German Committee
Future Earth

Sustainability Science Summit 2025

Conference Summary Report

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Helmholtz Zentrum Hereon
Chilehaus - Eingang B, Fischertwiete 1
20095 Hamburg, Germany

info@dkn-future-earth.de
www.dkn-future-earth.org
https://www.linkedin.com/company/deutsches-komitee-fuer-nachhaltigkeitsforschung/

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Deutsches Komitee für Nachhaltigkeitsforschung in Future Earth (DKN)
German Committee Future Earth

Prof. Dr. Michael Bollig
University of Cologne, Department of Social and Cultural Anthropology, Global South Studies Center (GSSC)

Prof. Dr. Aletta Bonn
Helmholtz-Centre for Environmental Research (UFZ); German Centre for Integrative Biodiversity Research (iDiv)

Prof. Dr. Anna-Katharina Hornidge
German Institute of Development and Sustainability (IDOS); University of Bonn

Prof. Dr. Daniela Jacob (Chair)
Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon

Prof. Dr. Thomas Potthast
International Center for Ethics in the Sciences and Humanities (IZEW), University of Tübingen

Prof. Dr. Markus Reichstein
Max Planck Institute for Biogeochemistry, Department of Biogeochemical Integration

Prof. Dr. Britta Renner
University of Konstanz, Psychological Diagnostics and Health Psychology

Prof. Dr. Jakob Rhyner
University of Bonn; Bonn Alliance for Sustainability Research

Prof. Dr. Bernd Siebenhüner
Carl von Ossietzky University of Oldenburg, Ecological Economics

Dr. Christiane Joerk (ex-officio)
DFG Head Office

Dr. Sebastian Sonntag (ex-officio)
Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon

DKN Secretariat

Hosted at Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon

Dr. Tanja Blome
Dr. Elisabeth Haefs
Dr. Sebastian Sonntag

The parallel session and workshop summaries in this report were kindly provided by the respective session chairs.

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1. The Summit

The Sustainability Science Summit took place in Berlin from 19 to 21 February 2025. The conference was held under the motto "Advancing Sustainable Development" and continued the series of German Future Earth Summits organized by the German Committee Future Earth (DKN). It provided a platform for the exchange of new scientific findings, research needs and aspects of research funding in the field of sustainability science.

Around 250 participants from Germany and abroad took part over three days. While the participants mainly came from academia, some also came from research funding and administration, as well as politics, science communication and practice. Three plenary panel discussions were held in the large hall of the Umweltforum and offered the opportunity for an intensive exchange. The topics included the question of how sustainability science can contribute to the transformation towards sustainability, (inter-)national advances in sustainability science, and the science-policy interface. Furthermore, the program offered more than 30 parallel sessions that emerged from the open call for session proposals. The panel discussions as well as the parallel sessions and workshops are documented in the following chapters.

The conference also featured a range of interactive formats designed to foster engagement and exchange among participants. One highlight was the evening networking session on the first day, which included a lively Bingo game aimed at encouraging informal connections. Participants were invited to find others who, for example, integrate climate change and justice issues in their work, have already used the new Future Earth member portal, collaborate with local authorities in areas such as health, justice, and equity, or are engaged in green technologies for the energy transition. This format proved to be a true icebreaker, facilitating numerous new connections between attendees who might otherwise not have interacted with each other.

On the second day, a World Café session provided all participants with the opportunity to engage in broader discussions. The session was structured around a set of questions that aimed to explore the conference theme, "Advancing Sustainable Development," through a multi-perspective dialogue. These questions were available online and answered live during the session. The World Café format allowed for open discussion among all attendees, incorporating insights collected through the live online survey. This hybrid approach – combining in-person dialogue with digital input – facilitated the gathering of a broad spectrum of perspectives.

The third interactive format, a Fishbowl session, offered a dynamic and reflective space for participants to explore the evolving landscape of sustainability. This final session prior to the closing of the event served as a forum for sharing experiences during and the perception of the summit itself, both with respect to the themes and topics and to the design of the summit's formats and program.

During the summit, the DKN published a statement entitled "Sustainability research more urgent than ever!", with the opportunity for the participants to sign the paper. The full statement can be found in the appendix. It emphasizes the following points: 1. Scientifically sound analysis and fact-based action are needed; 2. Excellent science needs secured funding; 3. Impactful sustainability science needs support and coordination; 4. Interdisciplinary and transdisciplinary research and problem-solving are essential; 5. Free democracies need to base their decisions on facts and science, not on fake news and conspiracy theories.

The DKN would like to thank all participants for their valuable contributions, committed exchange and stimulating discussions.

Graphic Recording by Sabine Gressel-Soeder (CoCreativeFlow) and kaa Faensen (kaa.works)
Photography by Nadine Stenzel (Nadine Stenzel Photography)

The graphic recording files and photographs can be accessed here:
https://www.dkn-future-earth.org/events/sustainability_science_summit_2025/index.php.en

2. The Summit Program

Day 1 – 19 February 2025 (Wednesday)

9:00 – 10:30 **Registration**

10:30 – 11:00 **Welcome and Introduction from DKN and DFG**

Daniela Jacob, *German Committee Future Earth (DKN), Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon;* Axel A. Brakhage, *German Research Foundation (DFG)*

11:00 – 12:30 **Panel Discussion: "Advancing Sustainable Development: Perspectives of International Sustainability Science"** with Anna-Katharina Hornidge, *German Institute of Development and Sustainability*, Karen O'Brien, *University of Oslo*, Hans-Otto Pörtner, *Alfred Wegener Institute*, Markus Reichstein, Max Planck Institute for Biogeochemistry, chaired by Bernd Siebenhüner, *University of Oldenburg*

12:30 – 14:00 ***Lunch***

14:00 – 15:30 **Parallel Sessions and Workshops**

Session 1 – Changing Plates: Meat Alternatives as Key to Sustainable Eating (DKN Working Group "Meat Alternatives for a Nutrition Transition")
CHAIR: Frederike Neuber, *University of Rostock; Kiel University*
CO-CHAIR: Florian Antony, *Institute for Applied Ecology (Öko-Institut)*
Working Group Members: Anne Klatt, *German Environment Agency;* Sebastian Lakner, *University of Rostock;* Britta Renner, *University of Konstanz;* Melanie Eva-Maria Speck, *Osnabrück University of Applied Sciences;* Achim Spiller, *University of Göttingen;* Stephanie Wunder, *Agora Agriculture;* Cäcilia von Hagenow, *The Nature and Biodiversity Conservation Union (NABU e.V.)*

Session 2 – Adaptive Governance for Sustainable Coastal Systems: Insights from the German North Sea Coast
CHAIR: Cormac Walsh, *Future Proof Grasslands, Carl von Ossietzky University Oldenburg*
CO-CHAIR: Bernd Siebenhüner, *Carl von Ossietzky University Oldenburg*
SPEAKERS: Ernst Schäfer, Jule Talea Froehlich, Anne-Marie Walczuch, *Future Proof Grasslands, Carl von Ossietzky University Oldenburg;* Lara Saalfrank, *WAKOS, Carl von Ossietzky University Oldenburg;* Evke Schulte-Güstenberg, *Gute Küste, Carl von Ossietzky University Oldenburg*

Session 3 – Systemic Sustainability: A New Chapter of Inter- and Transdisciplinary Sustainability Science
CO-CHAIRS: Jochen Schanze, *Leibniz Institute of Ecological Urban and Regional Development (IOER);* Dieter Gerten, *Potsdam Institute for Climate Impact Research (PIK);* Annette Ruml, *German Institute for Global and Area Studies (GIGA);* Miriam Prys-Hansen, *GIGA;* Katharina Helming, *Leibniz Centre for Agriculture Landscape Research (ZALF)*

Session 4 – Shifting Fisheries Towards Sustainability: Lessons from the Collapse of the Cod Fishery in the Western Baltic Sea
CHAIR: Martin Friedrich Quaas, *University of Leipzig; German Centre for Integrative Biodiversity Research (iDiv)*
CO-CHAIRS: Robert Arlinghaus, *Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB); Humboldt University of Berlin;* Christian Möllmann, *University of Hamburg;* Moritz Drupp, *University of Hamburg;* Stefan Baumgärtner, *University of Freiburg;* Harry V. Strehlow, *Thünen Institute of Baltic Sea Fisheries (TI)*

Session 5 – Evaluating Sustainability Impacts of Living Labs and Real-World Laboratories
CO-CHAIRS: Justus von Geibler, *Wuppertal Institute for Climate, Environment, and Energy;* Martina Schäfer, *Centre for Technology and Society (ZTG)*
SPEAKERS: Justus von Geibler, Annalena Präger, Florian Feldmann, *Wuppertal Institute for Climate, Environment, and Energy*

Session 6 – Regenerative Business: Complement of or Substitute for Corporate Sustainable Development?
CO-CHAIRS: Jacob Hörisch, Jakob Strobel, Julia Benkert, *Centre for Sustainability Management, Leuphana University Lüneburg*

15:30 – 16:00 ***Break***

16:00 – 17:30 Parallel Sessions and Workshops

Session 7 – Inequality Beyond Money: Data, Indicators, Causality, and Modelling for Sustainability Transformations
CHAIR: Stefan Pauliuk, *University of Freiburg*
CO-CHAIRS: Jakob Napiontek, Benedikt Bruckner, Peter-Paul Pichler, *Potsdam Institute for Climate Impact Research (PIK);* Christian Hauenstein, *University of Freiburg*

Session 8 – Boundaries in Inter- and Transdisciplinary Sustainability Research: Boundaries as Integration, Boundaries of Integration (Junior Research Group "regulate: Sustainable Groundwater Management in Europe")
CHAIR: Fanny Frick-Trzebitzky, *Institute for Social-Ecological Research (ISOE)*
CO-CHAIR: Linda Söller, *Goethe University Frankfurt*

Session 9 – Engaging the 3-Horizons for Transformative Sustainability Science: A Methods Workshop and Reflective Exercise for Asking 'the Right Questions'
CHAIRS: Claudia Heindorf, *University of Göttingen;* Gabriela Wuelser, *Swiss Academy of Arts and Sciences (SCNAT)*
CO-CHAIRS: Laura Kmoch, Marion Jay, Maria Chiara Camporese, *University of Göttingen;* Lukas Flinzberger, *University of Kassel;* Christian Bunn, *The International Center for Tropical Agriculture (CIAT), Cali, Colombia*

Session 10 – Belmont Forum: Research Projects (CRA: Sustainable Consumption and Production)

JUST GROW: Co-designing justice-centric indicators and governance principles to intensify urban agriculture sustainably and equitably
Ann-Kristin Steines and Kathrin Specht, *Research Institute for Regional and Urban Development (ILS)*

Circularity3: Conceptualizing, Implementing and Measuring the Circular Economy from the Micro to the Macro Level
Antonia Loibl, *Fraunhofer Institute for Systems and Innovation Research (ISI);* Christoph Helbig, *University of Bayreuth*

BEDROCK: Building an Evidence-Base for Deforestation-Free Landscapes: Supporting Equitable Outcomes in and Beyond Commodity Supply-Chains
Thomas Kastner, *Senckenberg Biodiversity and Climate Research Centre (SBiK-F)*

Co-Creating Sustainable Transformations of Food Supply Chains Through Cooperative Business Models and Governance
Wanda Wieczorek, Pia Laborgne, *ITAS, KIT*

Session 11 – Climate Services in Practice: How Assessment Tools Support the Planning of Adaptation Measures
CHAIR: Jan Harrs, *GERICS; ReglKlim; Projekt WIRKsam*
CO-CHAIRS: Laura Dalitz, *Umweltbundesamt; Projekt WIRKsam;* André Assmann, *Geomer GmbH, Projekt R2K-Klim+;* Rebecca Kutzner, *Forschungsinstitut für Bergbaufolgelandschaften e.V.; Projekt IAWAK-EE;*

