Global-Local-Global Analysis of Systems Sustainability

GLASSNET

An International Network of Networks

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SUSTAINABLE DEVELOPMENT GOALS

The United Nations Sustainable Development Goals (SDGs) describe a global resolve to transform our world across 17 related economic, social, and environment thematic areas. The compelling challenge, however, is the inevitable set of conflicts and tradeoffs among competing SDG demands for poverty reductions, food and energy security, clean water, biodiversity, and climate change mitigation. While local circumstances require fine-scale analyses, market forces and government policies drive global changes that compel macro-level analyses. Equitable and sustainable resource use requires harnessing new data streams and modeling approaches across natural and social science disciplines. The critical need for such analyses in land- and water-related SDGs inspired the international network of networks *Global to Local Analysis of System Sustainability (GLASSNET).*

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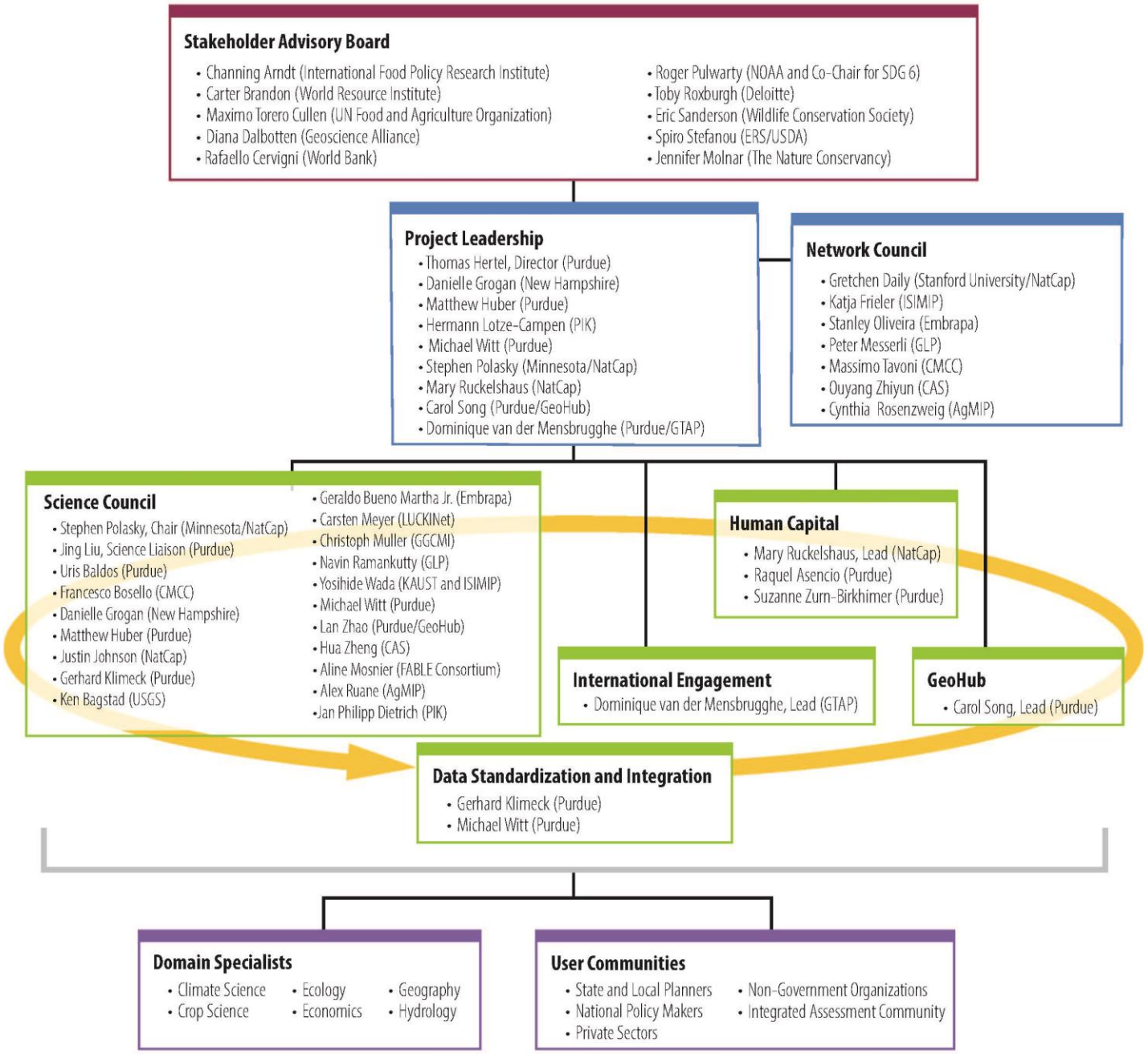
Executive Summary

The global grand challenge posed by the United Nations Sustainable Development Goals (SDGs) remains hindered by an incapacity to chart alternative sustainable pathways and analyze tradeoffs and synergies across local- and global-level policies. This urgent need to link global communities of practice on more than a researcher-to-researcher basis calls for a collaborative infrastructure that is not proprietary or excessively complex, and necessitates a strategy to leverage complementary expertise, integrate cross-disciplinary multiscale data and analyses, and systematically address communication, cultural, and procedural barriers.

The GLASSNET network is a deep integration across scientific teams and research communities undertaking global analyses in an international network of networks supported by the powerful GeoHub global bridging cyberinfrastructure. Three prominent U.S.-based networks (Global Trade Analysis Project (*GTAP*), Natural Capital Project (*NatCap*), and the Consortium of Universities for the Advancement of Hydrologic Science Inc (*CUAHSI*) are partnering with eight vibrant networks: Global Gridded Crop Model Intercomparison (*GGCMI*), *GlobEcon*, the Inter-Sectoral Impact Model Intercomparison Project (*ISIMIP*), Global Land Programme (*GLP*), Land Use Change Knowledge Integration Network (*LUCKINet*), Artificial Intelligence for Environment and Sustainability (*ARIES*), the Agricultural Model Intercomparison and Improvement Project (*AgMIP*), and The Food, Agriculture, Biodiversity, Land-Use, and Energy (*FABLE*) Consortium to:

GLASSNET is building a shared vision, harmonizing data, deploying modeling tools, developing innovative training for diverse participants, testing workflows to analyze tradeoffs and synergies across SDGs, implementing sustainability plans, and disseminating network of networks convergence best practices.

GLASSNET Organizational Structure



Goals and Accomplishments

Provide transformative analysis for public and private investments for sustainability

Major Activities

In an effort to provide transformative global-local-global analysis of sustainability investments, we hosted a ***GLASSNET conference at Purdue University*** in the first week of April, 2022. Fifty participants were organized into six panels, each covering a key sustainability challenge. The first day involved two dozen short presentations by participants, combined with discussions across and within panels. On the second day, participants outlined review papers on each of these topics, building on meetings held in the months before the conference. The conference concluded with short overviews of the special issue papers, presented by lead authors.

In late 2021, we solicited ***GLASSNET Use Case proposals*** from the community. Of the six proposals submitted, three were approved and we proceeded to work with the Use Case Leads to schedule workshops for the summer of 2022. Topics were selected to provide geographic and topical diversity and included:

- ***The UK netzero afforestation initiative*** - Chair: Carter Brandon (WRI and SAB); Speakers: Sabrina Eisenbarth (U.Exeter), Ian Bateman (U.Exeter); Discussants: Maksym Chepeliev (GTAP), Aline Mosnier (FABLE), Christoph Mueller (GGCMI), Stephen Polasky (NatCAP)

- ***Land use change in Southern Africa*** - Chair: Channing Arndt (IFPRI and SAB); Speakers: Channing Arndt, Patrick Meyfroidt (GLP), Dilini Abeygunawardane (GLP), Cristina Chiarella (GLP); Discussants: Carston Meyer (LUCKiNET), Natasha Ribeiro (Mozambique), Rui Benfica (IFPRI), Justin Johnson (NatCap)

- ***Protecting the Amazon rainforest*** - Chair: Carter Brandon (WRI and SAB); Speakers: Onil Banerjee (RMGO Consultants), Ziga Malek (GLP), Marcia N. Macedo (Woodwell Center); Discussants: Angelo Gurgel (GTAP), Aline Soterroni (FABLE), Mateus Batistella (Embrapa)

In addition, we organized a ***town hall and a scientific session at the annual meetings of the American Geophysical Union (AGU)***, held in Chicago in December, 2022. This included 4 oral papers and 11 posters.

