth and sustainable economic development, considering economic, environmental and social dimensions, by employing the Integrated Economic-Environmental Modeling (IEEM) framework for Brazil. **To read more about the project, please visit [Open IEEM](#).**

Stay tuned for more
information
about this
July 2022 workshop!



Use Case Study Winners

"Agricultural and Forestry Investments, Land Use Change and Socio-ecological Sustainability Impacts in Southern and Eastern Africa"

Professor Patrick Meyfroidt & Team of the project MIDLAND erc-midland.earth (UCLouvain; Global Land Programme network)

Agriculture and forestry expansion is a major process of land use change, with large human and environmental impacts that occur well beyond the places where this expansion occurs. Much recent land use expansion is concentrated on a few frontier areas where the dynamics are not well captured in global-scale assessments. This use case will build on the data and knowledge that we have accumulated across nested scales, from the globe to pantropical dry forest and woodlands, the Eastern/Southern African region, and Northern Mozambique, to explore scenarios of future agricultural and forestry investments in the region, characterized by different types of investors with different assets, goals and logics, and their impacts on land use change, and socio-economic and environmental dynamics. We can build on several assets including maps of deforestation frontiers and of factors (land resource and agglomeration economies potential) influencing land-related investments, a Bayesian Network model linking investors assets and decision-making logics to probabilities of investing in certain categories of land, remote sensing-based maps of land use and land cover change in Northern Mozambique, and in-depth understanding of investors' logics and dynamics in the region. We look to exchange and collaborate with GLASSNET colleagues interested in contributing to this work, in particular to strengthen and develop our modelling capacity, both in terms of socio-economic as well as environmental and ecosystem services processes. **More details can be found on the MIDLAND project website: <https://erc-midland.earth/>.**

Stay tuned for more
information
about this
August 2022 workshop!



Use Case Study Winners

"Brazilian Agriculture to 2050: Local, National, and Global Scales Implications in Pursuing Further Developments in the Sustainability Path"

Dr. Geraldo Martha, Jr., Empresa Brasileira de Pesquisa Agropecuária (Embrapa)

Brazil's role in world agriculture has been increasingly relevant over the past two decades and it is projected to continue to be relevant in the future. However, understanding the interdisciplinary challenges relevant to the sustainability of Brazilian agriculture toward 2050 is not a trivial task. Scenarios supporting the decision-making process will become more relevant and able to mimic real-world opportunities and challenges when considering a myriad of possibilities, ranging from global to local drivers and impacts, and vice-versa. Ultimately, such multi-scale analysis of sustainability dimensions aims to provide knowledge and insights tailored to specific contexts, and to avoid strategies built on incomplete perspectives that may eventually prove to be inappropriate and/or impractical, leading to negative unintended consequences. The Brazilian Agriculture to 2050 project, as a use case study at GLASSNET, will benefit from a wider set of partners able to strengthen methodological approaches and expand the set of relevant questions that can be addressed, increasing the flow of knowledge and insights to support better informed decisions. Additionally, the project may prove to be an interesting approach to promote human capital formation across the network.



Stay tuned for more
information
about this
September 2022 workshop!

Featured Researchers



Dr. Justin A. Johnson, Assistant Professor of Applied Economics, University of Minnesota

Justin Andrew Johnson received his Ph.D. in 2014 from Applied Economics at the University of Minnesota and his B.A. in economics from St. Olaf College. Justin works closely with the [Natural Capital Project](#) at The Institute on the Environment, University of Minnesota and Stanford University. Justin's research focuses on how the economy affects the environment, and vice versa, on global to local scales. Currently, Justin leads a project that links the [Global Trade Analysis Project \(GTAP\)](#) out of Purdue University with the Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) model from the Natural Capital Project, aiming to build strong quantitative evidence on how changes in ecosystem services affect economic performance at the macroeconomic level and how global policies can be designed to sustainably manage our natural capital. In his spare time, Justin is an avid board game designer.

Dr. Iman Haqiqi, Post-Doctoral Research Associate, Center for Global Trade Analysis, Purdue University

Iman conducts policy-relevant research on the interaction of social and environmental systems addressing major sustainability and resilience challenges regarding international agricultural trade, land use, water resources, and climate change. He studies food security and environmental sustainability employing cutting-edge methods in coupling natural-human systems. The strength of his research is a global-to-local-to-global approach that considers economic feedbacks and local conditions. Recently, he coupled a global Water Balance Model with



a global land-use model and a partial equilibrium trade model to establish an advanced framework in which he explores the consequences of a pandemic like COVID-19 co-occurring with heat and water stress.

Featured Students

Read more about our students on the [GLASSNET site](#)!



Zhan Wang, Graduate Student, Purdue University

Field of specialization: Economic analysis of environment and sustainability, especially the food-land-water nexus.