Matthias Soot, *TU Dresden, Projekt KlimaKonform;* Kevin Laranjeira, *IREUS, University of Stuttgart; Projekt WIRKsam;* Astrid Sturm, *Brandenburg Technical University Cottbus-Senftenberg*

Session 12 – Bridging Science, Policy, and Practice: Addressing Water Security and Socio-Ecological Impacts in Climate Adaptation
CHAIRS: Jürgen Stamm, *Dresden University of Technology (TUD);* Jonas Carvalho e Silva, *TU Dortmund; Federal University of Pará, Brazil*
CO-CHAIRS: Edeltraud Günther, *Institute for Integrated Management of Material Fluxes and of Resources (FLORES), United Nations University (UNU);* Yi-Jhen Wu, *TU Dortmund;* Erlan Silva de Sousa, *Federal University of Tocantins, Brazil*

17:30 Networking Session

19:00 Reception and Get-Together

Day 2 – 20 February 2025 (Thursday)

09:00 – 10:30 Parallel Sessions and Workshops

Session 13 – Our Precious Food: Food Security, Sustainable Food Choices, Dietary Diversity, and Reduction of Spoilage and Waste
CO-CHAIRS: Maria Katharina Gröne, *Wuppertal Institute for Climate, Environment, and Energy;* Lena Hennes, *Wuppertal Institute for Climate, Environment, and Energy;* Thilo M. Fuchs, *Friedrich-Loeffler-Institut, Jena*
SPEAKERS: Agnes Weiß, *University of Hamburg;* Jasmin Godemann, *Justus-Liebig-University Gießen;* Vera Lange, *Justus-Liebig-University Gießen;* Dorothee Straka, *University of Applied Sciences Osnabrück;* Melanie Eva-Maria Speck, *Osnabrück University of Applied Sciences; Wuppertal Institute;* Alexander Follmann, *University of Cologne;* Carmen Jochem, *University of Bayreuth*

Session 14 – Emotions and Inner Transformation in Sustainability Science
CO-CHAIRS: Saravanan Subramanian, *German Institute of Development and Sustainability (IDOS);* Timo von Wirth, *Frankfurt University; Erasmus University Rotterdam;* SPEAKERS: Petra Jansen, *University of Regensburg;* Lorena Eulgem, *German Institute of Development and Sustainability (IDOS);* Ute Thiermann, *Imperial College London*

Session 15 – Institutionalization of Participatory and Transdisciplinary Research at the Macro-, Meso-, and Micro-Levels of the Science System: Towards a Coordinated and Consolidated Implementation Strategy in Germany
CHAIRS: Audrey Podann, *TU Berlin;* Daniel J. Lang, *ITAS, KIT; Gesellschaft für transdisziplinäre und partizipative Forschung (GTPF)*

Session 16 – Just Bio? Intergenerational Justice, Biodiversity Loss, and the Sustainable Bioeconomy Transition
CO-CHAIRS: Dirk Lanzerath, *German Reference Centre for Ethics in the Life Sciences (DRZE), University of Bonn; Practical Challenges of Climate Change: Intergenerational Justice and Freedom (PRACC);* Marius Bartmann, *DRZE, PRACC;* Ulrich Schurr, *Forschungszentrum Jülich; Heinrich-Heine-University Düsseldorf;* Tade Spranger, *Center for the Law of the Life Sciences (CLLS), PRACC;* Sandra Venghaus, *Forschungszentrum Jülich; PRACC;* Jens Mutke, *Bonn Institute for Organismic Biology (BIOB);* Michael Bernstein, *Austrian Institute of Technology (AIT)*

Session 17 – Interdisciplinary Perspectives on the Impact of Climate Change on Workplaces and Health and Safety at Work
CHAIRS: Adrien Thomas, *Luxembourg Institute of Socio-Economic Research LISER;* Nadja Dörflinger, *Federal Institute for Occupational Safety and Health (BAuA)*
SPEAKERS: Anja Kirsch, *FU Berlin;* Jule Klink, *FU Berlin;* Robin Pelkner, *BAuA;* Christian Wille, *verdi*

Joint Session 18

Learning to Change the Structures of Unsustainability: A Whole-System Perspective on Education and its Role in Sustainability Transitions
Jorrit Holst, *Free University of Berlin*

Where Does Sustainability Science Meet the Humanities in Leveraging Change?
Agnieszka Komorowska, *University of Kassel;* Andra Milcu, *Kassel Institute for Sustainability;* Arcadie Botnaru, *Kassel Institute for Sustainability*

Urban Human-Nature Partnerships – From a Positive Vision to Sustainable and Flourishing Realities
Martina Artmann, *University of Applied Sciences Weihenstephan-Triesdorf;* Jessica Böhme, *Institute for Practical ekoPhilosophy (IPeP);* Christoph Woiwode, *Indian Institute of Technology*

10:30 – 11:00 ***Break***

11:00 – 12:30 **Panel Discussion: "Transformation in Sustainability Science – Transformation of Sustainability Science"** with Christiane Joerk, *German Research Foundation - DFG*, Marco Fritz, *DG RTD, European Commission*, Stefan Bartke, *German Environment Agency*, Daniela Jacob, *Climate Service Center Germany - GERICS, Helmholtz-Zentrum Hereon*, chaired by Michael Bollig, *University of Cologne*

12:30 – 13:30 ***Lunch***

13:30 – 16:30 **World-Café:** "Priorities for Sustainability Science"

16:30 – 17:00 ***Break***

17:00 – 18:30 **Parallel Sessions and Workshops**

Session 19 – Discussion on the Need and Possible Options for the Organization of a DACH Association for Sustainability
CO-CHAIRS: Stefan Lechtenböhmer, *University of Kassel;* Harald Heinrichs, *Leuphana University Lüneburg;* Daniel J. Lang, *Karlsruhe Institute for Technology (KIT)*
SPEAKERS: Sarah Ryglewski, *Minister of State at the Federal Chancellery;* Dan Brown, *University of Washington*

Session 20 – Assessing Risks and Benefits of Technologies in Scenarios for Sustainability Transformations (DKN Working Group "RiskTransScens")
CO-CHAIRS: Sabine Fuss, *Mercator Research Institute on Global Commons and Climate Change;* Jana Sillmann, *University of Hamburg; Center for International Climate Research Oslo (CICERO);* Pia-Johanna Schweizer, *Helmholtz Centre Potsdam;* Hermann Held, *University of Hamburg*

Session 21 – Why Is Climate Mitigation and Adaptation So Slow? Perspectives From the Social Sciences, the Humanities, etc. (German Climate Consortium, DKK)
CHAIR: Angela Oels, *DKK; Centre for Climate Resilience, University of Augsburg*
CO-CHAIR: Tilman Santarius, *DKK*
SPEAKERS: Mark Lawrence, *Research Institute for Sustainability (RIFS);* Jan Wilkens, *CLICCS (Climate, Climatic Change and Society), University of Hamburg;* Antje Bruns, *Academy for Territorial Development in the Leibniz Association (ARL)*
DISCUSSANT: Daniela Jacob, *DKN; Climate Service Center Germany (GERICS)*

Session 22 – Towards Green AI in Medicine
CO-CHAIRS: Peter Boor, *RWTH Aachen University;* Martin Strauch, *RWTH Aachen University*
SPEAKERS: Loïc Lannelongue, *University of Cambridge;* Cristina Richie, *University of Edinburgh;* Raghavendra Selvan, *University of Copenhagen;* Peter Boor, *RWTH Aachen University*

Session 23 – Transdisciplinary Interface Management in Sustainability Science Projects: Good Practices, Institutionalization, and Training
CHAIR: Katja Brundiers, *University of Freiburg*
CO-ORGANIZERS: Chantal Krumm, Flurina Schneider, *Transdisciplinarity Institute for Socio-Ecological Research (ISOE);* Felix Beyers, *Research Institute for Sustainability (RIFS);* Nina Kulawik and Dörte Peters, *Sustainability Innovation Campus (ICN); University of Freiburg;* Andra Milcu, *Kassel Institute for Sustainability;* Viola Hakkarainen, *Leuphana University Lüneburg; University of Helsinki;* Karoline Augenstein, *Center for Transformation Research and Sustainability (TransZent), University of Wuppertal*
SPEAKERS: Fletcher Beaudoin, *Institute of Sustainability Solutions, Portland State University;* Philip Bernert, *Research Institute for Sustainability (RIFS);* Holger Hoff, *Field of Excellence Climate Change, University of Graz;* Anne Nelissen and Iris Bos, *Community Hubs, Utrecht University;* Miriam Jordan, *Innovation Campus Sustainability (ICN); Karlsruhe Institute of Technology (KIT);* Braden Kay, *Community-City-University Partnership City of Tempe and Arizona State University;* Daniel J. Lang, *KIT;* Stefanie Meyer, *Leuphana University Lüneburg;* Anna Häring, *Eberswalde University for Sustainable Development;* Melanie Mbah, *Institute for Applied Ecology (Öko-Institut);* Alexandra Ramey, *University of Freiburg*

Session 24 – Designing and Monitoring Impact-Oriented Sustainability R&I Funding
CHAIRS: Gabriela Wuelser, *Swiss Academy of Arts and Sciences (SCNAT);* Katrin Ostertag, *Fraunhofer Institute for Systems and Innovation Research (ISI)*
CO-CHAIRS: Katharina Helming, *Leibniz Centre for Agricultural Landscape Research;* Rainer Walz, *Fraunhofer Institute for Systems and Innovation Research (ISI)*

18:30 – 18:45 ***Break***

18:45 – 20:15 **Panel Discussion: "Science-Policy Interface: Challenges and Opportunities"** with Katrin Böhning-Gaese, *Helmholtz Centre for Environmental Research*, Mark Lawrence, *Research Institute for Sustainability*, Jakob Lundberg, *Future Earth*, Dirk Messner, *German Environment Agency*, chaired by Axel Berger, *German Institute of Development and Sustainability*

Day 3 – 21 February 2025 (Friday)

08:30 – 10:00 Parallel Sessions and Workshops

Session 25 – Sustainability Science Meets Development Studies: How Can Synergies Between Both Research Programs Be Strengthened?
CHAIRS: Katja Bender, *International Centre for Sustainable Development (IZNE), Bonn-Rhein-Sieg University of Applied Sciences;* Sebastian Heinen, *IZNE, Bonn-Rhein-Sieg University of Applied Sciences;* Susanne von Itter, *European Association of Development Research and Training Institutes (EADI);* CO-CHAIRS: Basile Boulay, *EADI;* Stefanie Meilinger, *IZNE;* Sanjana Rajasekar, *IZNE;* Alfredo Saad-Filho, *Queen's University Belfast*

Session 26 – Interactive Spatial Tools for Socially Inclusive Integration of Energy Transitions and Ecosystem Restoration
CO-CHAIRS: Fritz Kleinschroth, *Institute of Environmental Planning, Leibniz University Hannover; Department of Environmental System Sciences (D-USYS), ETH Zurich;* Xuezhu Zhai, Yilin Huang, Eva Lieberherr, *D-USYS, ETH Zurich;* Christina von Haaren, *Institute of Environmental Planning*

Session 27 – Exploring Pathways for Integrating Disciplinary and Transdisciplinary Research in Real-World Laboratories to Enhance Transformative Science (DKN Working Group "LinkLab")
CHAIR: Daniel J. Lang, *Institute for Technology Assessment and System Analysis (ITAS), Karlsruhe Institute for Technology (KIT)*
CO-CHAIRS: Annika Weiser, *ITAS, KIT;* Veronika Stein, *ITAS, KIT*

Session 28 – Knowing Better, Doing Better: Stocktaking of the UN Agenda 2030
CO-CHAIRS: Sandra Venghaus, *Forschungszentrum Jülich; RWTH Aachen University;* Daniel Kammen, *Goldman School of Public Policy, University of California, Berkeley; Department of Nuclear Engineering;*
SPEAKERS: Magdalena Klemun, *Hong Kong University of Science and Technology;* Angel Hsu, *University of North Carolina at Chapel Hill;* Youba Sokona, *Special Advisor for Sustainable Development at South Centre*

