

Speaker information

October 24, 2025 (7 am PST)

Zoom link: <https://ubc.zoom.us/j/61322638159?pwd=IHcyipUJI3Su27baz5ivpRGj0cogwC.1>

Dr. Paul Wolfram

Title

Do multi-sector dynamics models and life cycle assessment models agree? Comparing GCAM's with GREET's fuel life cycle estimates

Abstract:

Model-based analysis of fuel pathways is essential for informing energy and environmental policy. Two major model types are typically used: multi-sector dynamics models, which capture the broader energy-economy, such as GCAM (Global Change Analysis Model), and life cycle assessment models, such as GREET (Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation). Each has distinct strengths and limitations, and recent studies increasingly adopt hybrid approaches to harness the advantages of both. However, such integration is often time-consuming and complicated by inconsistencies in system boundaries and technology definitions. We present LC-GCAM, a new tool that enables estimation of life-cycle greenhouse gas emissions and primary energy use for any fuel pathway represented in GCAM. We apply LC-GCAM to 300 scenarios designed to explore key uncertainties affecting the life-cycle performance of future fuel options in the U.S. freight sector. To evaluate LC-GCAM, we compare its results with those from GREET for nine fuel types in a 2030 U.S. reference scenario. When input assumptions are modestly aligned, LC-GCAM and GREET estimates typically agree within 10%. LC-GCAM offers a flexible and efficient approach to generating life-cycle metrics within an integrated modeling framework, supporting robust policy analysis across a wide range of interacting energy system uncertainties.

Presenter Bio

Paul Wolfram is a Research Scientist at the Joint Global Change Research Institute (JGCRI), focusing on the environmental trade-offs of decarbonization. He holds a Ph.D. in industrial ecology from Yale, an M.S. from the Technical University of Berlin, and a B.S. from Technical University Dresden. Before joining JGCRI in 2021, he worked at the International Council on Clean Transportation and the Potsdam Institute for Climate Impact Research. His work has been featured in the IPCC Sixth Assessment Report, *The New York Times*, and German national media.

To be rescheduled

Zoom link:

Guillaume Royer

HESTIA: Data and models for more sustainable agriculture

Abstract:

Our mission is to provide the data and scientific models to enable consumers, farms, businesses, and policymakers to make informed decisions on how to consume and produce food in a more environmentally sustainable way. We have invested in the long-term application of our data and models by basing everything on a new and highly detailed data format. We have established long-term partnerships with a range of organisations in this area, essential to drive our vision to solve the vast and unprecedented sustainability challenges caused by the current food system. Our models use established and globally-recognised methods, including those from the IPCC and EEA guidelines, and our modelling approach prioritises transparency and reproducibility.

Bio:

Guillaume co-created the HESTIA platform together with Joseph Poore. He has been part of the project since its beginning in 2019. He has built much of the platform, designed much of the software architecture, and oversees software delivery.

August 6, 2025 (11 am PST)

Zoom link: <https://ubc.zoom.us/j/65921702474?pwd=CSBKmrkSPPUied9XQJ3QFSdaa7rcPb.1>

Dr. Mo Li

Title

CEDA by Watershed, an open database for spend-based scope 3 accounting

Abstract:

CEDA (Comprehensive Environmental Data Archive) is a greenhouse gas (GHG) emissions factor database widely used for spend-based scope 3 accounting based on

multi-regional Environmentally-Extended Input-Output (EEIO) model. Providing extensive global coverage, CEDA represents 95% of the world's GDP across 148 countries and regions at 400 sector-resolution. CEDA is updated annually to reflect the most recent changes in the global economy and emissions intensities. By integrating input-output (IO) tables, international trade statistics and GHG emissions data, CEDA quantifies the cradle-to-gate emissions of products and services throughout their global supply chains. First published in 2000 and continuously improved since, CEDA leverages data from over 100 sources and employs various methods and techniques to fill data gaps using the best available proxies, while ensuring completeness and reliability. CEDA covers all six GHG categories specified under the Kyoto Protocol plus NF3 and expresses emissions in carbon dioxide equivalents (CO₂e) measured in Global Warming Potential (GWP) 100. CEDA is aligned with international standards on Scope 3 GHG emissions measurement and reporting including the Greenhouse Gas Protocol standard.