GLASSNET related research projects: Since 2019, Zhan has been working on research projects of multi-scale analysis on crop-land-water system with the Simplified International Model of agricultural Prices, Land use and the Environment (SIMPLE). His work includes developing gridded model for China and Brazil, and researching impacts from climate change, infrastructure development and conservation policies on food security, land use change and the environment.

These multi-scale studies highlight the importance of integrating both global level drivers and fine-scale level heterogeneity in data, in order to achieve more comprehensive analysis. Findings have been presented at the Annual Conference on Global Economic Analysis and the Agricultural & Applied Economics Association Annual Conference.



Gabriel Leonard, Undergraduate, Purdue University

Major: Economics Honors; **Minors:** Mathematics, Environmental Politics & Policy

GLASSNET-related activities: AGEC 528: Feeding the World Sustainably (as a student, Research Assistant—GLASS Lab, and Grader/Teaching Assistant: AGEC 528.

Plans after graduation: "I've accepted a full time position as a Quantitative Research Assistant for the RAND Corporation in Washington, D.C. From there I could see myself going to grad school, or searching for positions in the government/NGOs. Truthfully, I am still sorting out what direction I'd like to take my career!"



Yolanda Sung, Undergraduate, Purdue University

Major: Supply Chain Analytics; **Minors:** Computer Science & Environmental Science;
Concentration: Business Analytics

GLASSNET-related activities: Currently working with Alfredo Cisneros (postdoc with Dr. Hertel) on the relationship between land use change and biodiversity loss, hopefully going to publish my first paper soon!

Plans after graduation: "I will be a Supply Chain Analyst at 3M working in the facility that deals with the N95 respirators. I'll be getting my Masters; currently, I'm thinking about Agricultural Economics, but not entirely certain."

Classes & Events

GLASSNET Conference; Purdue University (April 7-8)

"Managing the Global Commons: Sustainable Agriculture and Use of the World's Land and Water Resources in the 21st Century"

Ensuring the long-term sustainability of our land and water resources, even as we seek to meet the world economy's growing demands, requires informed management of the complex networks of policies, infrastructure, and technologies that connect the food and resource nexus. In addressing this challenge, a global perspective is required to determine the boundary conditions facing decision-makers as they seek to craft policies to ensure a sustainable economy and planet. Conference goals are: (i) to lead and to learn from other scholars, policymakers, and industry leaders engaged in the analysis of sustainability challenges at global, national, and local scales, and (ii) to identify current challenges in this space and (iii) contribute to the community-driven research agenda being developed under the auspices of the NSF-funded GLASSNET project can tackle these challenges using collaborative, interdisciplinary approaches that are responsive to stakeholder needs. A special issue of Environmental Research Letters has been commissioned to publish papers emerging from this conference. **Read more (and download the program): [GLASSNET Conference](#).**

Simple-G Course (April, online; May, Purdue University)

The training modules are designed to provide an immersive experience that spans geo-spatial data, model code, and software structures to allow participants to examine real policy problems and synthesize quantitative results while enhancing their own intuition.

NEW this year: There were two scholarships available to cover travel costs. To be eligible, applications included a brief statement of interest, and how the applicant intends to use the model in their research.

There are also improved teaching materials (more diversified SIMPLE-G applications, a flexible SIMPLE-G mini model, etc.)

Read more about [Simple-G](#).

MAGPIE22: Held in March 2022

The workshop was preceded by a pre-event on Mar 4th and was based on the MAGPIE tutorials available online and presented by various members of the MAGPIE development team, giving the opportunity to not only get to know the model but also the team behind it. Sessions address different levels of experience from absolute beginners to more experienced MAGPIE users.

More information and course materials are available at: <https://magpiemodel.github.io/>

Partners/Network Classes & Events



GIS for INVEST (online, Natural Capital Project; Stanford)

Dates: Available now

The GIS for InVEST is a video tutorial series that provides step-by-step guidance related to a variety of geographic information system (GIS) topics for working with InVEST models. Each tutorial covers one topic, and each topic is presented in both ArcGIS and QGIS.

The online set of tutorials around InVEST and GIS, are available online here:

<https://naturalcapitalproject.stanford.edu/virtual-training/gis-invest-tutorials>

Natural Capital Project NatCap (online)

Introduction to the Natural Capital Project Approach:

People depend on nature to sustain and fulfill human life, yet the values of nature are typically ignored in decisions. Mapping and modeling ecosystem services can help highlight the diverse benefits provided to people by nature (what and where) and explore how those benefits might change under different management options--thus bringing information about nature's values into decisions in practical ways. With these approaches, we can improve the state of biodiversity and human well-being by motivating greater and more cost-effective investments in both.

This course introduces the Natural Capital Project's (NatCap's) approach to using ecosystem service information to inform decisions. It uses specific examples to illustrate how the approach has worked in each case and highlights key methods and tools used in implementation.