Session 29 – Session of the New DKN Working Groups

Green Skills for Implementing Public Policy Programs
Daniel Reimsbach, *University of Paderborn*

Resilient Circular Economy 5.0 in a Global Context
Christian Wolf, *Cologne University of Applied Sciences;* Henning Wilts, *Wuppertal Institute for Climate, Environment, and Energy*

Critical Elements for the Energy and Climate Transition: Local Sustainability and Global Development of Georesources
Johan Lilliestam, *University of Erlangen-Nuremberg (FAU)*

Rethinking Sustainable Development Through Post Growth
Matthias Kranke, *University of Kassel*

Reforming European Biodiversity Protection (BIODIVREFORM)
Birgit Peters, *University of Trier*

Session 30 – Future Earth Discussion Session

10:00 – 10:30 ***Break***

10:30 – 12:00 Parallel Sessions and Workshops

Session 31 – Planning Cultures and Cultural Dimensions of the Energy Transition
CHAIR: Thomas Weith, *Research Institute for Regional and Urban Development (ILS)*
CO-CHAIR: Melanie Mbah, *Institute for Applied Ecology (Öko-Institut)*
SPEAKERS: Ingo Uhlig, *Institute for Climate Protection, Energy and Mobility (IKEM);* Sarah Friese, *Research Institute for Regional and Urban Development (ILS);* Jonas Marschall, *Research Institute for Regional and Urban Development (ILS);* Felix Zoll, *Leibniz Centre for Agricultural Landscape Research (ZALF);* Alexandra Doernberg, *Leibniz Centre for Agricultural Landscape Research (ZALF)*

Session 32 – Sustainability at the Origin: Mining as a Global Transformation Field
CHAIR: Anna Schomberg, *Sustainable Technology Design, Kassel Institute for Sustainability*
CO-CHAIRS: Stefan Lechtenböhmer, *Geography, Economics and Political Science, Kassel Institute for Sustainability*
SPEAKERS: Andreas Gutmann, *Law, University of Kassel;* Victor Maus, *Ecological Economics, Vienna University of Economics and Business;* Hannes Warnecke-Berger, *Political Sciences, University of Kassel*

Joint Session 33

Freshwater Ecosystems and Biodiversity: A Truly Cross-Cutting Topic, Missing at Future Earth
Sonja Jähnig and Sibylle Schroer, *Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB)*

Safe, Healthy and Environmentally Friendly Ship Recycling Through Automation
Stefan Groß, *Robotics and Mechatronics, RWTH Aachen University*

Co-Creation: More Than a Trend? Building an Interdisciplinary Approach to Joint Understanding Across Sustainability Research Stream
Mahsa Motlagh, *Kassel Institute for Sustainability;* Ina M. Sieber, *University of Kassel*

Session 34 – Metrology and Reliable Measurement Results Supporting Smart and Sustainable Decisions
CO-CHAIRS: Olav Werhahn, Joanna Freyse, Fabian Plag, Mareike Wilms, *Physikalisch-Technische Bundesanstalt (PTB), Germany's National Metrology Institute;* Céline Pascale, *Federal Institute of Metrology (METAS), Switzerland*

Session 35 – We're All in This Together: Shifting Roles of Scientists in the Socio-Ecological Transformation
CHAIR: Pavel Kambersky, *Future Earth, CNRS*
SPEAKERS: Gabriela Wuelser, *Swiss Academy of Arts and Sciences (SCNAT);* Wolfgang Cramer, *French National Committee to Future Earth;* Anke Schaffartzik, *Austrian National Committee to Future Earth;* Nana-Maria Grüning, *Charité Berlin*

Session 36 – Advancing Sustainability in Teaching and University: Best Practices and Challenges
CHAIR: Sarah Wedde, Franziska M. Hoffart and Stefan Lechtenböhmer, *Kassel Institute for Sustainability*

12:00 – 13:00 ***Lunch***

13:00 – 14:00 **Fishbowl Discussion:** "Advancing Sustainable Development"

14:00 – 14:30 **Summit Conclusions and Looking Forward**

14:30 **Goodbye**

2. Welcome Addresses by DKN and DFG

Daniela Jacob

Climate Service Center Germany – GERICS, Helmholtz-Zentrum Hereon

German Committee Future Earth (DKN)

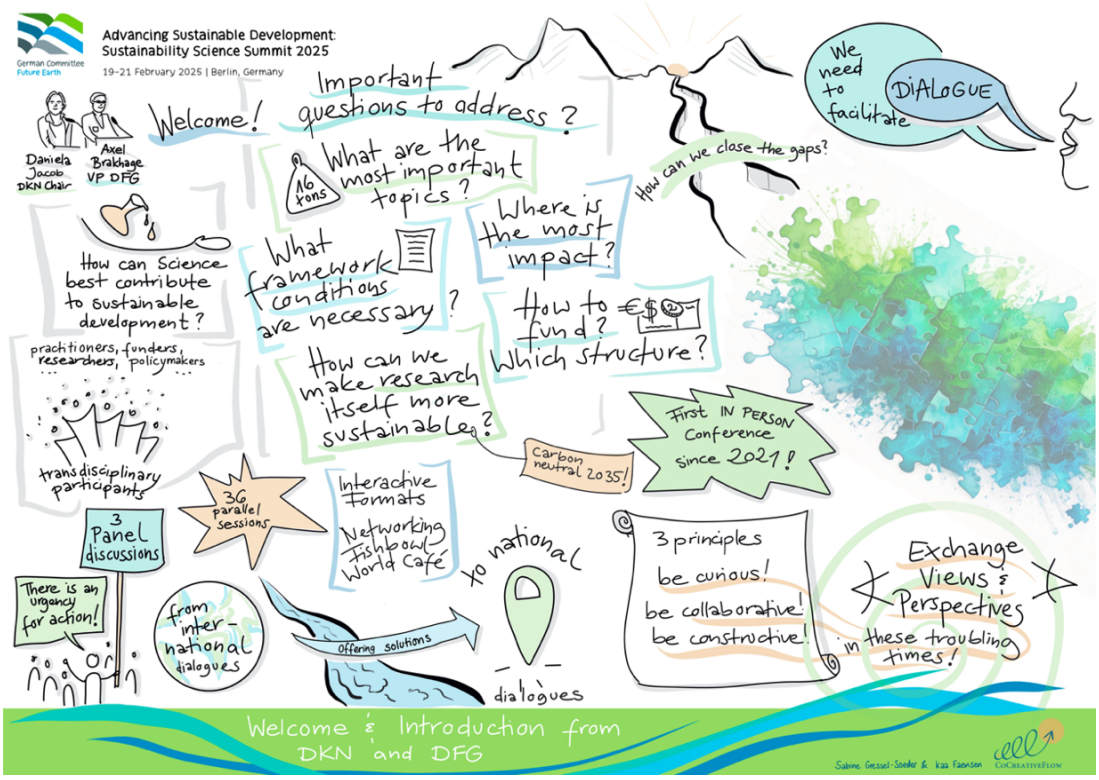
Good morning, dear colleagues and participants,

It is my great pleasure to welcome you to the Sustainability Science Summit 2025. Seeing this room filled with so many familiar and new faces is particularly special for us, as this marks our first in-person summit since 2021, when the pandemic forced us into a virtual format. For those who don't know me, I am Daniela Jacob, Chair of the German Committee Future Earth, also known as the Deutsches Komitee für Nachhaltigkeitsforschung, or DKN. I am the director of the Climate Service Center Germany (GERICS) at Helmholtz-Zentrum Hereon and visiting professor at the Leuphana University of Lüneburg.

Let me share with you why we gather here today. The umbrella theme of our summit focuses on a critical question: How can science most effectively contribute to sustainable development? This isn't just an academic exercise – it's about shaping the future of our planet and societies. We find ourselves at a crucial juncture where the role of science in driving sustainable development has never been more important.

The DKN, as an independent scientific advisory body to the German Research Foundation (DFG), serves as a vital bridge between national research efforts and international programs like Future Earth and the World Climate Research Programme. This positioning allows us to facilitate crucial dialogues between different stakeholders and across various levels of governance.

Over the next two and a half days, we will collectively explore three fundamental questions: First, what are the priority topics in sustainability research? In a world facing multiple crises, from climate change to biodiversity loss and rising authoritarian tendencies, we need to identify where our research efforts can have the most significant impact.



Graphic Recording: Sabine Gressel-Soeder and kaa Faensen

Second, what framework conditions are necessary to enable effective sustainability research? This includes discussing funding structures, institutional support, and collaborative mechanisms that can enhance our research capabilities. Third, and perhaps most reflectively, how can we make research itself more sustainable? This question challenges us to examine our own practices and methodologies. To address these questions comprehensively, we have structured an intensive program that includes 36 parallel sessions spread across six blocks. These sessions represent the cutting edge of sustainability research and practice, selected from many excellent submissions to our open call.

We are particularly proud to present three major panel discussions. This morning, we'll begin with international perspectives on sustainability science, featuring distinguished speakers from various institutions. Tomorrow, we'll examine the transformation of sustainability science itself, and later, we'll explore the crucial interface between science and policy. We've designed interactive elements to maximize engagement, knowledge exchange and community building. Today's networking session, tomorrow's World-Café, and Friday's Fishbowl discussion will provide opportunities for everyone to contribute their insights and experiences.

Looking around this room, I see scientists, funding representatives, policy experts, and practitioners. This diversity is not accidental – it's essential. The challenges of sustainable development cannot be solved in isolation. We need the synthesis of different perspectives, the fusion of various approaches, and the courage to think beyond traditional boundaries. As we begin this summit, I encourage you all to embrace three principles: Be curious – ask questions and challenge assumptions. Be collaborative – reach out to colleagues from different disciplines and sectors. And be constructive – focus on solutions and possibilities rather than just problems.

In a few moments, we will begin our first panel discussion on "Advancing Sustainable Development: Perspectives of International Sustainability Science." But before that, I would like to welcome Professor Axel Brakhage, vice-president of the German Research Foundation (DFG). We are very happy to have you with us today. We are looking forward to hearing some words from the DFG. We would like to thank the DFG for their generous funding for this event and for the good collaboration over many years. Dear participants, thank you for being here and for your commitment to advancing sustainability science. Let us make the most out of the next three days together. Thank you, and I wish us all a productive and inspiring summit.

Axel A. Brakhage

Vice President, German Research Foundation (DFG)

Professor Jacob,

Dear colleagues and friends,

Distinguished guests,

I am delighted to welcome you on behalf of the German Research Foundation (DFG) to the Sustainability Science Summit 2025. I am very grateful for the opportunity to speak to you and to get to know this extraordinary summit better – and, of course, to exchange views and perspectives with you.

On behalf of the President of the DFG, Prof. Katja Becker, whom I represent here today as Vice-President, I would like to express our gratitude and thanks to the German Committee Future Earth (DKN) for organising this three-day summit. And for hosting it in this remarkable venue, the Umweltforum, which is also highly committed to sustainability – with its self-generated green electricity, honey from the roof, clay plaster walls and solar façade.

The summit not only continues the important series of German Future Earth Summits that the DKN has been organising for more than ten years (since 2014). More importantly, it also provides a valuable forum for the exchange of the latest scientific findings and trends in sustainability research within and across disciplines, as well as on activities within Future Earth and the World Climate Research Programme.

Some of the key questions the summit will address include how to bring together the wealth of knowledge already available on global change and sustainable development, how to make this knowledge more fruitful by combining and scaling it up, and how to consider the impact that science can have on the implementation of the 2030 Agenda.

These questions are all the more pressing as many societies may not be able to achieve the SDGs by 2030. There is an urgent need for action, particularly in the areas of climate and sustainability. Unfortunately, this is increasingly being overshadowed by the various crises. Ambitious action at all levels is therefore essential to achieve the SDGs, and science and research can open up a variety of pathways to greater sustainability and resilience.