Specific Objectives

Provide transformative analysis: Provide transformative global-local-global analysis of sustainability investments through hosting events like GLASSNET conference and GLASSNET use case workshops, and through organizing sessions at professional meetings

Significant Results

The GLASSNET conference held in April 2022 led to a set of papers that are currently in review with *Environmental Research Letters* with the final paper comprising an overview of the special issue. This special issue will help to build out the intellectual foundations for GLASSNET and will be published in 2023. It covers topics linked to sustainable agriculture and use of the world's land and water resources in the 21st century, including climate change, sustainable use of water, cyberinfrastructure for sustainability science, and biodiversity. Some of these papers have already been published online: https://iopscience.iop.org/journal/1748-9326/page/Managing_the_Global_Commons

The three Use Case Workshop Series provided broader perspectives on sustainability challenges. They drew in GLASSNET scholars from different backgrounds, disciplines, and networks to enrich the resulting use case and identify potential linkages with related work within the broader GLASSNET community. The workshops were held in June, August and October. They were held virtually and lasted for two hours. During the first hour, the scientists presented their research, while in the second hour a select group of discussants (three or four), provided feedback from a variety of GLASSNET perspectives (each from a different network). Discussants (and session Chairs) were selected to bring broader perspectives to the Use Case. For example, in the UK net zero use case, trade economists from the GTAP community highlighted the importance of international trade and spillovers. Subsequently, the UK team has subcontracted work in

this area to two trade economists. In the Southern Africa case study, discussants highlighted the need for an ecological perspective and plans were made for jointly pursuing funding in this area.

The success of the 2022 use case series approved the opening a new call for GLASSNET Use Cases in 2023. One significant change from 2022 is that we are now requiring participation from at least two different networks, in order to encourage cross-network collaboration.

Develop human capital for SDG advancement and sustainability

Major Activities

Develop human capital: The Early Career Researcher (ECR) subcommittee of the GLASSNET Leadership Group, comprising Danielle Grogan, Jing Liu and Justin Johnson, conceived and implemented a series of ECR workshops focusing on funding and managing international, interdisciplinary and inclusive research projects. The first workshop, held in September and chaired by Dr. Danielle Grogan, was attended by 32 participants, including three prominent women scientists who spoke to questions related to obtaining such grants as well as ensuring they are inclusive. Special attention was devoted to engaging with indigenous populations. The second ECR workshop focused on organization and leadership of these grants. Dr. Jing Liu chaired this workshop, which took place in November and featured three leading scientists and included 18 participants. The final workshop in this series, to be held in spring 2023, will feature presentations by ECR's from the network. The most outstanding proposal selected will be provided support for the ECR to travel to visit one of the GLASSNET member networks in support of their interdisciplinary, international research.

Specific Objectives

Develop human capital: Train the next generation of interdisciplinary researchers to assess and attain SGDs related to land and water resources. This objective was attained by offering short course and interactive information-oriented workshops to the GLASSNET members. Opportunities were also provided to the ECRs for them to teach, lead GLASSNET events, and participate in professional meetings.

Significant Results

In inviting the papers for the special issue of ERL, a concerted effort was made to recruit ECR lead authors. As a result, 10 of the 13 submissions were led by early career scientists. We also brought to the conference an ECR ecologist from India, Abhishek Chaudhary, who is working on biodiversity and international trade in collaboration with several US-based ECRs who bring a trade perspective. This has resulted in an ECR-led draft paper (not included in the special issue) due for submission by the end of the year. This paper also formed the basis for an ECR-led poster presentation at the AGU meetings.

In an effort to broaden the use of the SIMPLE-G modeling framework which is being widely employed for global-local-global analysis of sustainability (four of the papers in the ERL special issue mentioned above employ this framework), we held a SIMPLE-G short course in April/May of this year. This consisted of four weeks of on-line training, delivered through MyGeoHub, and then one week of in-person training at Purdue University. Eight ECRs and five senior researchers participated in this course. Three of the ECR participants were supported by GLASSNET travel scholarships – two females and one male – from collaborating institutions in Italy, Brazil and the US. Participants replicated a state-of-the-art SIMPLE-G application, followed by an extension of their own choosing. This has led to project proposals for further development of SIMPLE-G in Italy and Brazil.

Finally, four of the GLASSNET posters at the AGU meetings were led by ECRs. In addition, GLASSNET post-doc Alfredo Cisneros Pineda has been mentoring a young scholar, Yolanda Sung, who completed her undergraduate degree in Management Science at Purdue in May. She is now working for the 3M Corporation on sustainable supply chains. She has an interest in furthering her career in research and she presented a poster at the AGU meetings. This was her first time participating in a scientific meeting.

Integrate networks into network of networks to accelerate innovation

Major Activities

Integrate Networks: In October 2022, the Natural Capital Project combined efforts with the Stockholm Resilience Center (SRC) to hold a week-long meeting in Stockholm to facilitate integrative analysis of global sustainability challenges. As part of that meeting, GLASSNET Co-PI, Stephen Polasky, coordinated a workshop focused on linking models from NatCap (InVEST), GTAP (GTAP and SIMPLE-G) and PIK-based (MAgPIE) networks. This resulted in a draft paper and proposal to deepen the linkages between scientists from these different networks and their capability to address biodiversity challenges. A closely related working group involving NatCap, GTAP and SRC also worked on a proposal to the NSF DISES program. This proposal is being led by an ERC – Rebecca Chaplin-Kramer from the NatCap Project/University of Minnesota. GLASSNET Co-PI Polasky has played a key mentoring role in this proposal, along with GLASSNET PI Hertel.

In the fall of 2022, PI Hertel organized a virtual meeting between Co-PI Danielle Grogan and leaders from the ISIMIP network focusing on hydrological modeling with an emphasis on groundwater sustainability. As a result of this contact, Dr. Grogan will be participating in the 2023 ISIMIP Conference in Prague, with support from GLASSNET. She will be the first US representative actively participating in this EU-funded, groundwater model intercomparison (Dr. Grogan will be using the UNH-based WBM model). She is also planning a follow-on conference and workshop in the US.

Specific Objectives

Integrate Networks: Consolidate resources within existing GLASSNET members and extend the network to new members.

Significant Results

We added a new network to GLASSNET. AgMIP/Columbia University, led by Cynthia Rozenzweig and Alex Ruane have now joined our network of networks. They already work closely with two of our network members (GGCMI and GlobEcon). By adding AgMIP "Central" we will strengthen our ties to the Global South and also tap into participation in the annual AgMIP meetings, to be held in New York City in June of 2023. We plan to hold a GLASSNET session at these meetings.

In addition, through PI Hertel's sabbatical at PIK, GLASSNET ties with the three PIK-based networks were significantly strengthened with several new collaborative research projects and ECR exchanges planned for the coming year.
Finally, PI Hertel has been serving on the Advisory Board for the newly formed FABLE Consortium. FABLE is one of the most recent networks to join GLASSNET and they have been seeking advice on how to strengthen their nearly formed consortium.

Part of the challenge in integrating networks is having an overview of the emerging network of networks such that one can identify key gaps as well as new strengths. In order to facilitate such an overview, GLASSNET scientist, Michael Witt, developed a prototype tool for mapping the network – both in terms of individual collaboration, as well as topical focus. A preliminary analysis of GLASSNET based on data from year one of the project revealed important gaps and opportunities for network expansion. With encouragement from NSF-AccelNet leadership, Professor Witt has collaborated with the MultiNet team at Indiana University (another AcceNet awardee) to develop a proposal to the AccelNet program to further develop this idea. This proposal has been funded and it will result in a series of three workshops, to be held in early 2023, for AccelNet members from a dozen different projects. These workshops will cover both technical aspects of network graphing, as well as strategic applications by AccelNet leadership teams.