Presenter Bio

Dr. Mo Li is a Senior Environmental Scientist at Watershed, where she leads the development of CEDA, a key environmentally-extended input-output (EEIO) database for corporate carbon accounting and action. She brings over 15 years of research and consulting experience in sustainability, life cycle assessment, and supply chain carbon accounting. Prior to joining Watershed, Dr. Li co-developed the U.S. EPA's United States Environmentally-Extended Input-Output (USEEIO) models. She holds a Ph.D. and a master's degree in Natural Resources Science and Management from the University of Minnesota.

May 26, 2025 (7 am PST)

Zoom link: <https://ubc.zoom.us/j/64886408952?pwd=2EdoluNkgrTuCAno6lwUAZpgESllrh.1>

Dr. Fabian Lechtenberg

Towards Life Cycle Sustainability Optimization with PULPO

Abstract: Life cycle optimization (LCO) is common in process systems engineering (PSE), where LCA indicators feed directly into models of energy systems, chemical facilities, and more to balance cost, performance, and environmental impact. Elsewhere in LCA practice, however, optimization remains scarce. PULPO bridges that gap: the open-source Python package links Brightway for LCI handling with Pyomo for mathematical programming, letting practitioners declare design variables, constraints, and objectives, and efficiently scan the design space using only LCI data. The current release works with environmental inventories, and it's being extended towards a more holistic life cycle sustainability optimization (LCSO) framework. Social and economic datasets are being ported to Brightway, so they can be considered during optimization.

Short Bio: Dr. Fabian Lechtenberg is a postdoctoral researcher in ETH Zurich's Department of Chemistry and Applied Biosciences. He completed his PhD in Chemical Process Engineering at the Universitat Politècnica de Catalunya, where he developed methods to address multi-actor, multi-criteria problems in the process industries, combining game theory, mathematical programming, and LCA. Today, his research focuses on coupling optimization with LCA across the chemical, energy, transport, and IT sectors. The open-source package PULPO, which he created during his doctorate, now underpins and expands this work, helping practitioners make more sustainable, data-driven decisions.

April 22, 2025 (6-7 am PST)

Recording: <https://www.youtube.com/watch?v=tcMumrjbQJ4>

Christian Kongsgaard

LCAX: A Digital Backbone for Whole Building LCAs

Abstract: LCAX is an open-source library for exchanging and working with LCA projects. The goal of LCAX is to make an open, machine, and human-readable data structure and format for exchanging LCA projects, assemblies, impact data, and results.

LCAX intends to be an infrastructure layer for common procedures regarding exchanging, converting, validating, and calculating LCA projects. The aim is to make LCA calculations more accessible, transparent, and open.

Short Bio: Christian Kongsgaard has a background as an architectural engineer, but has always professionally been working with developing software for the AEC industry. His expertise lies at the crossroads of software & digitization, sustainability, and the AEC Industry.

Today he is running his own consulting company focusing on helping companies in the AEC industry develop software with a focus on sustainability and LCA.

Dr. Maxime Agez

Unlocking regionalization in ecoinvent: harnessing trade data for accurate life cycle assessments

Abstract: This project called "regioinvent" is a life-cycle based tool aiming to completely get rid of broad regions within the ecoinvent database (e.g., our friends RER, RoW or GLO). To do so, I automatically create copies of ecoinvent processes and regionalize their energy inputs. Furthermore, I create consumption markets based on national reported trade data and link these created consumption markets to the different process of ecoinvent. Hence, for example, the production of yogurt in Canada won't use "RoW" or "GLO" anymore for its supply of milk, but instead will use the real Canadian consumption market of milk, based on declared Canadian trade. Finally, on top of all that, I also spatialize all the relevant elementary flows and connect them to three different regionalized LCIA methods: IMPACT World+, EF and ReCiPe. The relevant elementary flows are water, land, acidification, eutrophication, particulate matter and photochemical ozone formation flows.