One might ask, however, whether the current global science system is well positioned and organised to enable scientists to contribute effectively and comprehensively to finding solutions and responding to global challenges. Given their immense scale, it may sometimes seem difficult to mobilise the necessary resources, which are often dispersed at national and, in some cases, international levels.

Fortunately, sustainability researchers can rely on a wide range of different institutions to advocate the importance and promotion of sustainability research. These institutions operate at all levels, from the Global Research Council, to which I will return in a moment, or the International Science Council, through the EU research programs and to the Future Earth Network.

As the central self-governing research funding organisation in Germany, the DFG focuses on funding of knowledge-driven research projects developed by the scientific community itself. In doing so, the DFG takes particular care to promote international cooperation, early-career researchers, gender equality and diversity in the sciences and humanities. The DFG is also pursuing its goal of advancing sustainability through research funding and its own actions.

In recent years, the DFG has set sail to fulfil its own responsibility, promoting sustainability in three dimensions:

The first dimension lies in funding research activities that contribute to knowledge for the benefit of sustainable development. Thousands of DFG-funded individual projects contribute to the SDGs. In addition, the DFG funds several large consortia that address sustainability issues, such as the renowned German Centre for Integrative Biodiversity Research (iDiv). Moreover, the DFG provides institutional support to the German Committee Future Earth and promotes sustainability in the broader science policy context.

In the second dimension, the DFG is taking an active role in integrating sustainability into research practices. To this end, a special Commission on Sustainable Research Practices, chaired by the President, has been established to develop reasonable standards for sustainable research processes across all disciplines. This Commission, composed of legal scholars, sustainability experts and researchers from

disciplines with a high potential for climate-damaging practices, published a Recommendation Paper that was critically reviewed and formally adopted by the DFG Senate.

The Recommendation Paper focuses primarily on environmental sustainability, ensuring that both scientific freedom and the quality of research remain uncompromised while promoting responsible practices. Since September 2024, thus, researchers must reflect on sustainability in their proposals, fostering a culture of awareness and responsibility. The DFG supports this process through discipline-specific guidance, best-practice examples, and a catalogue of sustainability questions that encourage reflection on resource-saving research methods without imposing rigid constraints.

The third dimension aims to achieve carbon neutrality in our own operations by 2035. This includes a variety of approaches to the sustainable orientation and management of the Head Office, from building management, travel policy and review processes to all administrative procedures and processes.

In its efforts to promote sustainability, the DFG is pursuing a 'learning process' that offers flexibility for development and adaptation. At the same time, it aims to stimulate the creativity of the individuals and organisations involved to drive change in the research system. In addition, consultations with the German Rectors' Conference will address the role of universities in sustainability and consider their infrastructure and resource needs.

In light of the upcoming federal elections, the DFG will furthermore publish an impulse paper for the next legislative period, outlining key areas for action and recommendations for setting the political course. As part of it, we will of course acknowledge the crucial role played not only by sustainability, but also by international science and research cooperation.

At the international level, too, the DFG is engaged in fruitful cooperation for greater sustainability. A number of successful examples illustrate our tireless commitment: One is the GRC Annual Meeting 2024, which also focused on the three key dimensions mentioned above: research for sustainable development, making research itself sustainable, and ensuring that sustainability science has a lasting impact. The 'Statement of Principles on Sustainable Research' was adopted, emphasising responsibility, international cooperation and societal relevance. Another good example is the excellent cooperation with partners from the Belmont Forum, a large transdisciplinary network of funding organisations from almost 30 countries around the world.

After all, we believe that by working together, we can integrate sustainability into research and ensure that science continues to serve society and future generations in a responsible way. Let us therefore take the opportunity of this conference to deepen our reflection on how research and research organisations can best work together to contribute to sustainable societies.

In this spirit, I wish you an inspiring conference! Enjoy the rich power of collective reflection and exchange!

Thank you very much.

3. Panel Discussions

3.1 Advancing Sustainable Development: Perspectives of International Sustainability Science

Speakers

Anna-Katharina Hornidge
German Institute of Development and Sustainability (IDOS)

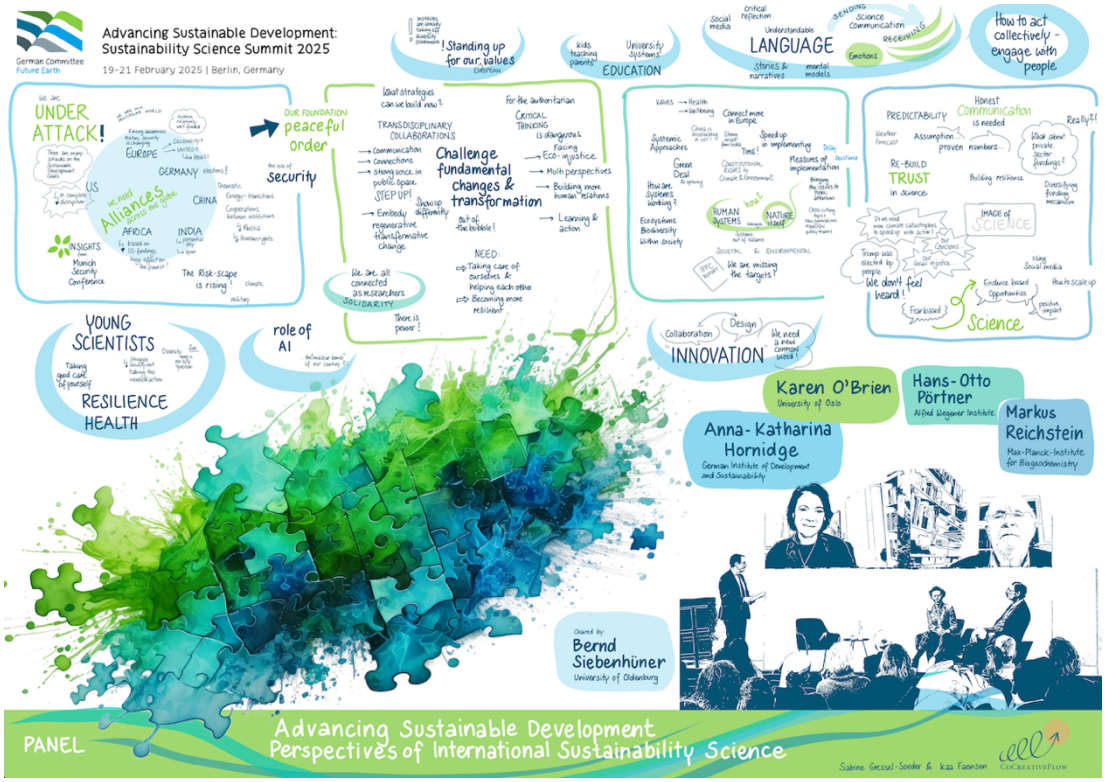
Karen O'Brien
University of Oslo

Hans-Otto Pörtner
Alfred Wegener Institute

Markus Reichstein
Max Planck Institute for Biogeochemistry

Chair

Bernd Siebenhüner
University of Oldenburg



Graphic Recording: Sabine Gressel-Soeder and kaa Faensen

Key points

The panelists highlighted the political context and challenges for sustainability science, including geopolitical shifts and attacks on research. The speakers identified key themes, such as the need for stronger international alliances, improved science communication, and educational reforms to support sustainable development.

Summary

The discussion began with the political and global context of the Summit, including a reminder of increasing attacks on sustainability science and impressions from the Munich Security Conference (MSC), held shortly before the Summit. At the MSC, the US was perceived as dismissive of fact-based discourse, China and India positioned themselves as potential partners in global governance, the EU acknowledged the necessity of military investment, and the destabilizing effects of climate change on vulnerable regions were discussed in relation to migration and European security. Among the Summit panelists, a requirement of progressive alliances among high-, middle-, and low-income countries to strengthen the 2030 Agenda was identified.



Photograph: Nadine Stenzel

Following this introduction, the topic of transformative change in relation to sustainability science emerged as a key factor. The need to reconnect people with nature was aligned with the key principles of justice, pluralism, inclusion, and respect for human-nature relationships. The panelists recognized the role of authoritarian regimes in restricting scientific inquiry and sustainability discussions, the necessity of transdisciplinary research and citizen engagement, and the importance of international solidarity with researchers facing political suppression.

The discussion then turned to environmental goals; one challenge identified by the IPCC's Working Group 2 was the strong influence of lobbyists and political interests on policy decisions. Further ideas touched on societal education, the media's role in amplifying sustainability concerns, and a request for assertive sustainability science leadership to be carried out by the EU. Additionally, the panelists suggested promoting science communication and public engagement by avoiding fear-based narratives (instead, rather emphasizing "innovation" as a positive narrative to foster public and political support) and focusing on data-driven storytelling, engaging younger audiences through digital platforms like TikTok, and, importantly, strengthening trust in science by maintaining a balance between advocacy and factual precision. Notably, the diversification of funding resources to reduce dependence on national budgets was a key argument.

Concerning the status of science cooperation, the panelists debated the increasing influence of big technology firms in shaping research and policy and warned of bowing to corporate interests. Private companies partly listen to science but nevertheless also act in self-interest. In this context, the EU's AI Act and regulatory frameworks were cited as crucial policy instruments, along with the need for science-to-science collaboration particularly in politically challenging contexts.

The audience interacted with the panelists regarding the role of AI in sustainability, the need for better science-policy interfaces, and the future of open science. They raised concerns about the mental health and career sustainability of early-career researchers, highlighting the need for structural support. Finally, the panelists reinforced the importance of resilience, proactive engagement, and maintaining pressure on political systems to advance sustainability transformations.

The session concluded with a call to strengthen international alliances for sustainability research, to develop more effective science communication strategies, to promote educational reforms that integrate sustainability topics, to support young scientists and ensure equitable funding mechanisms, and to advocate for policies that protect scientific independence from political interference. All in all, the discussion underscored the urgency of sustainability challenges while emphasizing the potential for scientific collaboration and societal engagement to drive transformative change.

3.2 Transformation in Sustainability Science – Transformation of Sustainability Science

Speakers

Christiane Joerk
German Research Foundation, DFG

Marco Fritz
DG RTD, European Commission

Stefan Bartke
German Environment Agency

Daniela Jacob
Climate Service Center Germany – GERICS, Helmholtz-Zentrum Hereon

Chair

Michael Bollig
University of Cologne

Key points

The panelists highlighted the need for appropriate frameworks and funding for sustainability science, emphasizing interdisciplinary and transdisciplinary approaches. They conveyed the importance of clear communication between science and society, and the role of institutions in this context. The discussion participants also stressed the necessity of national and European funding opportunities, and the integration of sustainability into research agendas.

Summary

The panel discussion began with a focus on frameworks for sustainability science, addressing obstacles, funding interlinkages, research institutions, and modes of knowledge. Panelists emphasized the importance of multi-, inter-, and transdisciplinary approaches. They discussed how career settings influence sustainability science, highlighting the role of frameworks in supporting these approaches.



Graphic Recording: Sabine Gressel-Soeder and kaa Faensen

Several speakers from agencies and research institutions explained their research and funding strategies. For instance, the UBA (German Environment Agency) was portrayed as bridging science and society. It fosters a systemic approach, collaborating with other European environmental agencies, and aims to be actionable by collecting research needs and matching them with funding mechanisms. In comparison, the DFG (German Research Foundation) discussed the challenges posed by the new US administration, such as travel restrictions and funding cuts, and the potential impact on the European research system. Despite these challenges, the DFG focuses on coordinated programs to finance sustainability research, with 20% of projects linked to sustainability, and encourages proposal submissions. The European Commission's Horizon Europe program, the world's largest research and innovation program, announced that it is planning a new round that may not prioritize sustainability. However, it may support interdisciplinary projects, including those on biodiversity. Panelists agreed on the need for improved cooperation between the EU and member states, accelerated research output, and better research translation and policy implementation. They also stressed the importance of universities embracing transdisciplinary research.