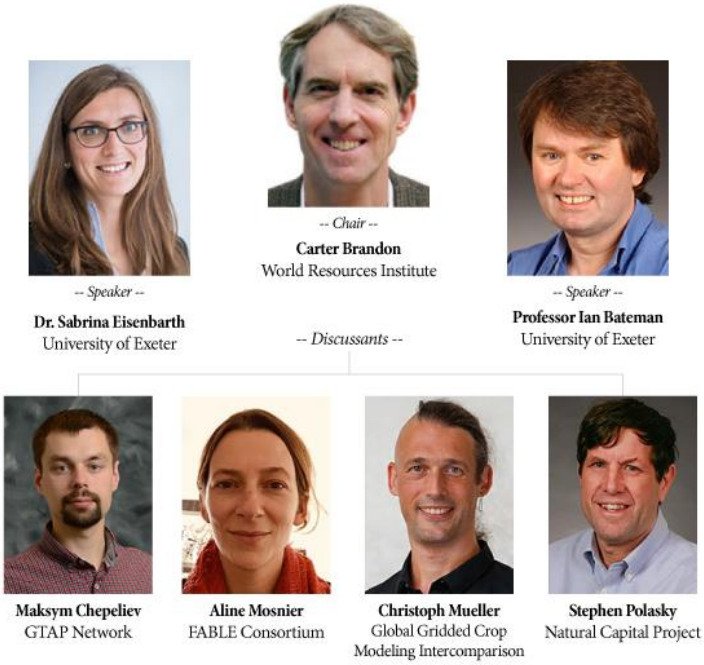
Activities

Use Case Workshops

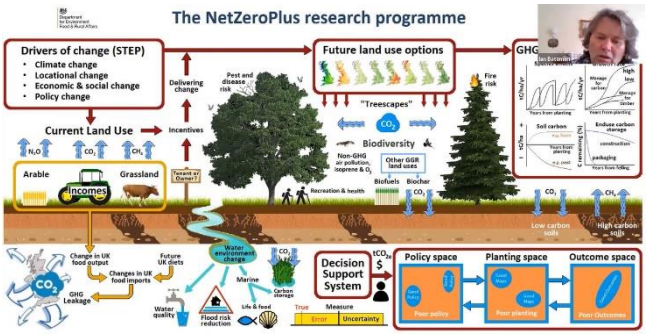
The goal of the Use Case Workshop Series is to provide a broader perspective on sustainability challenges, drawing in GLASSNET scholars from different backgrounds, disciplines, and networks to enrich the resulting use case and identify potential linkages with related work within the broader GLASSNET community.

Net Zero Plus - Creating the UK's New Woodlands

June 21, 2022



The Net Zero Plus (NZ+) project 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 expected to make 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.



Agricultural and forestry investments, land use change and socio-ecological sustainability impacts in Southern and Eastern Africa

August 2, 2022

-- Chair --
Channing Arndt
Director, Environment and Production Technology Division
International Food Policy Research Institute

-- Speaker --
Patrick Meyfroidt
Professor
UCLouvain

-- Speaker --
Dilini Abeygunawardane
Research Associate
Leibniz Institute of Agricultural Development in Transition Economies

-- Speaker --
Cristina Chiarella
Post-doctoral Researcher
UCLouvain

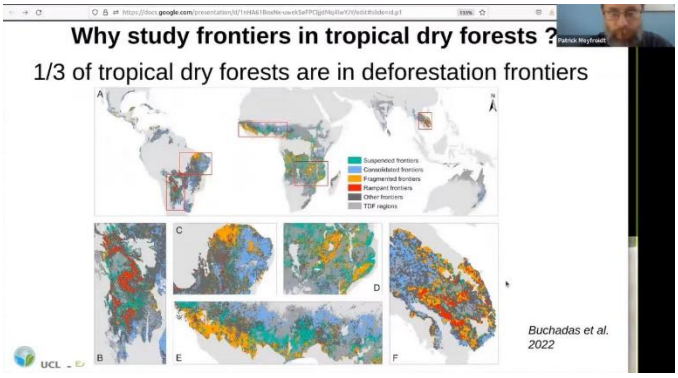
-- Discussant --
Carston Meyer
Head of Junior Research Group
German Centre for Integrative Biodiversity Research

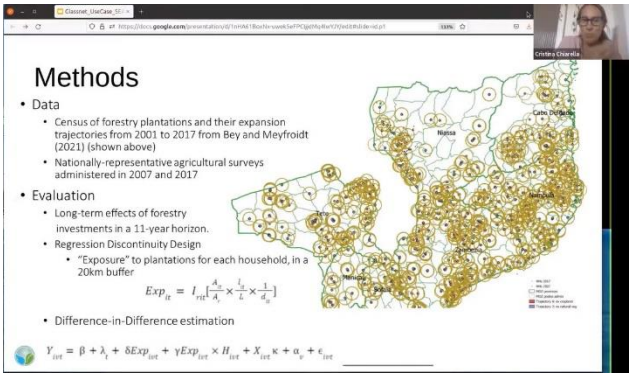
-- Discussant --
Natasha Ribeiro
Associate Professor
Universidade Eduardo Mondlane

-- Discussant --
Rui Benfica
Senior Research Fellow
International Food Policy Research Institute

-- Discussant --
Justin Johnson
Assistant Professor
Universtiy of Minnesota

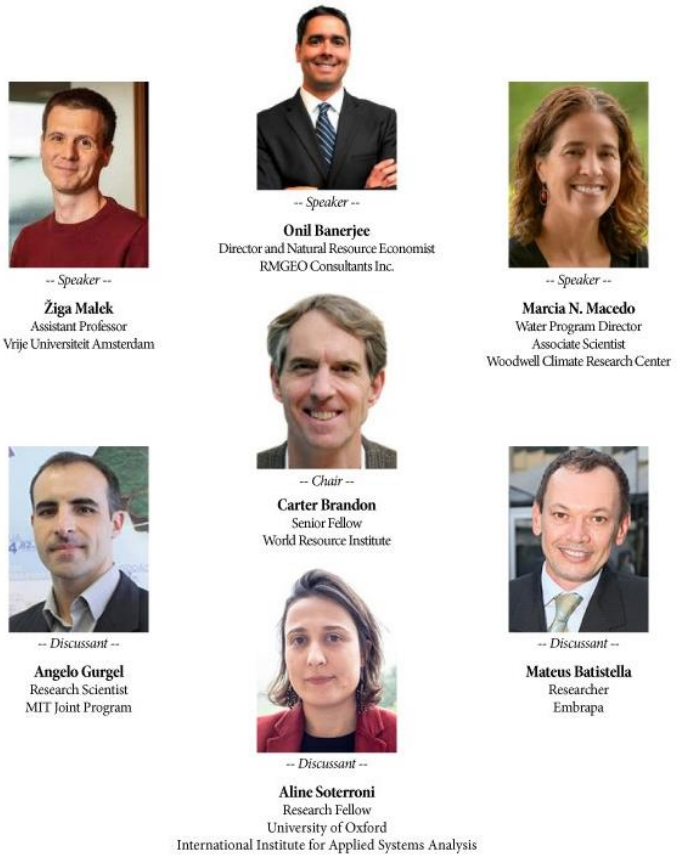
This use case builds on the knowledge we have accumulated across nested scales, from global to pantropical dry forest and woodlands, the Eastern/Southern African region, and Northern Mozambique, to build distinct scenarios of future agricultural and forestry investments in the region, characterized by different types of investors with different assets, goals and logics and build on the Bayesian Network model that we developed to turn these investment scenarios into scenarios of land use change at the scale of the region. These scenarios can be further downscaled within Northern Mozambique to investigate detailed land use change and impacts. The cross-scale assets on which we build include in particular a global characterization of frontiers as places with excess agricultural expansion compared to standard land rent predictions, a pan-tropical map and typology of deforestation frontiers covering all dry tropical forests and woodlands, a typology of lands into categories of frontiers or more settled regions, a Bayesian Network model linking investors assets and decision-making logics to probabilities of investing in certain categories of land, and at the more detailed scale, time series of land use maps for Northern Mozambique.