Overall, studies performed with regioinvent should have an improved accuracy when compared to their ecoinvent counterpart, thanks to the added accuracy of the better representation of supply chains and of full spatialization. Regioinvent automatically adds more than 200,000 processes to the ecoinvent database. It operates on the brightway2 LCA software and can run on the graphical user interface activity-browser seamlessly. All you need to use regioinvent is a valid ecoinvent license as the code is open-source and the trade data used is also open-source.

Short Bio: I am a research associate at CIRAIG, Polytechnique Montreal. My job at CIRAIG is mainly focused on performing LCAs and Input-Output analyses for clients. Yet, I also develop open-source tools for the Industrial Ecology community. Such tools include pylcaio, a package to hybridize the ecoinvent and exiobase databases; openIO-Canada, an open-source IO database for Canada; and regioinvent, one of the focus of this webinar. I also operationalized and currently maintain the IMPACT World+ LCIA methodology.

March 24, 2025

Recording: <https://www.youtube.com/watch?v=V2Kv9g8XAlo>

Dr. Stefano Merciai

BONSAI IO: An Open-Source Platform for Product Footprinting

Abstract: BONSAI IO open-source framework designed to calculate the carbon footprint of products. BONSAI IO is based on Input-Output Tables (IOTs) principles, but it is adjusted to meet the daily needs of the industrial ecologists.

The database can be used directly for calculating product footprints or as a background database for LCA. It can be freely downloaded using dedicated APIs.

BONSAI-IO reconciles detailed physical bottom-up data with top-down data coming from statistical offices or international institutions. The codebase is written in Python and is freely accessible on the GitLab repository.

BONSAI-IO is a multilayer framework, meaning that flows are accounted for in various units such as tonnes, terajoules, euros, and more. Each unit corresponds to a distinct layer of the database. These layers are interconnected through properties of the flows, such as prices, calorific values, and other attributes. Each layer is balanced to ensure compliance with conservation laws.

The database is being developed within the GTDR project financed by KR-foundation (DK). The final version is expected to be delivered in June 2025.

Short Bio: I am a researcher at 2-0 LCA consultants and at CML, Leiden University. I have mainly contributed to the construction of the hybrid version of EXIOBASE. In recent years I am working on BONSAI IO, an open-source web platform for the calculation of product footprints. My research focuses on the construction of multi-layer Input-Output tables and their application to environmental and economic analyses.

Dr. Yang Qiu

Developing modeling capabilities in IAM to assess critical mineral supply and demand

Abstract: CMMs are indispensable building blocks for various energy technologies. A future energy system transition characterized by electrification and deployment of renewable energy and storage technologies will substantially increase the demand for CMMs. However, future material supplies may not respond fast enough due to supply-chain issues, which could constrain the availability of sufficient and stable material supplies to meet their escalating demands. In this talk, Dr. Yang Qiu will introduce recent efforts to enhance GCAM's capability to represent the supply and demand of CMMs. Specifically, he will discuss his latest research on the supply-demand dynamics of CMMs in the context of energy transitions and examine how material supply availability could affect the future deployment of energy technologies.

Short Bio: Dr. Yang Qiu is an Earth Scientist at the Joint Global Change Research Institute, Pacific Northwest National Laboratory (PNNL). His research focuses on understanding the interactions across various human and earth systems using integrated, multi-sector approaches. At PNNL, Yang leads the development of the Global Change Analysis Model (GCAM) to enhance its representation of critical minerals and materials (CMMs). His current work aims to examine the implications of CMMs on energy system transition and supply security. In addition, he also has extensive research experience across a range of topics, such as life cycle assessment, electricity optimization modeling, and carbon dioxide removal. Yang holds a PhD in Environmental Science & Management from the University of California, Santa Barbara.

Feb. 26, 2025

Recording: <https://www.youtube.com/watch?v=caAlcc45nCA>

Dr. Bu Zhao

A Data-Centric Investigation on the Challenges of Machine Learning Methods for Bridging Life Cycle Inventory Data Gaps.