Afterwards, transdisciplinary research was discussed in depth, with thoughtful reflections on aspects such as funding, eligibility for PhD students, and its epistemological underpinnings. While early tensions between transdisciplinary and disciplinary research have largely subsided, several speakers emphasized the importance of continuing to embed transdisciplinary research more fully within the scientific community. Advancing high-quality transdisciplinary research will benefit from supportive institutional structures and broader recognition, which are essential for attracting sustained funding and fostering innovation.



Photograph: Nadine Stenzel

Discussants also addressed the difficulty of monitoring research output and impact after the conclusion of project funding and the short timeframes for contributing to political discussions. A system change was suggested to better manage funded research projects and ensure their findings are implemented. Examples from Germany on translating IPCC results were highlighted. The audience discussion included the challenge of translating scientific findings for the public, preparing for developments like those in the US, and lessons from Brexit. An audience member pointed out the difficulty of connecting research and public administration in Germany.

The limited appreciation of scientific work in public administration was emphasized, with a call for the most qualified labor rather than the cheapest. There was a discussion on whether federal agencies should focus more on implementing research rather than competing for research funding. The sustainable use of human capital, knowledge, and infrastructure was stressed, suggesting that the success of research projects should be measured by their contribution to the public good.

In the final remarks, the need to accelerate career perspectives was emphasized. There was a suggestion that framing sustainability as a distinct academic field could offer certain advantages, including potential administrative simplifications. In conclusion, collaboration, understanding different research needs, and the sustainable use of newly generated knowledge were underscored, along with a call to rethink the structures and responsibilities of science communication.

3.3 Science-Policy Interface: Challenges and Opportunities

Speakers

Katrin Böhning-Gaese
Helmholtz Centre for Environmental Research

Mark Lawrence
Research Institute for Sustainability

Jakob Lundberg
Future Earth

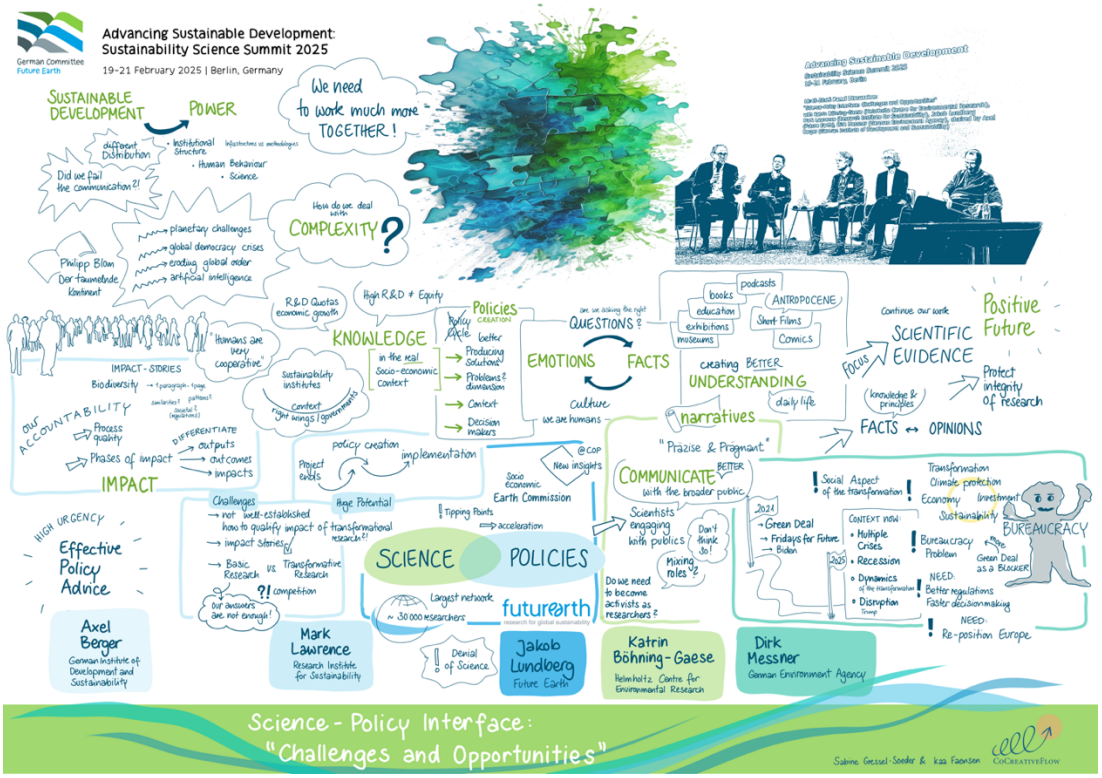
Dirk Messner
German Environment Agency

Chair

Axel Berger
German Institute of Development and Sustainability Key points

Key points

The discussion highlighted the need for scientists to distinguish between activism, advocacy, and research to ensure public understanding. It emphasized the importance of integrating sustainability into core discussions despite the current global crises. The role of public engagement and effective science communication was underscored, along with the need for balancing precision with emotional engagement. The panel discussion concluded with calls for interdisciplinary collaboration, improved science-policy communication, and stronger global cooperation to advance sustainable development.



Graphic Recording: Sabine Gressel-Soeder and kaa Faensen

Summary

A reflection of the position of scientists in society opened the discussion: The speakers suggested that scientists should distinguish whether they use their voices as researchers, activists or advocates to ensure public understanding. The necessity for science to integrate solution labs, transformative science, and responses to stakeholder demands into traditional system knowledge was confirmed.

A focal point was the question of how to return sustainability to the core of discussions, considering the current multiple crises. In this context, the panel argued that first, without climate protection, long-term wellbeing and economic stability is impossible. Second, climate protection and sustainability investments do not per se undermine economic development. Third, climate neutrality transformations do not automatically push an economy towards more wellbeing. In the context of the European Green Deal, participants called for leaner regulation and acceleration of bureaucratic decision processes. In the face of rising right-wing populism, the security-oriented repositioning of Europe was proposed along with a defense of the European Green Deal.

Afterwards, the speakers argued that the scientific community needs to continue to develop quantifiable evaluation approaches for transformative research to fulfil its potential. While evaluating projects, the process quality, outputs, outcomes and impacts should first be reviewed separately and then in connection with each other. Funders were encouraged to embed impact evaluation time within the funded period. For researchers, evaluation was portrayed as learning rather than as accountability.



Photograph: Nadine Stenzel

This conversation was followed by a presentation of the Future Earth organizational structure, mission and history, highlighting its focus on transdisciplinary research and the science-policy interface. The Earth Commission was mentioned as a key initiative shaping global sustainability research.

Concerning public engagement and science communication, the influence acted out by public opinion was described as crucial, as it pressures political decision-making. Scientists themselves must be 'precise and concise', while emotions strongly influence political decisions, and engaging communication methods are necessary. In the context of policy influence, the types of knowledge needed to influence decision-making were addressed.

The discussion continued with a broader conversation on the insights from psychological and social sciences. The role of psychologists and anthropologists in understanding how decision-makers react to

scientific messages was highlighted, along with the importance of human cognition and cooperation in building institutions that mobilize collective action.

Importantly, the critical role of traditional power structures resisting sustainability transitions was underscored. The key mechanisms mentioned in this context included the fossil fuel lobby, institutional inertia, resistance to change at an individual level, and the ineffectiveness of the post-WWII global governance order in managing planetary crises. The need for stronger scientific partnerships to counteract misinformation and political resistance was accentuated, along with a call to frame sustainable development as an opportunity rather than a loss of power.

The discussion concluded with calls for stronger (interdisciplinary and global) collaboration between scientists, policymakers, and the public, for science communication to balance precision with emotional engagement to resonate with different audiences, for scientists to develop strategies to navigate political resistance, and a reminder that education and media engagement play a critical role in countering misinformation and increasing public trust in science.

4. Parallel Sessions and Workshops

4.1 Changing Plates: Meat Alternatives as Key to Sustainable Eating (DKN Working Group "Meat Alternatives for a Nutrition Transition")

Chair

Frederike Neuber
University of Rostock; Kiel University

Co-chair

Florian Antony
Institute for Applied Ecology (Öko-Institut)

Working group members

Anne Klatt
German Environment Agency

Sebastian Lakner
University of Rostock

Britta Renner
University of Konstanz

Melanie Eva-Maria Speck
Osnabrück University of Applied Sciences

Achim Spiller
University of Göttingen

Stephanie Wunder
Agora Agriculture

Cäcilia von Hagenow
The Nature and Biodiversity Conservation Union (NABU e.V.)

Session abstract

A dietary shift away from conventional meat is mandatory. While this mandate is coined for Western societies, it also applies to other cultures that currently increase their meat consumption. There are multiple, well-known reasons why meat consumption ought to drop drastically, such as animal-ethical and ecological considerations. Yet, while meat consumption has dropped, it has neither dropped enough nor quickly. At this rate, the current food system will continue to contribute to substantial ecological overshoot, animal cruelty and social injustices. We are in need of different levers and options to enhance the transformation of the current food system. Specifically, we need to refrain from promoting the perfect solution (legumes, seeds and vegetables as part of a vegetarian diet) as the only solution. Instead, we want to open up the discussion to many different "good enough" solutions, in order to establish a pool of food options to serve a variety of ethical values, dietary preferences and economic interests within specified "sustainability boundaries".

4.2 Adaptive Governance for Sustainable Coastal Systems: Insights from the German North Sea Coast

Chair

Bernd Siebenhüner & Cormac Walsh
Carl von Ossietzky University of Oldenburg

Speakers

Ernst Schäfer, Lara Saalfrank, Evke Schulte-Güstenberg, Cormac Walsh
Carl von Ossietzky University of Oldenburg

Key discussion points

- Main findings: Effective governance for coastal adaptation requires multi-stakeholder partnerships supporting collaborative working among practitioners and researchers from both natural and social science disciplines. Knowledge transfer must be place-based and context-specific. Transdisciplinary processes support mutual learning for climate adaptation. Visualizations of future scenarios for coastal adaptation provide an important means of communication concerning possible and plausible coastal futures. A regeneration paradigm offers possibilities to move beyond sustainability and nature conservation, linking socio-ecological and nature restoration perspectives through innovative practices.
- Supporting evidence or specific examples (e.g. case studies): Case Studies from North Sea / Wadden Sea coast and coastal hinterland of Lower Saxony (Eastern Frisia) and wider Wadden Sea context.
- Methodologies/tools or technological aspects: Transdisciplinary methods, qualitative social science.
- Practical implications or applications (potential impacts or significance: Working directly with local practitioners to co-design solutions to current problems and challenges.
- Policy implications: Need for greater attention to local and regional contexts in climate adaptation. Need for recognition of long-history of adaptation to sea-level rise at the North Sea coast. Potential for greater integration of nature conservation/restoration and sustainable transformation policy agendas.

Summary of the most important questions and answers:

- (Perceived) increased uncertainty associated with nature-based solutions – need to find new ways to cope and live with uncertainties (moving beyond traditional engineering thinking in coastal management).
- Managing expectations of stakeholders in transdisciplinary processes were acknowledged to be a challenge. Parameters need to be clear from the beginning.
- Challenges of technical and societal adaptation – often technical solutions exist but bigger challenges can be changing mindsets, behavioral change (example of managed treat in response to flood risk on Wadden Sea islands).
- Do we see a change in attitudes over time, e.g. from one project to the next? Do / how can we measure this? This has not been the focus of our research and would require other methods (e.g. large-scale surveys). It is perhaps something that can be considered in future work.
- To what extent can 'ecosystem services' act as a boundary object (specific for individual transdisciplinary project contexts)? In this case (FutureProof Grasslands), it was effective, although there was no agreed common understanding of what ecosystem services are.

Audience engagement, reactions, or feedback:

- Audience engagement and feedback were very positive, particularly concerning the coherence of the four presentations and underlying projects.

Conclusion and action items

- The session highlighted the value of context-specific and regionally focused research on climate adaptation as the overall impact of multiple projects is more than the sum of each individual project.

They are embedded in and support wider processes of learning. Global problems require local solutions.