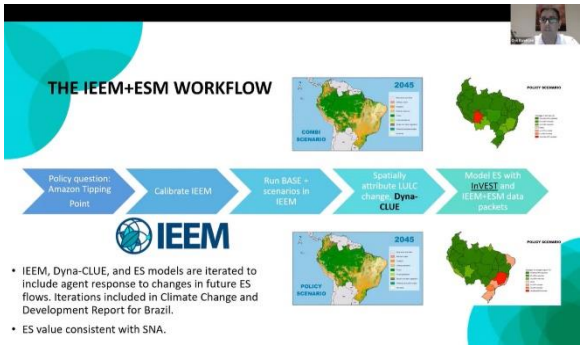


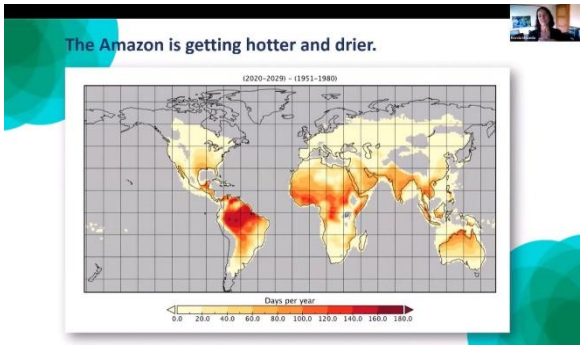
Land Use Land Cover Change Modeling for Integrated Economic-Environmental Analysis: An Application to the Amazon Region

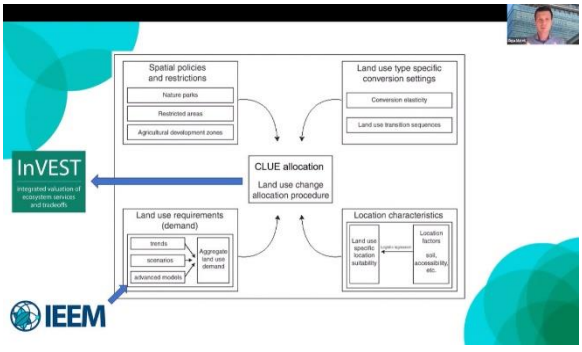
October 12, 2022



The Amazon biome, despite its resilience, is being pushed by unsustainable economic drivers towards an ecological tipping point where restoration to its previous state may no longer possible. This is the result of self-reinforcing interactions between deforestation, climate change and fire. In this paper, we develop scenarios that represent movement towards an Amazon tipping point and strategies to avert one. We assess the economic, natural capital and ecosystem services impacts of these scenarios using the Integrated Economic-Environmental Modeling (IEEM) Platform linked with high resolution spatial land use land cover change and ecosystem services modeling (IEEM+ESM). This paper's main contributions are developing: (i) a framework for evaluating strategies to avert an Amazon tipping point based on their relative costs, benefits and trade-offs, and; (ii) a first approximation of the economic, natural capital and ecosystem services impacts of movement towards an Amazon tipping point, and evidence to build the economic case for strategies to avert it. We find that a conservative estimate of the cumulative regional cost through 2050 of an Amazon tipping point would be US$256.6 billion in Gross Domestic Product. Policies that would contribute to averting a tipping point, including strongly reducing deforestation, investing in climate-adapted agriculture, and improving fire management, would generate approximately US$339.3 billion in additional wealth. From a public investment perspective, the returns to implementing strategies for averting a tipping point would be US$29.5 billion. Quantifying the costs, benefits and trade-offs of policies to avert a tipping point in a transparent and replicable manner can pave the way for evidence-based approaches to support policy action focusing on the design of regional strategies for the Amazon biome and catalyze global cooperation and financing to enable their implementation.







Early Career Researcher Workshops

As a network of researchers, GLASSNET can help connect researchers with diverse expertise across a wide range of disciplines, data holdings, and experience. These connections help researchers more quickly tackle the interdisciplinary challenges that arise in SDG research.

Workshop 1: Proposal Success

September 21, 2022

Obtaining funding is an essential part of academic work for most researchers. In the first of three workshops, Proposal Success, we heard from a panel of experts on how to obtain funding for research that is interdisciplinary, international, and inclusive.

Dr. Karen Fisher-Vanden
Penn State University

Dr. Nancy Searby
NASA

Dr. Suzanne Zurn-Brikhimer
Purdue University

Dr. Danielle Grogan
University of New Hampshire

Workshop 2: Developing Successful Interdisciplinary Research

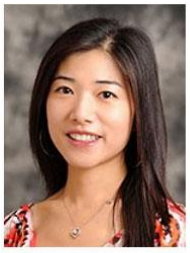
November 7, 2022

Interdisciplinary research collaborations hold great promises for disentangling the complex sustainability challenges facing the world today. What knowledge and practices foster innovative and effective interdisciplinary endeavors? How can one best to empower present and future generations of interdisciplinary researchers? This workshop invited early career scholars to engage with a panel of experts who shared their experience and practical advice on the leadership of interdisciplinary research projects, as well as discussing opportunities and challenges.

Dr. Catherine Kling
Cornell University

Dr. Alex Ruane
NASA Goddard Institute

Dr. Ben Gramig
USDA ERS



Dr. Jing Liu
Purdue University

SIMPLE-G Short Courses

The security of food, energy, and water is interwoven with human, economic, and environmental sustainability. This recognition suggests that decision-making for sustainability could benefit from a nexus approach that integrates resources across sectors and scales. The short course is designed to provide students comprehensive training in the equilibrium modeling tools for economic as well as interdisciplinary analysis of sustainability issues across local, national, and global scales. The training modules are designed to provide an immersive experience that spans geospatial data, model code, and software structures to allow participants to examine real policy problems and synthesize quantitative results while enhancing their own intuition.

2022 Multi-Scale Analysis of Sustainability SIMPLE-G Short Course

April 4 – May 6, 2022

The 2022 SIMPLE-G Short Course was held at Purdue University. Thirteen participants from the US, Europe, Australia, and Brazil completed four weeks of online learning, followed by one week of in-person training to learn the SIMPLE and SIMPLE-G models. SIMPLE-G is a multi-scale framework used for evaluation of sustainability policies in a global context while factoring in local heterogeneity in land and water resources, as well as natural ecosystem services.

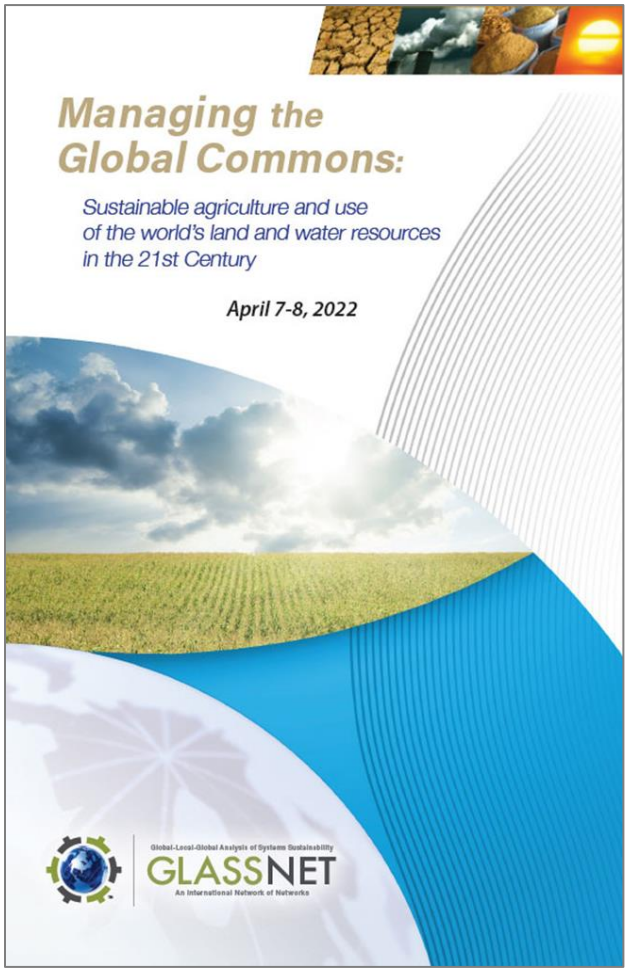
Eight course participants were early career researchers from the US, Italy, Brazil, and the Netherlands. The Italian participant successfully secured funds to develop a SIMPLE-G-Italy model for assessing the SDGs linked to land and water resources. The Brazilian participant is leading an extended version of the SIMPLE-G-Brazil model to incorporate pasture land and livestock industry to the model. A paper using this model will be submitted to a GLASSNET organized session at the 2023 GTAP Conference in Bordeaux, France.

GLASSNET Conference

Scientists and policy makers gathered at Purdue University for a conference on Managing the Global Commons: Sustainable Agriculture and the use of the World's Land and Water Resources to discuss potential solutions to the global sustainability challenges facing agriculture in the 21st century. The conference was sponsored by Purdue University's Provost Committee on Reputational Stewardship and USDA-NIFA. Presented papers will be published in an issue of Environmental Research Letters.

Managing the Global Commons: Sustainable Agriculture and use of the World's Land and Water Resources
April 7-8, 2022

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. The goals of the conference were: to lead and to learn from other scholars, policymakers, and industry leaders engaged in analysis of sustainability challenges at global, national and local scales, identify current challenges in this space, and develop a community-driven research agenda for the next 5 years that tackles those challenges using collaborative, interdisciplinary approaches that are responsive to stakeholder needs.