Abstract: Life cycle assessment (LCA) is a systematic approach to quantify the environmental impacts of a product system from its entire life cycle. Despite the great success, the inventory data gap has been a fundamental challenge that limits the application of LCA to emerging new processes. Machine learning (ML) methods are among the possible solutions that can mitigate these data gaps in an automated and

scalable way. Nonetheless, the performance of existing ML methods is unstable which limits the trustworthiness and generalizability of the models. In this study, we conducted a data-centric investigation to delineate the causes of the unstable performance using a similarity-based ML framework based on Ecoinvent 3.1 unit process (UPR) database. We found that the pattern of imbalance in the data for method development, manifest by the substantial differences in (1) flow & process availability and (2) the order of magnitude of their values, is a major cause of the unstable performance. We also identified the causes due to the challenges with ML method development workflow, particularly, the steps of data preprocessing, and ML model training (e.g., randomness in train-test data splits). In addition, we also tested the proposed ML method on the U.S. Life Cycle Inventory database, where we observed that the generalizability of the method was highly influenced by the database size of the application. To address these issues, we proposed that further research should focus on reducing the barriers in database integration such that both the size and balance of the data for ML method development can be improved.

Short Bio: Dr. Bu Zhao is an Assistant Professor in the Department of Environmental and Sustainable Engineering at the University at Albany. Prior to this role, he was an Eric and Wendy Schmidt Postdoctoral Fellow at Cornell University and earned his Ph.D. in Environment and Sustainability and Scientific Computing from the University of Michigan, Ann Arbor. Dr. Zhao's research lies at the intersection of environmental engineering, sustainability, and artificial intelligence, where he employs cutting-edge AI techniques to analyze the complex interactions between environmental impacts and human activities from a systems perspective. His work aims to advance sustainable solutions through data-driven insights and innovative modeling approaches. Dr. Zhao is actively involved in the academic community, serving as the Managing Editor of Resources, Conservation & Recycling and as a Guest Editor for Energy and AI.

Dr. Gargeya Vunnava

Emission Factor Recommendation for Carbon Footprinting with Generative AI

Abstract: Accurately quantifying greenhouse gas (GHG) emissions from products and business activities is crucial for organizations to measure their environmental impact and undertake mitigation actions. Life cycle assessment (LCA) is the scientific discipline for measuring GHG emissions associated with each stage of a product or activity, from raw material extraction to disposal. Measuring the emissions outside of a product owner's control is challenging, and practitioners rely on emission factors (EFs) – estimates of GHG emissions per unit of activity – to model and estimate indirect impacts. These EFs come from prior LCA studies and are

collated into databases. The current practice of manually finding the appropriate EF to use from databases is time-consuming, error-prone, and requires domain expertise, hindering scalability and accuracy in emissions quantification. We present a novel AI-assisted method that leverages large language models to automatically recommend EFs. Our method parses business activity descriptions and recommends the appropriate EF with a human-interpretable justification. We benchmark our solution across multiple domains and find it achieves state-of-the-art performance in EF recommendation, with an average Precision@1 of 88.4%. By streamlining and automating the EF selection process, our AI-assisted method enables scalable and accurate quantification of GHG emissions, supporting organizations' sustainability initiatives and driving progress toward net-zero emissions targets across industries.

Bio: Dr. Gargeya Vunnava is a Research Scientist in Amazon's World Wide Sustainability organization, where he develops novel computational methods to enable more scalable and data-driven life cycle assessments. He earned his Ph.D. in Environmental Sustainability from Purdue University, specializing in mechanistic process modeling and physical input-output analysis to quantify the environmental and economic impacts of products and industrial systems. His research has been published in leading journals including Energy & Environmental Science, Applied Energy, Journal of Industrial Ecology, and Journal of Cleaner Production. He has also presented his work at prominent computer science conferences such as ACM COMPASS and the NeurIPS Climate Change AI workshop. Dr. Vunnava is passionate about leveraging the latest advances in data science and modeling to drive sustainability solutions.