4.3 Systemic Sustainability: A New Chapter of Inter- and Transdisciplinary Sustainability Science

Chairs

Jochen Schanze
Leibniz Institute of Ecological Urban and Regional Development (IOER)

Dieter Gerten
Potsdam Institute for Climate Impact Research (PIK)

Miriam Prys-Hansen
German Institute for Global and Area Studies (GIGA)

Katharina Helming
Leibniz Centre for Agriculture Landscape Research (ZALF)

Speakers

Jochen Schanze
IOER

Dieter Gerten
PIK

Katharina Helming
ZALF

Anette Ruml
German Institute for Global and Area Studies (GIGA)

Moderator

Raghid Shehayeb
Leibniz Institute of Ecological Urban and Regional Development (IOER)

Key discussion points

- 'Systemic sustainability' as an advanced sustainability concept follows a systems approach for the cross-scale interlinkages between the Earth system and societal systems with their specific characters and dynamics
- Systemic and cross-scale key interactions between Planetary Boundaries should be considered to reduce the current transgression of six out of nine Planetary Boundaries
- Agricultural and food systems transformation pathways need to be further elaborated and tested under real-world conditions based on inter- and transdisciplinary research
- Value chains are critical for systemic sustainability as it can be depicted by examples from agriculture and food supply
- 'Systemic sustainability' is anchored in the SES and SETS discourses
- This novel perspective can advance the foundation of systemic innovations and hence be highly relevant for policy and practice.

Conclusion and action items

- 'Systemic sustainability' involves a high potential for a more comprehensive and dynamic understanding of sustainability
- Its conception and operationalization bear on existing research and innovation, but beyond focuses on novel cross-scale and emergent tasks of the sustainability transformations of systems involving inter- and transdisciplinary research
- The co-chairs invite all interested colleagues to participate in this recent initiative, particularly in the frame of the Leibniz Lab "Systemic Sustainability" (ll-systain@ioer.de).

4.4 Shifting Fisheries Towards Sustainability: Lessons from the Collapse of the Cod Fishery in the Western Baltic Sea

Chair

Martin Quaas
University of Leipzig; German Centre for Integrative Biodiversity Research (iDiv)

Speakers

Stefan Baumgärtner
University of Freiburg

Robert Arlinghaus
Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB); Humboldt University of Berlin

Christian Möllmann
University of Hamburg

Panelists

Alexandra Blöcker
University of Hamburg

Marie Riekhof
Kiel University

Harry Strehlow
Thünen Institute of Baltic Sea Fisheries (TI)

Key points

The Western Baltic Western Baltic Sea can be seen as a data- and experience-rich 'time machine' into the future of the world's marine ecological-economic systems under changing climatic and socio-economic conditions. It has experienced much stronger climate change than the global average, with up to 3 degrees warming over the past 50 years. It is also extraordinarily rich in data and information, with decades of intensive research in this area. Yet, it can also be seen as an example of unsustainable use of a natural common pool resource, given the decades of overfishing especially of the cod fishery, one of the historically most important fisheries for the region. The cod stock has collapsed, and this collapse has not only been detrimental to the fishery, but it has also found a lot of attention in the German public. Three presentations addressed specific aspects of the question how to use the experience of the Western Baltic Sea to analyze what leads to unsustainable fisheries outcomes, study an on-going process of reorganization after collapse, and explore pathways how to tip such an ecological-economic system into a regime of sustainability.

Stefan Baumgärtner introduced concepts of how to attribute causal responsibility to unsustainable outcomes. Using an empirical model, the presentation quantified the causal responsibilities of overfishing and climate change for the collapse of the Western Baltic cod stock. Christian Möllmann presented scenario planning as a method to support the sustainability transformation and demonstrated the suitability of this method using the Western Baltic fisheries as a case study. Robert Arlinghaus considered the substantial past and on-going changes in the Western Baltic fisheries and analyzed the behavioral and psychological responses to tipping and collapse of the Western Baltic cod stock, focusing on recreational anglers. He presented results from a large panel study of recreational cod and pike anglers before and after the introduction of a restrictive bag limit as an instrument for regulated resource use by the anglers.

Key discussion points

- Both the audience and the panel engaged in lively discussions about the session's topic. The following list summarizes a couple of main conclusions from the presentations and discussion.
- The collapse of the Western Baltic cod stock is an important example of unsustainable use of natural common pool resources.

- Stefan Baumgärtner showed that by 75%, the fishery is causally responsible for the collapse, and by 18% the collapse can be attributed to climate change, albeit these point estimates come with substantial uncertainty.
- Being able to demonstrate causal responsibility is a prerequisite for normative responsibility, which should be allocated to actors of the sustainability transition.
- The presentations and discussions showed several scenarios towards sustainability of the Western Baltic Sea, including scenarios where the fishery plays an important role, with this associated the rebuilding of fish stocks or the use of new fisheries resources. Other scenarios of sustainability include conservative use of the Western Baltic Sea with much less emphasis on extractive use by fisheries.
- An ecosystem-based approach to fisheries management, which adopts a holistic perspective on ecosystem, uses, conservation, and their social values, could be a major step forward. Some participants would also welcome a participatory, transdisciplinary approach to overcome the divide between research and fisheries.
- The recreational anglers are a group of particular interest for sustainability, as they benefit from both extractive and non-extractive uses of the ecosystem.

Conclusion and action items

- Sustainability faces the challenge of huge uncertainty about the future of ecosystems in the face of global change.
- As the ecosystems on land and in the water are connected, an integrated management of fish and the natural environment on land and in the water is needed, which requires more collaboration also in sustainability science.
- Sustainability actions should allow for trial and error and emphasize reversible interventions.
- Trust between science and stakeholders is essential, especially given the complexity and uncertainties in the sustainability transition.
- Open science and transparency are generally important for science, but they are particularly important for sustainability science for trust-building.
- Open science includes that science is open for the knowledge demands of society for the sustainability transition.
- Especially in transdisciplinary sustainability research, we need to establish standards of transparent and open science. This could be a task for DKN.

4.5 Evaluating Sustainability Impacts of Living Labs and Real-World Laboratories

Chairs

Justus von Geibler
Wuppertal Institute for Climate, Environment, and Energy

Martina Schäfer
Centre for Technology and Society (ZTG)

Speakers

Martina Schäfer
Centre for Technology and Society (ZTG)

Justus von Geibler
Annalena Präger
Wuppertal Institute for Climate, Environment, and Energy

Aim of the session

- Sharing conceptual insights about the impact evaluation of Living Labs (LL) and Real-world Laboratories (RwL)
- Sharing practical experiences from the impact monitoring and evaluation (M&E), with focus on the cases of the BioVal project and the Green-AI Hub Mittelstand
- Discussing challenges and benefits of impact M&E and identifying research needs to further improve impact M&E of LL and RwL

Key discussion points

- Audience engagement in the session (with about 40 participants), reactions and feedback were very good and led to a fruitful discussion.
- Both cases of M&E presented have been acknowledged as good practice of M&E. The theory of change/impact logic has in both cases been an important basis for a successful impact evaluation.
- Quantitative results of M&E can be very supportive for communicating results of LL and RwL, however, they bear the risk of false conclusions or statements that are too universal. Quantifying impacts is more challenging than quantifying outputs or other direct effects of interventions.
- It is necessary to include unintended effects (e.g., rebound effects) and the perceptions of people in M&E.
- The monitoring/evaluation design is not neutral; it can cause (intended and unintended) changes in the living labs/research projects itself.
- Differences between “living lab” and “classic” research projects in M&E: LL research is much more collaborative, engaging various stakeholders; results of the LL evaluation can be used to improve the transdisciplinary research process.
- Opposing opinions on the value of standards for M&E: Standards on M&E concepts can be helpful but also difficult since projects are too different.
- Balance between accuracy and usability of the evaluation is a challenge, especially in smaller projects.

Conclusion and action items

- A theory of change/impact logic is an important basis for successful impact-oriented monitoring and evaluation. Unintended effects should be taken closer into consideration.
- Funding for impact evaluation 3-5 years after the projects ended is needed to make an evaluation of mid- and long-term impacts more accurate.
- For the German speaking researchers and practitioners, the Gesellschaft für Transdisziplinäre und Partizipative Forschung e.V. (GTPF) is a good forum to discuss these points further. Also, the network “Reallabore der Nachhaltigkeit” offers opportunities for further exchange in Germany.

4.6 Regenerative Business: Complement of or Substitute for Corporate Sustainable Development?

Chairs

Julia Benkert
Jakob Strobel
Jacob Hörisch
Centre for Sustainability Management, Leuphana University Lüneburg

Speaker

Simon Berkler
TheDive

Key discussion points

The concept of regeneration was discussed in relation to established frameworks of sustainable development with the objective to better understand how management-oriented sustainability science can contribute most effectively to sustainability transformations. Based on the framework put forward by Reed (2007), it was discussed that established sustainable development frameworks are focused on eco-efficiency, the decoupling of resource use from economic growth, and the reduction of unsustainability, e.g. to a net-zero state. The concept of regeneration on the other hand acknowledges deep relationalities and interdependencies in the socio-ecological system and provides a lens for considering "positive sustainability" that goes beyond the goal of simply reducing harm to actively restoring ecosystems and regenerating natural and social capital.

Conclusion and action items

Taking the perspective of regeneration as a substitute for sustainability challenges traditional sustainability frameworks that focus on maintaining the status quo, proposing regenerative models as a more ambitious and necessary strategy for long-term planetary health. This also challenges conventional ways of conducting sustainability research, as it requires businesses and other organisations to undergo deep paradigm-shifting transformations. At the end of the session, ideas were collected on how sustainability science can engage with practitioners and non-academic stakeholders to co-create impactful research that promotes a regenerative economy. At the epistemological levels, this requires an opening towards more relational ways of knowing, which include storytelling, multi-stakeholder dialogue or even alliances, and transdisciplinary collaboration as modes of enquiry, grounded in principles of inclusivity, relationality, and normativity. The small group size in the session enabled a deep exchange between participants, and contact details were exchanged for further exchange on the topic.

Resources to consider

Fischer, J., Farny, S., Abson, D. J., Zuin Zeidler, V., von Salisch, M., Schaltegger, S., ... & Kümmerer, K. (2024). Mainstreaming regenerative dynamics for sustainability. Nature Sustainability, 7(8), 964-972.

Reed, B. (2007). Shifting from 'sustainability' to regeneration. Building Research & Information, 35(6), 674-680.

Institute for Practical ekoPhilosophy: https://www.institute-pep.com/

Berkler, S., Lagé, E. (2024). Der Stellar-Approach. Wie deine Organisation zum regenerativen Wandel der Wirtschaft beiträgt. Campus Verlag.

4.7 Inequality Beyond Money: Data, Indicators, Causality, and Modelling for Sustainability Transformations

Chair

Stefan Pauliuk
University of Freiburg

Co-chairs

Peter-Paul Pichler
Potsdam Institute for Climate Impact Research (PIK)

Christian Hauenstein
University of Freiburg

Roundtable facilitators

Stefan Pauliuk
Christian Hauenstein
University of Freiburg

Jakob Napiontek
Benedikt Bruckner
PIK

Key discussion points

- There was strong support for the relevance and timeliness of the topic.
- The topic of socio-metabolic inequality bridges discourses on justice implications between human development (e.g., via the HDI) and ecological implications of human activities (e.g., via the EF).
- Income and wealth are no sufficient proxies for wellbeing, because
- Many contributions to wellbeing arise from in-use stocks (infrastructure, appliances, self-owned houses), which are not part of economic accounting
- Many contributions to wellbeing are spatial, such a proximity to public transport and the quality thereof, which is not part of economic accounting
- Many contributions to wellbeing are dependent on the interplay of different factors: density, infrastructure, regulations, zoning of building types in cities, which are not part of economic accounting.
- Agent-based and system dynamic models can be key to exploring the impact of decisions on socio-metabolic inequality.
- Scenarios including inequality at the city scale map the solution space for sustainable development; transformation pathways depict the sequence of decisions needed to get there.
- Inequality, including socio-metabolic inequality, can result from regulation and from peoples' traits and tricks (in case of mistrust) as well as lifestyle factors.
- Framework first – data first? The goal is to have the data gathering largely independent of the causal framework, but this requires careful work, since the normative and causal framework applied later determines data needs to some extent, and data/indicators chosen are not completely independent of the framework. Way forward: review different causal and normative frameworks to explain wellbeing outcomes and synthesize them into one that's generally applicable and derive a broad and consensus-based indicator set from that common framework.
- Check out a potential major data source: The Berlin environmental inequality map (covering public health (air quality), physical infrastructure (street density) and income)!
- The role of digital infrastructure in socio-metabolic inequality must be studied
- The role of cultural contexts needs to be considered as they influence subjective well-being.
- Related fields of study/theory: environmental justice; social practice theory (individuals embedded in social practices, as well as material practices).
- Case studies would be useful to describe the stock-flow-service nexus in action and then generalize the framework for different contexts.