Annual Meetings

GLASSNET researchers actively attended numerous annual meetings in support of the overall project.

NSF-AccelNet Annual Meeting

December 2022

At the NSF-AccelNet annual meeting in Washington, D.C., two GLASSNET scientists made presentations based on work they have been doing in the context of our AccelNet Project. This included a panel presentation by Danielle Grogan on the GLASSNET Use Case Workshops, and a presentation by Michael Witt on his network graph analysis of the GLASSNET network of networks. Earlier in the year, PI Hertel made a presentation to the virtual AccelNet awardee meeting titled: "A bottom-up approach to identifying key knowledge/coordination gaps in a network of networks".

AGU Fall Meeting - GLASSNET Early Career Researcher Presentations

December 12-16, 2022

Five early career researchers (ECR) presented posters and oral presentations of their work at the AGU meeting. Iman Haqiqi chaired two sessions at these meetings. Presenting at and participating in these professional meetings provided them with valuable networking opportunities. The ECRs shared many useful resources and potential collaborative opportunities that they discovered during the conference in their briefing. Of special note is the mentorship by GLASSNET post-doc, Alfredo Cisneros Pineda, of a young scholar, Yolanda Sung, who recently received her Bachelors' degree from Purdue University. She is working in the private sector on sustainable supply chains and collaborated on a poster which she presented at the AGU meetings. This was her first opportunity to be involved in a scientific meeting.

Experiences from AGU

Yolanda Sung
3M Corporation

"I thought that the session was quite enjoyable, and it was exciting to see that our research could be applied extensively in other fields."

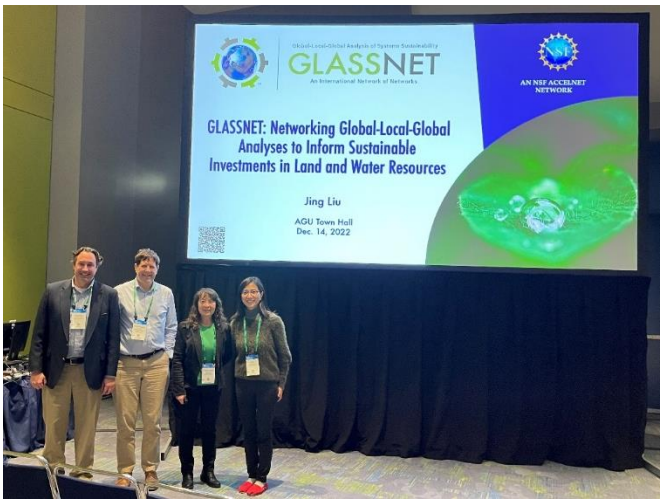
Zhan Wang
PhD Student, Purdue University

"With research interests on food-land-environment nexus with fine-scale economic modeling, I regarded the AGU Fall Meeting as a valuable opportunity to communicate with researchers on climate and land system and discuss new ideas from the intersection of earth science and economic studies."

AGU Fall Meeting - GLASSNET Town Hall Meeting

December 12-16, 2022

GLASSNET organized an AGU Town Hall focused on “Networking global to local to global analysis to inform sustainable investment in land and water resources”. The first half of the session started with an overview of the GLASSNET network, its mission and how it functions by the organizer Jing Liu (ECR). Then Co-PI Stephen Polasky talked about the importance of global-local connections in modeling integrated socio-economic-ecological systems, followed by Carol Song who spoke to how cyberinfrastructure can be an enabler for sustainability science and how it's being employed in our network of networks. Finally, speaker Michael Witt used GLASSNET as an example to illustrate how a network graphing approach can help understand networks. The second half of the session allowed for questions and discussion.



Other Achievements and Outcomes

Key Accomplishments

The list below details a number of key accomplishments by GLASS researchers during the past year.

GLASSNET Growth

As of the end of 2022, GLASSNET had 157 subscribed members and was comprised of 11 networks spanning three continents and 3 testbeds, which are institutions engaged in joint research, training, and outreach. GLASSNET also added AgMIP-Columbia University to its network of networks, which complements two closely related networks in GLASSNET, GlobEcon and GGCMI, which cover global modeling of the economy and crops, respectively.

InVEST on the GeoHub

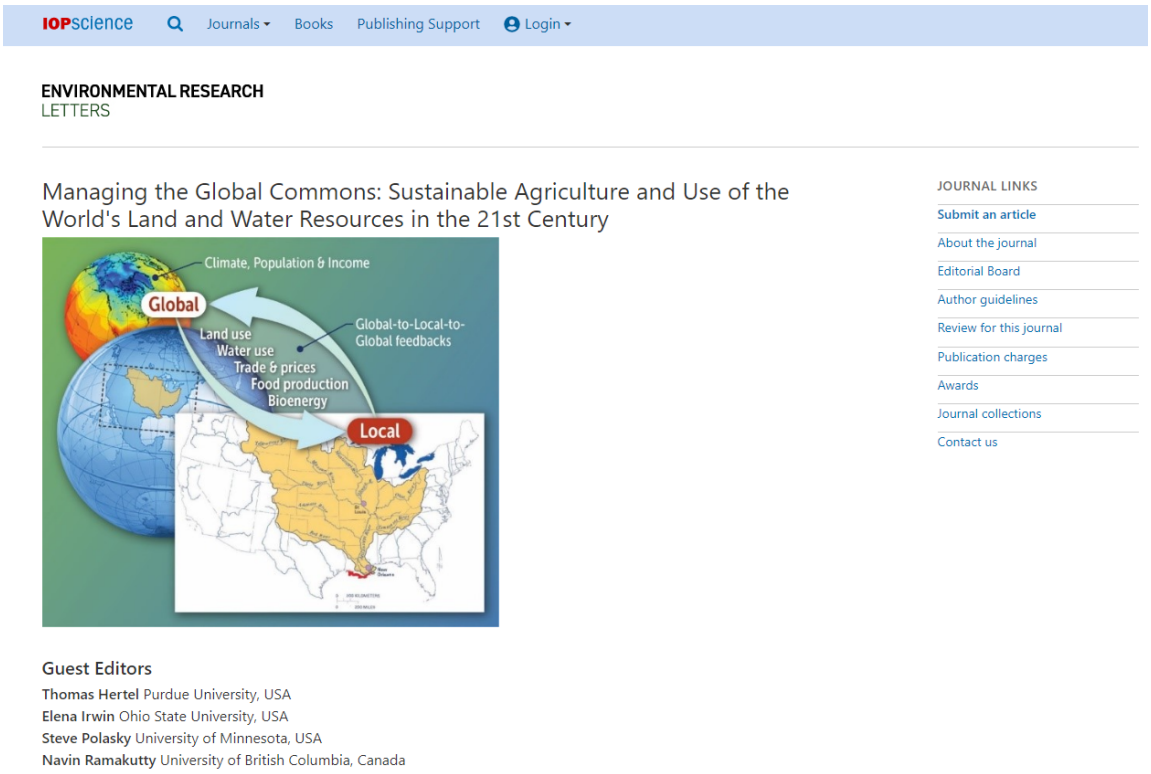
Software engineers from Purdue and NatCap-Stanford worked together to make the InVEST suite of ecosystem services models, developed by the NatCap network, available on the GeoHub. To date this has been done through interactive Jupyter notebook sessions and as a processor in the Purdue team's GeoEDF framework, which opens up access to InVEST to researchers using the GeoHub as well as other HPC systems. Future work will include releasing InVEST as an interactive tool on the GeoHub, creating an interactive demonstration of a case study in Ghana, and developing a clearer, more formal integration between InVEST and GTAP. Building on this close linkage between the GTAP and NatCap networks, members of GTAP and the Natural Capital Project worked to integrate the GTAP and InVEST models to show how projected growth in economic activity through time leads to declining levels of ecosystem services that in turn cause reductions in the value of economic activity. This work also analyzed policies to conserve natural capital, which analysis showed was effective in reducing losses in the value of economic activity. This work led to the World Bank publication of The Economic Case for Nature. This report has generated additional interest spawning additional collaborations with private and public sectors, including the OECD, the central banks of Chile, Mexico, and Hungary and several investment and consulting firms. It has also generated popular interest and was picked up by 10 different mainstream media outlets. This work has also led to a paper entitled "Investing in nature can improve equity and economic returns" that is currently in review with PNAS. The integration of the GTAP and InVEST models and analysis that led to World Bank Report entitled: "The Economic Case for Nature", funded by the World Bank and WWF, has continued and expanded under GLASSNET with special attention devoted to outreach led, by Co-PI Polasky and ECR Justin Johnson. This work has been widely disseminated to relevant communities and has generated considerable interests from these communities for future engagements. From late 2021 through 2022, this work was presented at meetings sponsored by the Federal Reserve Board in the US, the Central Banks of Mexico, Chile, and Hungary, the Financial Times Digital Dialogs, a joint US National Academy of Sciences - UK Royal Society Meeting on Bringing Natural Capital into Decision-making, as well as at other academic meetings and meetings with other financial institutions. Additionally, the work was highlighted in the UN Biodiversity COP15 in Montreal as an example of how countries can identify effective yet equitable ways of protecting nature. Additionally, Co-PI Polasky is working with the Intergovernmental Science Policy Platform on Biodiversity and Ecosystem Services (IPBES) which is launching This should include discussion of Biodiversity for Business assessment in 2023, for which the modeling work of GLASSNET will provide valuable scientific input.

