Workshop Sustainable Societal Metabolisms

Tuesday 18 November 2025 - Thursday 20 November 2025

UFZ

Scientific Programme

Dear Colleagues,
Our current societal relationship with nature has led to a profound socio-ecological crisis, marked by the transgression of planetary and regional ecological boundaries alongside the unequal and insufficient fulfilment of societal needs. This raises a fundamental question: How can we achieve a good life for all while staying within planetary boundaries? For an interdisciplinary, solution-oriented scientific program, this means identifying viable pathways to determine which resources can be used, in what quantities, and through which economic, technological, and societal practices to sustainably satisfy societal needs.

We warmly invite you to join us building an integrated and interdisciplinary research network and framework for understanding, monitoring, planning and implementing Sustainable Societal Metabolisms. In a three day international workshop from November 18th to 20th 2025 at the UFZ in Leipzig, Germany, we bring together early-career and experienced researchers across ecological & socio-economic system modelling, social and data sciences. This workshop structured by five key modules (M1 - M5) is a kick-off for method & data integration, development as well as resulting publications, collaborative projects and research grant applications by 2026.

We hope you will join us in laying the foundations for a transformative, interdisciplinary research effort toward sustainable societal metabolisms. Your insights and collaboration are highly valued.
Warm regards,
Dr.-Ing. Walther Zeug

Background on UFZ Research on Sustainable Societal Metabolisms
Recent advancements have sought to integrate planetary boundaries (PB) into Life Cycle Assessment (LCA), enabling meso- and macroeconomic evaluations using sector- and product-specific bottom-up approaches. In this context absolute sustainability assessments emerged, which aim to determine the sustainable production quantities of a product. However, robust methodologies for such assessments in LCA remain underdeveloped. This is due to technical and political complexities and challenges associated with sharing principles and applying distributive justice theories across sectors and regions. These issues inevitably raise fundamental questions about political economy and ecology, particularly: How can economies be organized and evaluated to meet societal needs within planetary boundaries?

Therefore, transformative systemic approaches including sciences based methods are needed to address these challenges, such as Democratic Economic Planning (DEP). Planning, understood as the long-term organizational anticipation of actions, is already inherent in current economic systems. In recent years, an intensified debate about modern forms of democratic economic planning has been established again (Groos & Sorg, 2025; Groos, 2021; Pitt, 2022; Planning for Entropy, 2022; Rochowicz, 2024; Vettese/Pendergrass, 2022). As part of this strongly emerging debate, e.g. we developed an approach on Cybernetic Democratic Economic Planning (CDEP) (Heyer & Zeug, 2024). This concept of the CDEP as a democratic, central-decentral planned economy draws on current theoretical debates and integrates cybernetic approaches and methods from sustainability and environmental systems research, such as planetary boundaries (Bringezu, 2022; O'Neill et al., 2018), parametric control and regulation with feedback loops (Dapprich, 2022a, b), and methods of holistic life cycle analysis and sustainability modeling and assessment (Zeug et al., 2023), which can combine economic, ecological, and social dimensions in a holistic modeling and accounting framework.

CDEP utilizes the HILCSA (Holistic and Integrated Life Cycle Sustainability Assessment) LCIA method and the soca database, both implemented in openLCA. Via the HILCSA method over 100 socio-ecological and economic indicators are assessed and aggregated into synthetic units of accounting, referred to as tokens. These tokens represent raw material consumption (RMC),

climate change (CC), and working time (WT). By downscaling planetary and social boundaries to per capita budgets, and subsequently allocating and upscaling these budgets to four economic sectors—individual consumption, productive consumption, reserves, and care & infrastructure—this approach enables a comprehensive LCA-based proportioning and impact assessment of underlying production systems.
A feedback mechanism between production impacts and sectoral budgets facilitates self-regulation within the system. Furthermore, the tokens of RMC, CC, and WT are used to calculate synthetic prices, incentivizing sustainable consumption patterns. In order to account a complex economic system and to simulate the behaviour of its agents, Input-Output (I/O) and economy wide material flow accounting (EW-MFA) and Agent Based Modelling (ABM) will be applied in the future.

This CDEP-framework offers a tool for democratic decision-making, striving to achieve a good life for all within planetary boundaries. It also marks significant progress in methodological advancements toward absolute sustainability assessments and represents a concrete and solution-oriented model and instrument for strategic elements of a socio-ecological transformation that points to the concrete utopia of a democratic economic system.

Bringezu, S. (2022): Das Weltbudget: Sichere und faire Ressourcennutzung als globale Überlebensstrategie. Springer Fachmedien Wiesbaden.
Dapprich (2022a): Optimal Planning with Consumer Feedback: A Simulation of a Socialist Economy. In: Review of Political Economy 35(4): 1-21.
Dapprich (2022b): Tokens make the world go round: socialist tokens as an alternative to money. In: Review of Evolutionary Political Economy 4: 497-513.
Devine (1988): Democracy and economic planning: the political economy of a self-governing society. Cambridge, UK: Polity Press.
Groos & Sorg (2025): Creative Construction. Bristol University Press.
Groos (2021): Distributed Planned Economies in the Age of their Technical Feasibility. BEHEMOTH A Journal on Civilisation, 14(2).
Heyer, J., & Zeug, W. (2024): Ökobilanz und kybernetische Wirtschaftsplanung. PROKLA. Zeitschrift für kritische Sozialwissenschaft, 54(215), 267-286.
Laibman (2001): ‘Contours of the Maturing Socialist Economy’, Historical Materialism, 9(1), pp. 85–110.
O’Neill, D. W., Fanning, A. L., Lamb, W. F., & Steinberger, J. K. (2018): A good life for all within planetary boundaries. Nature Sustainability, 1(2), 88-95.
Pitt (2022): Self-Organizing Multi-Agent Systems. Algorithmic Foundations of Cyber-Anarcho-Socialism. London/Hackensack.
Planning for Entropy (2022): Democratic Economic Planning, Social Metabolism and the Environment. In: Science & Society 86(2): 291-313.
Rochowicz, N. (2024): Planning progress: Incorporating innovation and structural change into models of economic planning. Competition & Change, 29(1), 64-82.
Vettese/Pendergrass (2022): Half-earth socialism: a plan to save the future from extinction, climate change, and pandemics. Verso, London/New York.
Zeug, W., Bezama, A., & Thrän, D. (2023): Life Cycle Sustainability Assessment for Sustainable Bioeconomy, Societal-Ecological Transformation and Beyond. In Progress in Life Cycle Assessment 2021 (pp. 131-159). Springe