Conclusion and action items

- To keep up the momentum on this topic, there are currently two funding applications in the pipeline, one at Uni Freiburg and one at PIK.
- Several session organizers are part of an ongoing IRP project on city-level scenarios (https://www.resourcepanel.org/), and they will push to include the socio-metabolic inequality dimension into this work.
- We are considering applying for special sessions at scientific conferences on the topic.

4.8 Boundaries in Inter- and Transdisciplinary Sustainability Research – Boundaries as Integration, Boundaries of Integration

Chairs

Fanny Frick-Trzebitzky
Institute for Social-Ecological Research (ISOE)

Linda Söller
Goethe University Frankfurt

Keywords

Interdisciplinarity, Transdisciplinarity, Boundaries, Boundary Objects, Integration

Key points of discussion

The session aimed to explore how epistemic and methodological boundaries in inter- and transdisciplinary research can be identified, critically reflected upon, and, where appropriate, overcome in order to advance transformative sustainability research. The discussion was informed by reflections from the junior research group regulate (https://regulate-project.eu/), which investigates inter- and transdisciplinary approaches to sustainable groundwater management in Europe and discussed in relation to participants' experiences. We thank all session participants for a committed discussion.

3 types of boundaries in sustainability research were examined from multiple perspectives and experiences, with the following insights:

Epistemic boundaries in ITD

- Epistemic lenses in inter- and transdisciplinary scenario processes set boundaries as to the kind of decision support a scenario aims to and can provide, from objectivity to consensus and appreciation of diversity.
- System boundaries are similarly defined in disciplines and fields of practice deploying modelling; a combination with social sciences research allows asking: what are the things left out, what effects exist beyond the boundaries of the system at hand?
- The inclusion or exclusion of topics (definition of the boundary object) inherently shapes boundaries within transdisciplinary projects

Boundaries as research objects in their own right

- Physical boundaries in landscapes (such as dikes) influence ways of knowing flood risks (epistemic lenses) and thus policies and societies
- Institutional boundaries can serve as justifications for delaying or avoiding sustainability measures.

- Telecoupling is a concept that addresses flows across social-ecological system boundaries and serves as a boundary concept in addressing sustainability issues

Boundaries of integration

- Power dynamics—such as the influence of scientists leading the process—play a crucial role in determining which topics are prioritized. Ideally, guidelines for transdisciplinary research should ensure that both scientific and practical relevance guide these boundaries, fostering an equitable integration of knowledge from academia and practice.
- A tension between the aspiration of consensus-building in transdisciplinary projects and the importance of acknowledging diverse perspectives on sustainability issues exists. Reflecting incompatibilities of epistemic lenses and ensuring that topics omitted due to a focus on consensus are still addressed in scientific research. One proposed strategy for addressing this challenge is to foster collaboration without requiring full consensus at every stage.
- To overcome and reflect boundaries, joint field activities between disciplines and practitioners were suggested to enhance integration and mutual understanding.

Combining integrative and pluralist lenses in ITD research was discussed as increasingly relevant in times of growing populism and science skepticism.

4.9 Engaging the 3-Horizons for Transformative Sustainability Science: A Methods Workshop and Reflective Exercise for Asking 'the Right Questions'

Chairs

Claudia Heindorf
University of Göttingen

Gabriela Wülser
Swiss Academy of Arts and Sciences (SCNAT)

Marion Jay
Maria Chiara Camporese
Lukas Flinzberger
University of Göttingen and University of Kassel

Co-chairs

Laura Kmoch

Christian Bunn
The International Center for Tropical Agriculture (CIAT), Cali, Colombia

Key points of discussion

The session was structured as a workshop, beginning with an overview of SCNAT's work on priority topics for sustainability, with a particular focus on the roles of values, visions, and pathways in sustainability research. Following a brief introduction to the workshop framework, participants were divided into small groups to discuss key questions related to current challenges in sustainability research, desired future visions, and pathways to achieve them.

After exploring which aspects of sustainability research are challenging, which should be maintained (Horizon 1), and which should be transformed (Horizon 3), the entire group reconvened to cluster ideas into key themes. The workshop concluded with a final discussion to identify pathways toward ideal futures for sustainability research based on these themes (Horizon 2).

Transforming sustainability research: Challenges, opportunities, and strategies for the future

Key challenges in current sustainability research

Workshop participants expressed their concern over short-term, siloed research that misaligns with real-world needs due to rigid funding and disciplinary constraints. The overreliance on quantitative methods and rigid scientific rigor was noted as a limitation, leaving little space for tacit knowledge and participatory approaches. Science extractivism, top-down research approaches, and the lack of public engagement in funding decisions were identified as well as significant power and knowledge gaps. Furthermore, sustainability science was critiqued for handling too many undefined concepts and agendas driven by scientists without sufficient input from a broader range of stakeholders.

Key features to preserve in future sustainability research

Regarding what should be preserved in future sustainability research, participants highlighted the importance of targeted science communication, ensuring practical application and a common language (English) for accessibility. Inclusive collaboration was seen as crucial, with a focus on people-centered, transdisciplinary, and intersectional research that ensures equal partnerships across disciplines and sectors. Long-term public funding was emphasized as necessary to support impact assessment and rigorous, creative methodologies. Research should also continue to embrace qualitative, system-oriented methods that integrate both basic and applied knowledge. Furthermore, fostering enthusiasm and intrinsic motivation for sustainability goals, as well as strengthening international collaboration and interdisciplinary dialogue, were seen as vital to advancing sustainability research.

Ideal future research on sustainable landscapes

Looking ahead to the ideal future of research on sustainable landscapes, flexible and long-term funding models were considered essential to support real-world labs and experimentation. Integrating indigenous knowledge with scientific approaches, while decolonizing methodologies, was seen as vital for future research. Holistic and participatory approaches, including systems thinking and asset-based approaches, were emphasized. Transdisciplinary practices, involving co-creation and collaboration with communities and stakeholders, were identified as priorities. Future research should also focus on community-driven, needs-based research grounded in local realities, and embrace innovative methods such as AI, biomimicry, and participatory tools.

Innovative practices for scaling transformative research

To scale up transformative sustainability research, innovative practices such as living labs were highlighted. Living labs provide opportunities for experimentation and learning. Inclusive practices, including co-design and compensation for civil society participation in transdisciplinary research, were identified as important for ensuring equity in the research process. Adaptive management, with a focus on needs-based science, impact analysis, and flexibility in project management, was seen as crucial for responding to changing circumstances. Interface work to bridge research with policy and society through citizen science was another mentioned key practice for scaling up sustainability research. Finally, cultural sensitivity, acknowledging language, logic, and worldview differences, was seen as essential for fostering inclusive, trust-building research processes.

Tangible strategies for advancing research on competing values, visions, and pathways towards sustainable landscapes

Participants discussed several tangible strategies for advancing research on competing values, visions, and pathways towards sustainable landscapes. These included developing more reflexive, epistemically agile, and humble scientific methods, while emphasizing holistic systems thinking. Building long-term, trust-based relationships through transdisciplinary teams and mutual stakeholder dialogue was seen as a core strategy. Additionally, increasing transdisciplinary literacy and providing specialized training in international and non-human methods (e.g., AI, nature) were identified as crucial for advancing sustainability research. Encouraging creativity, expanding networks, celebrating small successes, and reconnecting with nature and non-humans were highlighted as important for engagement and motivation. Future thinking strategies and reflective approaches were seen as necessary for exploring different future possibilities and their implications. In terms of resources and funding, participants advocated for diverse,

trust-based funding models that minimize bureaucratic hurdles and provide transparent access to resources. Communication through standpoint theory, accessible language, and open science was seen as key to building trust and engaging broader audiences. Lastly, ensuring that research outputs are adaptive to local needs and contexts, while promoting inclusivity and impactful research processes, was considered essential for the future of sustainability research.



Final outcome of the 3-Horizons model, integrating insights from all workshop participants: H1 – established sustainability research practices, including existing good practices (yellow cards) and challenges (red); H2 – strategies, innovations, and transition pathways for more impactful sustainability research (blue); and H3 – the ideal future of sustainability research, incorporating valuable current practices (orange) and aspirational approaches for sustainability research (green).

4.10 Belmont Forum: Research Projects (Collaborative Research Action: Sustainable Consumption and Production)

This Collaborative Research Action focused on Systems of Sustainable Consumption and Production. Current patterns of global development based on people's continuous extraction and exploitation of natural resources are not sustainable, and a societal transition to systems of sustainable consumption and production (SSCP) is urgently needed. To promote co-development of research through science and stakeholder-based approaches to attain SSCP, this call invited research proposals on the following themes:

- Transdisciplinary research to help transition to green economies with sustainable systems of consumption and production.
- Sustainable and Resilient industries and their governance systems.
- Social Inequality and Environmental Justice.
- Integrating new technologies, policies, and practices into everyday life.

The call was launched in 2022, and the projects are ongoing.

4.10.1 JUST GROW: Co-designing justice-centric indicators and governance principles to intensify urban agriculture sustainably and equitably

Speakers

Ann-Kristin Steines
Kathrin Specht
Research Institute for Regional and Urban Development (ILS)

The project focuses on making intensified urban agriculture more sustainable and equitable. The aim of the project is to organize urban agricultural production processes in such a way that they are socially just, sustainable, and inclusive. The focus is particularly on aspects of distributive, procedural and knowledge justice. The German project team is researching the contribution of UA to food security. Initial results of the project were presented, including a list of indicators to measure the contribution of urban agriculture to food security.

The project period runs from 2023 to 2026 and methodological development to date has included a literature review and the development of indicator metrics. A question from the audience related to whether urban gardens are included in the project, which was confirmed.

4.10.2. Circularity^3: Conceptualizing, Implementing and Measuring the Circular Economy from the Micro to the Macro Level

Speakers

Antonia Loibl
Fraunhofer Institute for Systems and Innovation Research (ISI)

Christoph Helbig
University of Bayreuth

This project examines the circular economy across different levels, from micro (individual consumers and companies) to meso (associations, initiatives) and finally macro (governments, NGOs). It aims to develop and measure effective circular economy practices, ensuring sustainability from the smallest to the largest scale. Two products were chosen for case studies: consumer electronics, specifically smartphones, and EV batteries. This allows to study one established supply chain and its improvement for circularity as well as a new supply chain that is only now built up and provides the chance to optimize for circularity from the very beginning. Two respective case studies conducted in Germany were shown to provide insight into the project work: One study from the University of Bayreuth focuses on EV and their battery

materials in Germany on the meso level which will provide the material flows of EV batteries on a much more detailed level than available so far; and a second study on the macro level for smartphones in Germany and the EU provides a policy mix analysis for barriers and enablers of the circular economy of smartphones. Collaborations on the project include published papers with colleagues from Japan and Thailand, emphasizing green manufacturing ideas.