Testbed Coordination

GLASSNET Science Coordinator, Jing Liu, has been coordinating a set of research activities with GLASSNET 'test bed' Embrapa, based in Brazil. Together with GLASSNET Science Council member, Geraldo Martha and GLASSNET members Cicero de Lima and Zhan Wang, they have made great headway developing SIMPLE-G-Brazil and applying this framework to a range of sustainability issues in Brazil. In addition, Dr. Martha is currently leading a project in Brazil, the PRS-Cerrado, funded by DEFRA and IDB, that is funding further development of SIMPLE-G-Brazil. In addition, Dr. Martha has proposed a course, to be taught at UNICAMP in Brazil, modeled after PI Hertel's Global Sustainability Course at Purdue University.

Environmental Research Letters

A special issue of *Environmental Research Letters* on global-local-global analysis of sustainability was initiated with 13 articles submitted, 10 of which were led by early career researchers.



https://iopscience.iop.org/journal/1748-9326/page/Managing_the_Global_Commons

Integration of Modeling Tools

This integration was achieved with support from GeoHub/IT collaborators. Specifically, it involved containerization of the SIMPLE-G and WBM models, providing the capability to run them together. Two GLASSNET core modeling groups, the WBM hydrology team and the SIMPLE-G agricultural economics team, designed and implemented a cyberinfrastructure system for bringing the two disciplinary models together, called C3F: A Collaborative Container-based Model Coupling Framework. In building C3F, researchers identified challenges and limiting steps to coupled model development and deployment, including: (1) the two models were run on different operating systems and rely on different software dependencies; (2) large volumes of data need to be processed, re-formatted, and passed between the two high-resolution gridded models, and (3) challenges 1 and 2 had to be solved before the domain scientists could test key multi-model design questions. Further, both models are actively under development, and rely on large, diverse input datasets with version updates; this combination creates reproducibility obstacles, a common and pressing issue. C3F overcomes these challenges by creating a common and collaborative modeling environment using advanced CI including ACCESS Anvil HPC resources and virtual containers. We used MyGeoHub for team communication, and to document our work, including Wiki “how-to” pages on building virtual containers and submitting jobs to ACCESS Anvil to run the coupled model system.

Researcher Highlights

GLASSNET Researchers

GLASSNET prepares the next generation of researchers to engage in and lead international sustainability team science by leveraging network best practices for human capital development.

Iman Haqiqi is a Research Economist at Center for Global Trade Analysis at Purdue University. He 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.

Tom Hertel was awarded one of the 2022 Alexander von Humboldt Research Prizes to support his sabbatical in Germany where he was a visiting scientist at the Potsdam Institute for Climate Change Research (PIK), hosted by GLASSNET Science Advisory Board member, Hermann Lotze-Campen. One important goal of Hertel's sabbatical was to strengthen ties between the US-based networks in GLASSNET with those based in Germany, while also seeking to facilitate early career researcher exchanges between network members and institutions in Europe and those in the US.

Danielle Grogan is taking a leadership role within GLASSNET. She has established a new collaboration between the University of New Hampshire water systems analysis group, and the ISIMIP network in Europe, building on the link PI Hertel established to ISIMIP's home institution PIK in Germany. As a result of this contact, University of New Hampshire researchers will be attending the upcoming ISIMIP protocol conference in June 2023, and have committed to contributing model output to the newly-formed ISIMIP global groundwater modeling project. Danielle Grogan also represented GLASSNET Leadership at the December 2022 annual AccelNet PI Meeting, presenting in the first cohort panel.

Justin Johnson traveled to Leipzig, Germany to work with GLASSNET colleagues from PIK (Potsdam Institute for Climate Impact Research) aiming to improve model integration code between climate, economic, land-use change and ecosystem service models. Justin also attended a working group there with iDIV (German Centre for Integrative Biodiversity Research) that was tasked with writing a synthesis piece about how global and local models can be integrated to improve ecosystem service policy analysis.

Steve Polasky worked with ECR Rebecca Chaplin-Kramer (PI for the DISES proposal) to support a proposal to the NSF-DISES program, leveraging the GTAP-InVEST modeling approach to address global sustainability challenges. If funded, this will allow for deepening of this cross-network collaboration between the GTAP and NatCap communities.

Products

Advance & Accelerate Knowledge

Through GLASSNET's national and international partnerships, we will deliver comprehensive SDG insights to stakeholders.

Books

- Johnson, Justin Andrew; Ruta, Giovanni; Baldos, Uris; Cervigni, Raffaello; Chonabayashi, Shun; Corong, Erwin; Gavryliuk, Olga; Gerber, James; Hertel, Thomas; Nootenboom, Christopher; Polasky, Stephen (2021). *The Economic Case for Nature: A Global Earth-Economy Model to Assess Development Policy Pathways* World Bank.

Book Chapters

- Hamann, M., Johnson, J. A., Chaigneau, T., Chaplin-Kramer, R., Mandle, L., & Rieb, J. T. (2021). Ecosystem service modeling. *Routledge Handbook of Research Methods for Social-Ecological Systems* Routledge. 426.

Journals or Juried Conference Papers

- Busch, Jonah and Amarjargal, Oyut and Taheripour, Farzad and Austin, Kemen G. and Siregar, Rizki Nauli and Koenig, Kellee and Hertel, Thomas W.. (2022). Effects of demand-side restrictions on high-deforestation palm oil in Europe on deforestation and emissions in Indonesia. *Environmental Research Letters*. 17 (1) Article No. 014035.

- Golub, Alla and Sohngen, Brent and Cai, Yongyang and Kim, John and Hertel, Thomas. (2022). Costs of forest carbon sequestration in the presence of climate change impacts. *Environmental Research Letters*. 17(10) Article No. 104011.

- Haqiqi, Iman and Perry, Chris J. and Hertel, Thomas W. (2022). When the virtual water runs out: local and global responses to addressing unsustainable groundwater consumption. *Water International*. 47(7) 1060 to 1084.

- Saeed, W. and Haqiqi, I. and Kong, Q. and Huber, M. and Buzan, J. R. and Chonabayashi, S. and Motohashi, K. and Hertel, T. W. (2022). The Poverty Impacts of Labor Heat Stress in West Africa Under a Warming Climate. *Earth's Future*. 10(11).

- Nóia Júnior, Rogério de and Ewert, Frank and Webber, Heidi and Martre, Pierre and Hertel, Thomas W. and van Ittersum, Martin K. and Asseng, Senthold. (2022). Needed global wheat stock and crop management in response to the war in Ukraine. *Global Food Security*. 35 (C) 100662.

- Kabir, Kayenat and Baldos, Uris Lantz and Hertel, Thomas W. (2022). The new Malthusian challenge in the Sahel: prospects for improving food security in Niger. *Food Security*.

- Woo, Jungha and Zhao, Lan and Grogan, Danielle S. and Haqiqi, Iman and Lammers, Richard and Song, Carol X. (2022). C3F: Collaborative Container-based Model Coupling Framework. *PEARC22: Practice & Experience in Advanced Research Computing Conference*. 1 to 8.

- Hertel, Thomas and Elouafi, Ismahane and Tanticharoen, Morakot and Ewert, Frank. (2021). Diversification for enhanced food systems resilience. *Nature Food*. 2(11).

- Baylis, Kathy and Heckelei, Thomas and Hertel, Thomas W. (2021). Agricultural Trade and Environmental Sustainability. *Annual Review of Resource Economics*. 13 (1).