Learn more: <https://www.edx.org/course/introduction-to-the-natural-capital-project-approach>

AccelNet Awardee Updates

Webinar: "Working Together Apart" (February 25th, 2022)



Presenters:

Judith S. Olson & Gary M. Olson from the
University of California, Irvine

"The COVID pandemic has led to a huge uptick in the frequency and scale of groups that are working together while in different physical locations. But such work has been occurring for many decades, and research by us and others have identified the wide range of social and technical issues involved in making such work as effective as possible. Our goal is to share what we have learned about working together apart informed by our understanding of the challenges faced by the AccelNet projects. We hope to be able to respond to the kinds of questions you are all facing as you carry out your projects."

For more information: J.S. Olson & G.M. Olson.

[Working Together Apart: Collaboration over the Internet.](#) Morgan & Claypool, 2014.

NSF AccelNet Annual Awardee Meeting (Virtual, Feb. 2 & 3, 2022)

AccelNet 3rd Annual Awardee Meeting Highlights:

Day 1 - Team Introductions & Cohort Panel

Day 2 - Keynote Speaker – Bruce Currie-Alder, Program Leader, Canada's International Development Research Centre (IDRC)

Day 2 - Panel: Research & Practice on Building and Leading Collaborations

Comprised of:

- [Dr. Dorothy Carter](#), Associate Professor, Industrial-Organizational Psychology, University of Georgia
- [Dr. Joann Keyton](#), Distinguished Professor Emeritus, Communication, North Carolina State University
- [Dr. Deborah DiazGranados](#), Associate Professor, School of Medicine & Affiliate Associate Professor, Psychology, Virginia Commonwealth University



Thoughts from our Purdue Attendees about the AccelNet Awardee Meeting:

The AccelNet annual awardee meetings are an amazing opportunity to learn what is working and what is not working for other networks. For example, I spoke at length with leadership from the NATURA network, learning that their early career travel fellowships started out in a very general way, but they have now focused them more tightly around their working groups. I think the lesson for GLASSNET is that these travel fellowships should be coordinated with our other activities – such as the GLASSNET Use Cases, as well as our working groups. I was also struck by the enthusiasm for early career scholar workshops, run by, and for, early career researchers. I hope we can implement something like this in GLASSNET.

~Tom Hertel

I enjoyed learning how the other networks are bonded together by means of sharing resources and benefiting mutually from the collaboration across disciplines. I was also amazed by the various tools each network adopted to facilitate communication and project management.

~Jing Liu

To me, this is a unique program in that meaningful and effective collaboration is treated as a “first principle”. It is rare, in my experience, for such groups to gather and have focused discussions on how to collaborate better. I was really encouraged by the exchanges through the panels and breakout sessions that we’ve done some things well while also learned about methods and solutions from the other teams to address both short term and longer-term challenges for sustained collaboration.

~Carol Song

I was impressed by the variety of disciplines represented and the expertise that our colleagues brought to bear to advance the UN’s Sustainable Development Goals in the context of global-to-local-to-global. The base of the network is very strong, and in just a few days of discussion, many opportunities came up to branch out to other networks. The ceiling on building this network-of-networks is very high.

~Michael Witt

NETWORK HIGHLIGHTS

Network Highlight: The FABLE Consortium

Since 2017, FABLE has mobilized leading knowledge institutions from over 20 countries and supports them to develop decision-support tools and analysis for integrated long-term food and land-use pathways at the national scale, that are consistent with global objectives SDGs and the Paris Agreement. FABLE has a unique infrastructure to compute local-to-global-to-local consistent pathways of food and land systems, serving as a framework for engaging stakeholders to identify the trade-offs between the different pressures of land, align shorter-term strategies with long-term ambitions, identify key levers of transformation to meet multiple objectives. FABLE promotes the uptake and development of modeling tools by researchers from national research institutes who could more easily interact with and support national decision-makers. All FABLE members participating in joint analysis must comply with standard reporting of key indicators covering both model's parameters and results, which are reported yearly (available and downloadable at scenathon.org). Consortium Members decide which model is best suited to their national context, but the FABLE Secretariat only works on the development of open tools. Currently, three different models are used by the FABLE Consortium members: (1) the FABLE Calculator is available online and specific regional or country versions are produced and shared upon request; (2) the MAgPIE model code, which is available on GitHub; (3) the GLOBIOM model that is shared with members of the FABLE Consortium. Pre-processing and post-processing R codes are on GitHub, but not always with full open access.

Network Highlight: OPEN IEEM

The Integrated Economic-Environmental Model (IEEM) is an economy-wide analytical framework for evidence-based public policy and investment design. IEEM integrates environmental data organized under the System of Environmental-Economic Accounting (SEEA), and coupled with spatial Ecosystem Services Modeling, IEEM+ESM sheds light on policy impacts on the economy as well as on market and non-market ecosystem services. The OPEN IEEM Platform is the portal for all models, capacity building materials and other resources that enable institutions to develop capacity and apply IEEM in their policy processes.

For More Information, visit openieem.iadb.org