- Chaplin-Kramer, Rebecca and Brauman, Kate A. and Cavender-Bares, Jeannine and Díaz, Sandra and Duarte, Gabriela Teixeira and Enquist, Brian J. and Garibaldi, Lucas A. and Geldmann, Jonas and Halpern, Benjamin S. and Hertel, Thomas W. and Khoury, Colin K. and Krieger, Joana Madeira and Lavorel, Sandra and Mueller, Thomas and Neugarten, Rachel A. and Pinto-Ledezma, Jesús and Polasky, Stephen and Purvis, Andy and Reyes-García,

Victoria and Roehrdanz, Patrick R. and Shannon, Lynne J. and Shaw, M. Rebecca and Strassburg, Bernardo B. and Tylianakis, Jason M. and Verburg, Peter H. and Visconti, Piero and Zafra-Calvo, Noelia. (2021). Conservation needs to integrate knowledge across scales. *Nature Ecology & Evolution*. 6(2), pp.118-119.

- Busch, Jonah, et al. (2022). "Effects of demand-side restrictions on high-deforestation palm oil in Europe on deforestation and emissions in Indonesia", Environmental Research Letters. https://doi.org/10.1088/1748-9326/ac435e.

Conference and Invited Presentations

- Hertel, Thomas W. (2022). *A bottom-up approach to identifying key knowledge/coordination gaps in a network of networks*. Plenary Presentation to the AccelNet Awardee meeting, organized by the National Science Foundation. virtual.

- Haqiqi, I., Grogan, D.S., Horeh, M.B., Hertel, T.H., Liu, J., Baldos, U. (2021). *A pandemic combined with global heat stress and drought: Impacts on food security and environmental sustainability*. The Global Trade Analysis Project (GTAP) conference.

- J. Woo, L. Zhao, C. Song, D. Grogan, I. Haqiqi, R. Lammer (2022). *Accelerating Multi-scale Cross-domain Model Linking Using Advanced Cyberinfrastructure*. AGU Fall Meeting 2022. Chicago.

- Valin, Hugo, Thomas Hertel, Benjamin Leon Bodirsky, Tomoko Hasegawa, Elke Stehfest (2021). *Achieving Zero Hunger by 2030 – A Review of Quantitative Assessments of Synergies and Tradeoffs amongst the UN Sustainable Development Goals*. Scientific Group Report for the UN Food Systems Summit.

- Hertel, Thomas W. (2022). *Agricultural Trade and Sustainability: Global to Local to Global Analysis*. OECD Workshop on Agricultural Trade and Sustainability. virtual.

- Johnson, J.A. (2021). *Bringing the Value of Nature into the Economic Mainstream*. Natural Capital Project meeting. Stanford University.

- Hertel, Thomas, Ismahane Elouafi, Frank Ewert and Morakot Tanticharoen (2021). *Building Resilience to Vulnerabilities, Shocks and Stresses*. Scientific Group Report for the UN Food Systems Summit.

- Jungha Woo, Lan Zhao, Carol Song, Iman Haqiqi, Danielle Grogan and Richard Lammers (2022). *C3F: A Collaborative Container-based Model Coupling Framework*. Practice & Experience in Advanced Research Computing Conference. Boston, MA.

- Polasky, S. (2022). *Can business support sustainability?* Gund Xchange Talk, Gund Institute on the Environment, University of Vermont. University of Vermont.

- Hertel, Thomas W. (2022). *Evidence-based Economic Models, Data and Research Institutions to Tackle Future Challenges*. 25th Annual Rossi-Dorria Lecture, Rome-Tre University, Italy. Italy.

- Hertel, Thomas W. (2022). *Food Security in the Context of Multiple Crises*. plenary panel presentation on the occasion of the 30th Anniversary of the Potsdam Institute for Climate Research (PIK), Potsdam, Germany. Potsdam, Germany.

- Hertel, Thomas W. (2022). *Forging international, interdisciplinary collaborations to address global challenges*. Annual Meeting of the Leipniz Association. Berlin.

- Jing Liu, Stephen Polasky, Carol X Song and Michael Witt (2022). *GLASSNET: Networking Global to Local to Global Analyses to Inform Sustainable Investments in Land and Water Resources*. AGU Fall Meeting 2022. Chicago.

- Iman Haqiqi (2022). *Global Drivers of US Groundwater Stresses and Global Responses to US Groundwater Policies*. AGU Fall Meeting 2022. Chicago.

- Johnson, J.A. (2021). *Global Earth-Economy Modeling: Linking GTAP and InVEST to address sustainability challenges*. National Ecosystem Services Partnership meeting. Duke University, Nicholas Institute.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of FEW Systems*. INFEWS Conference, Organized by the National Science Foundation, Wednesday. virtual.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of Groundwater Scarcity*. Department of Geography and IRI-THESys, Humboldt University, Berlin, Germany.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of Land and Water Sustainability*. Institute-wide seminar at the Thuenen Institute, Braunschweig, Germany. Braunschweig, Germany.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of Land and Water Sustainability*. Institute-wide seminar at the Helmholtz Center for Environment Research, Leipzig, Germany. Leipzig, Germany.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of Land and Water Sustainability*. Seminar for the Department of Agricultural Economics, University of Copenhagen. Copenhagen.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of Sustainability Challenges*. seminar at the Center for Development Studies, University of Bonn, Germany. Bonn, Germany.

- Hertel, Thomas W. (2022). *Global-Local-Global Analysis of Sustainability Challenges*. Institute-wide research seminar at the Potsdam Institute for Climate Research (PIK), Potsdam, Germany. Potsdam, Germany.

- Thomas W Hertel, Matthew Huber, Jianguo Liu, Nicholas Manning, Carol X Song (2022). *Global-Local-Global Analysis of Sustainability and the Telecoupling of Land and Water Systems*. AGU Fall Meeting 2022. Chicago.

- Polasky, S. (2022). *Gross Ecosystem Product (GEP): A tractable approach for bringing ecological information into decision-making*. Conservation International.

- Shaowen Wang, Thomas W Hertel, Upmanu Lall, Deanna A Hence, Iman Haqiqi (2022). *Harnessing the Geospatial Data Revolution to Advance Sustainability Science*. AGU Fall Meeting 2022. Chicago.

- Johnson, J.A. (2021). *How Integrated Earth-Economy Modeling Can Inform Policy via Incorporation into Systems of National Accounts*. U.S. Geological Survey.

- Polasky, S. (2022). *How can business and government work together to address biodiversity loss*. Business and Biodiversity Action Roundtable in Association with Stockholm +50. Stockholm.

- Polasky, S. (2022). *IPBES, biodiversity, and finance: Setting targets and assessing nature? Yes, finance can*. Finance for Biodiversity Foundation webinar. virtual.

- Hertel, Thomas W. (2022). *Integrating Human and Natural Systems Across Scales in Great Lakes Energy-Water-Land Systems: Co-firing of Coal-fired Power Plants in the Midwest using Corn Residue*. Conference on the Great Lakes Environment, Organized by the National Oceanic and Atmospheric Administration and the Department of Energy. virtual.

- Johnson, J.A. (2022). *Integrating Macroeconomic and Ecosystem Service Models: Implications for IPBES*. Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES).

- Johnson, J.A. (2022). *Integrating economic models with ecosystem services to assess sustainable development*. Forum on Scenarios for Climate and Societal Futures.

- Johnson, J.A. (2022). *Introducing environmental risks into central banking: From climate- to nature-related scenario analysis*. Grantham Research Institute on Climate Change and the Environment. Zurich Switzerland.

- Polasky, S. (2022). *Invited Panelist*. Sustainability Leadership Council Roundtable on Biodiversity, Eurasia Group.

- Polasky, S. (2021). *Invited plenary speaker on panel on "Assessing biodiversity risks on the financial system*. Assessing biodiversity risks on the financial system. Banco de México.

- Polasky, S. (2021). *Invited plenary speaker on panel on "Driving ambitious outcomes for climate, nature, and people*. World Business Council for Sustainable Development.

- Polasky, S. (2022). *Land use, efficiency, carbon storage and other benefits*. World Bank workshop. World Bank.

- Polasky, S. (2022). *Linking ecosystems and economy: Valuing ecosystem services*. Biodiversity Loss and Ecosystem Degradation: Implications for Macroeconomic and Financial Stability, Banco Central Chile.

- Johnson, J.A. (2022). *Managing the Global Commons: Sustainable agriculture and use of the world's land and water resources in the 21st Century*. GLASSNET conference. West Lafayette, USA.

- Yolanda Sung, Alfredo Cisneros Pineda, Abhishek Chaudhary, Uris Lantz C Baldos and Thomas W Hertel (2022). *Mapping Trade Driven Land Use Change and Consequent Biodiversity Loss due to Future Global Population Increase*. AGU Fall Meeting 2022. Chicago.

- Hertel, Thomas W. (2022). *Multi-scale Analysis of Nitrogen Loss Mitigation and Climate Policies in the US Corn Belt*. institute-wide lecture at the Leipniz Center for Agricultural Landscape Research. Muencheberg, Germany.

- Jing Liu (2022). *Multi-scale Analysis of Nitrogen Loss Mitigation in the US Corn Belt*. invited talk to the MIT Joint Program. Virtual meeting.

- Hertel, Thomas W. (2022). *Multi-scale analysis of U.S. climate policy: Gridded implications for land systems change, nitrogen fertilizer leaching and water quality*. European Association of Agricultural Economics Seminar, Humboldt University, Berlin, Germany. Berlin, Germany.

- Johnson, J.A. (2022). *Multiscale analysis of ecosystem and economic interactions*. International Institute of Applied Systems Analysis (IIASA). Laxenburg, Austria.

- Polasky, S. (2022). *Natural Capital Index*. Introduction to the Natural Capital Approach and InVEST Software Suite, Natural Capital Project and Chinese Academy.

- Hertel, Thomas W. (2022). *North-South Relations – Global and Regional Sustainability Strategies*. Seminar presented at the Haus der Wissenschaft, Bremen, Germany. Bremen, Germany.

- S. Gesing, C. Stirm, G. Klimeck, L. Zentner, S. Wang, B. M. V. Martinez, C. D. Eaton, S. Donovan, L. Zhao, C. Song, I. L. Kim, A. Strachan, M. Zentner, R. Kalyanam (2022). *Open Science via HUBzero: Exploring Five Science Gateways Supporting and Growing their Open Science Communities*. HICSS 2022: Hawaii International Conference on System Sciences.

- Johnson, J.A. (2022). *Protecting biodiversity while maintaining macroeconomic performance*. World Biodiversity Forum. Davos, Switzerland.

- Jing Liu (2022). *SIMPLE-G model and Applications*. invited talk to University of Chinese Academy of Sciences. Virtual meeting.

- Hertel, Thomas W. (2022). *SIMPLE-G: A Framework for Global-Local-Global Analysis of Sustainability*. workshop at the Leipniz Center for Agricultural Landscape Research. Muencheberg, Germany.

- Iman Haqiqi (2022). *SIMPLE-G: Integrating Spatially and Temporally Heterogeneous Data to Inform a Multi-Scale and Multi-System Framework of Sustainability and Food Security*. AGU Fall Meeting 2022. Chicago.

- Nicole Brewer, Rajesh Kalyanam, Rob Campbell, Carol X. Song and Lan Zhao (2022). *Scientific Web Application Template*. Mini Gateways 2022.

- Carol X Song, Jaewoo Shin, Lan Zhao and Rajesh Kalyanam (2022). *Streaming Data Cyberinfrastructure for Global-Local-Global Analysis*. AGU Fall Meeting 2022. Chicago.

- Polasky, S. (2022). *Tackling the Climate Change and Nature Loss Twin Crises: Transforming market behaviour through targeted monetary policy and regulation*. Financial Times Digital Dialogues.

- Hertel, Thomas W. (2022). *The GTAP Consortium: Lessons Learned and Guidance for the FABLE Consortium*. FABLE Consortium meeting.

- Hertel, Thomas W. (2022). *The Poverty Impacts of Labor Heat Stress in West Africa under a Warming Climate*. seminar presented to the climate impacts and health group at the Potsdam Institute for Climate Research (PIK), Potsdam, Germany. Potsdam, Germany.

- Polasky, S. (2022). *The economic value of biodiversity: Bridging the fields of ecology and economics*. The Value of Diversity for Organizations and Society, Luohan Frontiers Dialog.

- Polasky, S. (2022). *The sustainable development challenge: The importance of accounting for the value of nature*. Federal Reserve Board meeting.

- Polasky, S. (2022). *The sustainable development challenge: The importance of accounting for the value of nature*. Google/Alphabet-wide Talk Serie.

- Zhan Wang, Geraldo B Martha Jr., Jing Liu, Cicero de Lima and Thomas W Hertel (2022). *Transportation Cost, Agricultural Production and Cropland Expansion in Brazil: A Multi-scale Analysis*. AGU Fall Meeting 2022. Chicago.

- Johnson, J.A. (2022). *Usage of computable general equilibrium models to assess costs from ecosystem service losses: implications for central banks*. Biodiversity Loss and Ecosystem Degradation: Implications for Macroeconomics and Financial Stability.

- Polasky, S. (2022). *Valuing nature in decision making – the power and limitations of economics*. US-UK Scientific Forum: Bringing nature into decision making. The Royal Society, London.

- Johnson, J.A. (2022). *sIntESE: Integrating ecosystem services into economic models SDiv working group*. German Centre for Integrative Biodiversity Research (iDiv).

Year 3 Goals

Mission

GLASSNET tightly integrates research teams undertaking global analyses with research teams evaluating local impact on humans and the natural environment in a multi-team, multi-disciplinary, multinational effort.

- Publish GLASSNET special issue of Environmental Research Letters which will assess what we know and what remains to be explored about global-local-global analysis of sustainability challenges confronting the world's land and freshwater resources.
- Hold a network-wide meeting in Minneapolis, Minnesota in October, 2023.
- Solicit a new set of GLASSNET Use Cases - this time requiring them to involve two or more GLASSNET networks. Hold 3-4 Use Case workshops in the summer of 2023.
- Hold another ECR workshop -- focused on ECR presentations of their own proposals. The most outstanding proposal will receive support to implement their proposal.
- Organize GLASSNET sessions at professional meetings, including: the GTAP conference in France, the AgMIP annual conference in New York City and the AGU meetings in December.
- Support early career scholar exchanges, sending ECRs to Europe and receiving ECRs from Europe in the US.
- Add network linking infrastructure to the GeoHub, including new data bases used by multiple networks, data processing facilities, and tools for accessing critical cross-network information.
- Support cross-network building activities
- Given sufficient demand, hold another SIMPLE-G Short Course.
- Promote participation in the GTAP and NatCap short courses by members of complementary networks.
- Identify a common 'big idea' towards which the community can collaborative strive. This will start with soliciting ideas from our Science Council.

Year 3 Activities

GLASSNET Events

GLASSNET events prepare the next generation of leaders in international sustainability team science through cross-disciplinary training and mentorship.

AccelNet Mapping Scientific Collaborations

- Workshop 1: Data Sources for Modeling and Graphing Scientific Collaborations (February 17, 2023)
- Workshop 2: Tools for Analyzing and Visualizing Scientific Collaboration Networks (March 17, 2023)
- Workshop 3: Evaluating the Growth of Your Scientific Network and Strategic Decision-Making (May 12, 2023)

GLASSNET Webinar: SIMPLE-G Brazil

March 20, 2023

This webinar results from the recent collaborative research highlighting one of the GLASSNET 'test bed' Embrapa. Stakeholders from academia, research institutes and decision-making entities will join the discussions about how the transportation infrastructure expansion in Brazil could affect the country's agriculture competitiveness and the environment.

GLASSNET Early Career Researcher Workshop – Project Launch Award

April 5, 2023

GLASSNET will help launch new policy-relevant SDG research by supporting Early Career Researchers as they embark on new research endeavors. GLASSNET community is invited for a workshop to collectively define the selection criteria for this new ECR Project Launch Award.

GLASSNET Use Case: Summer Seminars

Dates to be announced

The goal of the Use Case Workshop Series is to provide a broader perspective on sustainability challenges, drawing in GLASSNET scholars from different backgrounds, disciplines, and networks to enrich the resulting use case and identify potential linkages with related work within the broader GLASSNET community.

GLASSNET Biannual Meeting

October 2-3, 2023

This will be a full-scale project meeting at University of Minnesota, following the first all-team visioning meeting at Purdue University at project outset. GLASSNET leadership will work with the Stakeholder Advisory Board to analyze evaluation reports and assess progress toward GLASSNET milestones, mitigate risk, and strategize for implementation resources. Internal evaluation will leverage biannual meetings to conduct team science surveys including a baseline survey at the project outset vision meeting.

Contact

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