Key points of discussion

The interests of the audience were very much focused on the inner workings of Belmont Forum collaborative research actions (CRAs):

- How is collaboration between the different partners in such a CRA organized?
  We described the structure of our project with six partners in five countries (e.g. general assembly meetings for project management, research seminars for content and method exchange, collaborative tasks like publications of conference sessions).
- What type of collaboration is possible or encouraged between the different CRAs within the SSCP call?
  We described the importance of the SRI conference with the large SSCP session but also bottom-up initiatives like sessions organized by individual CRAs or several CRAs together.

Conclusion and action items

Considering the focus of the audience on the collaborative aspects of the Belmont Forum CRAs, the following action items come to mind:

- Use the possibility of cooperation and learning within the SSCP call projects:
  Planned session at SRI2025 by all SSCP CRAs on co-creation of theories of change through serious gaming
- Collaborate with stakeholders and external researchers to broaden the scope of our research:
  Planned session by Circularity[3] on barriers and opportunities of the Circular Economy

4.10.3. BEDROCK: Building an Evidence-Base for Deforestation-Free Landscapes: Supporting Equitable Outcomes in and Beyond Commodity Supply-Chains

Speaker

Thomas Kastner
Senckenberg Biodiversity and Climate Research Centre (SBiK-F)

This project aims to build a solid evidence base to support the creation of deforestation-free landscapes, ensuring equitable outcomes across commodity supply chains. The project presentation started with the development of a framework and toolkit to support deforestation policies, focusing on the supply chain with an emphasis on designing effective policies from the producers' side. The project will be establishing metrics to measure the impacts of deforestation policies. A major part of the project is the engagement of stakeholders by conducting interviews and workshops to gather insights. There are aspects of the project that required the evaluation of EU regulations such as the evaluating conditions for the effectiveness of EU regulations on deforestation-free supply chains, concentrating on the EU market particularly in relation to cocoa production and deforestation pathways. Questions from the audience addressed land use and the reasons behind potential production increases, as well as strategies to decrease demand to meet deforestation goals.

4.10.4. Co-Creating Sustainable Transformations of Food Supply Chains Through Cooperative Business Models and Governance

Speaker

Wanda Wieczorek
Pia Laborgne (online)
Institute for Technology Assessment and System Analysis (ITAS), Karlsruhe Institute for Technology (KIT)

The objective of this project is to create sustainable transformations in food supply chains by leveraging collaborative business models and governance, ensuring alignment with global sustainability goals. Its

focus lies on transforming food supply chains through collaborative business models and governance. The presentation emphasized common processes across different regions and countries. The assessment of the sustainability of food supply chains involving practice partners in the transformation process was discussed. The project will be developing a framework and indicators for sustainability, enabling the researchers to use strategic moments to initiate change in practices. The project is exploring how things are organized differently in food supply chains enabling communities to conduct their own assessments. One audience member asked if implications for the Global South are considered. Another question from the audience focused on the alignment of the project with the Sustainable Development Goals (SDGs).

4.11 Climate Service in Practice: How Assessment Tools support the Planning Processes of Adaptation Measures

Chair

Jan-Albrecht Harrs
Climate Service Center Germany – GERICS

Astrid Sturm
Brandenburg Technical University Cottbus-Senftenberg

Matthias Soot
Technical University Dresden

Speakers

Rebecca Kutzner
Forschungsinstitut für Bergbaufolgelandschaften e.V

André Assmann
GeomerGmbH

Key points of discussion

- Climate data and information tools are used as a starting point for the development of adaptation measures and the creation of adaptation concepts.
- How can we integrate climate services into the work processes of municipalities?
- How can we capacitate staff to use climate services, and which technical requirements are crucial?
- How to move from usable to used climate services?

Conclusion and action items

- Climate services can be used as communication tools to support and accelerate planning processes in municipalities.
- High-resolution projection data in combination with geo and socio-economic data can function as a good basis for various urban planning decisions. The element of costs is vital.
- Results should always be presented in form of climate function maps so that it can easily pass through the different departments
- Tool transfer in other regions remains a challenge because of the required open accessibility and availability of regionally specific high-resolution data.
- Inter-departmental workflows and meetings on the coherent use of climate services establish institutional mainstreaming

4.12 Bridging Science, Policy, and Practice: Addressing Water Security and Socio-Ecological Impacts in Climate Adaptation

Chairs

Jürgen Stamm
Dresden University of Technology

Jonas Carvalho e Silva
Technical University of Dortmund; Federal University of Pará, Brazil

Edeltraud Günther
United Nations University FLORES

Jonas Carvalho e Silva
Technical University of Dortmund; Federal University of Pará, Brazil

Erlan Silva de Sousa
Federal University of Tocantins, Brazil

Yi-Jhen Wu
Technical University of Dortmund

Speakers

Jürgen Stamm
Dresden University of Technology

Key points of discussion

- For academic teaching and research to generate a sustainable socioeconomic and ecological impact in addressing the challenges of climate change, an integrative collaboration between science, policy, practice, and society is required – one that enables the transformation toward climate resilience. This necessitates stakeholder-oriented transfer activities.
- Prof. Jürgen Stamm made an overview of the DAAD Global Water and Climate Adaptation Centre (ABCD-Centre) and discussed approaches and case studies for an effective linkage between education, research and transfer. ABCD-Centre wants to create impact and conducted a variety of different transfer activities. Prof. Edeltraud Günther presented an overarching concept and monitoring approaches to transfer concepts and efficiency monitoring to enhance the science-policy-practice interface for climate adaptation. Prof. Jonas Carvalho e Silva and his collaborators, Dr. Yi-Jhen Wu and Mr. Erlan Silva de Sousa, introduced their research on socio-ecological impacts of hydroelectric dams on family farms in the Tocantins Basin in Brazil.
- According to the theory of change, the case studies presented used several methodologies. Prof. Günther developed the Transfer Monitoring concept, enabling the control and modification of stakeholder-specific activities. Prof. Carvalho e Silva and his team presented results of a systematic review of qualitative studies and a socioecological model to assess the impacts of hydroelectric dams.
- The session showed good practices on water management and water security in the global south. The practical implication is to benefit the population (e.g. academics, stakeholders, and civilians) on how to better manage negative impacts and promote more social participation in planning and implementing water policies.
- The discussion pointed out the need for strengthening the dialog between researchers, decision-makers, local communities and private sector actors to co-create evidence-based adaptive strategies supporting the transformability in social and ecological context to a climate resilience system. Water security, a central element of climate adaptation, is directly linked to the resilience of human communities and ecosystems.
- The session generated great interest because it integrates science, public policies and local practices into solutions for water security and socio-ecological impacts. Participants highlighted the importance of accessible communication, community participation and climate justice.

Conclusion and action items

- Nature-based solutions and participatory governance have emerged as promising ways to strengthen socio-ecological resilience.

- The session opened space for collaborations between researchers, policymakers, local communities and international organizations interested in integrated solutions for water security. There is interest in developing collaborative platforms, pilot projects, and regional networks to share knowledge and effective climate adaptation practices. In the future, the aim is to strengthen the translation of science into public policy, expand funding for local initiatives, and foster nature-based actions with a positive socio-ecological impact.
- The group intends to promote periodic contacts for the future establishment of thematic working groups to promote continuity of discussions and concrete actions.

4.13 Our Precious Food: Food Security, Sustainable Food Choices, Dietary Diversity, and Reduction of Spoilage and Waste

Chairs

Katharina Gröne
Lena Hennes
Wuppertal Institute for Climate, Environment, and Energy

Thilo M. Fuchs
Friedrich Loeffler Institute

Speakers

Thilo M. Fuchs
Friedrich Loeffler Institute

Agnes Weiß
University of Hamburg

Katharina Gröne & Lena Hennes
Wuppertal Institute for Climate, Environment, and Energy

Carmen Jochem
University of Bayreuth

Alexander Follmann
University of Cologne

Jasmin Godemann & Vera Lange
Justus Liebig University Gießen

Dorothee Straka
Melanie Speck
University of Applied Sciences Osnabrück

Key points of discussion

Within the session, three topics were addressed, namely food spoilage, food and health, and food waste. Firstly, Thilo Fuchs introduced the impact of food production on the emission of global warming gases, thus pointing to the substantial contribution of food waste to climate change. As a potential measure to reduce food waste from farm to fork, he referred to the toolbox of food microbiota allowing the identification and application of microbial strains that confer resistance towards spoilage organisms. Then, Agnes Weiß highlighted that along the whole food production chain from farm to fork broader and deeper knowledge on the autochthonous microbiota is urgently needed. This knowledge will form the basis to investigate how humanity will be able to produce sufficient and safe food within the planetary boundaries under changing climate conditions and how to waste as little food as possible. As a result of both talks, the role of genetically modified organisms in food protection was discussed.

The second thematic section, food and health, started with a presentation by Katharina Gröne and Lena Hennes on “Investigating Food Environments in Hyderabad, India: The Role of Changing Dietary Patterns”. Building on findings from food environment research on sustainable food choices in the increasingly obesogenic urban Indian middle class, the challenges of the country’s ongoing nutrition transition were explored. Through the lens of key domains of the food environment—availability, accommodation, accessibility, acceptability, and affordability—the environmental, social, and health impacts of ten food groups representing India’s nutrition transition were discussed. Carmen Jochem contributed a talk on “Embedding planetary health into higher education curricula”, highlighting the importance of improving

knowledge and skills to contribute to sustainable health-promoting practices and systemic transformations. Based on the findings of an online survey that assessed the prior knowledge of students in health-, environment-, and sustainability-related programs across universities in Bavaria, a planetary health online course will be developed and offered by the Virtual University of Bavaria, Germany (vhb). Linking food and health to sustainability and biodiversity, Alexander Follmann argued that today's multiple crises led to significant disruptions in global agri-food chains and risks in global food security and health. Protection of global biodiversity is therefore crucial for resilience to future food security risks and sustainability in agri-food chains.

In the topic food & health, Vera Lange and Jasmin Godemann focused on food waste reduction practices in German households and sustainability communication. A key takeaway was that there is a significant gap between competencies and action in the context of food waste reduction practices. While many people consider themselves competent in dealing with leftovers, they do not consistently apply their knowledge in practice. Sustainability communication should therefore not only convey information but also actively encourage individuals to adopt sustainable practices by taking their personal values and everyday situations into account. Dorothee Straka then focused on the topic of communication strategies by examining the good practice example of the “Yellow Ribbon Harvest Project”. The opportunities of self-organized food distribution demonstrate the importance of communication and activity to both reduce food waste and enhance food valuing. Local food traditions and joint harvest activities were emphasized from the perspective of the orchard owners. Rural women's association saw much benefit in intergeneration-communication as proved in consumer activities. Such (national) initiatives may support not only growing practical knowledge but also preserve culinary practices in lively local networks and identify supporting communication strategies for better resilience towards future (food) crisis. Lastly, Melanie Speck presented current empirical findings on the distribution of food, including in the context of food banks. It became clear that food distribution is often carried out informally (food banks and food sharing) and economically oriented (e.g. Too Good to Go). There are legal issues that support, but also partly hinder food distribution. To conclude, there is still a lot of potential along the value chain, e.g. in out-of-home catering, to generate further food donations.

Conclusion and action items

As a main outcome of our session, we identified food as a cross-cutting issue that interferes with most topics of sustainability research such as planetary and individual health, climate change, safety and security of nutrition, biodiversity, and self-empowerment. All participants in the session agreed not only to provide new insights into future research on many aspects of nutrition, but also to share theoretical and practical concepts including (bio)diversity, education, environment protection, and resilience. Thus, food appeared as an ideal theme to combine the interests of distinct disciplines and to foster research activities with the goal of globally sustainable food production and consumption.

While several participants of session 13 already collaborate, future cooperations to broaden the spectrum of food topics are intended. The participants agreed to extend their network of researchers in the field and to strengthen the implementation of food research in science. Finally, we identified the need for more regular interactions and propose to establish a working group within the DKN in the next period (2026-2028).

4.14 Emotions and Inner Transformation in Sustainability Science

Co-chairs

Saravanan Subramanian
German Institute of Development and Sustainability (IDOS)

Timo von Wirth
Frankfurt University; Erasmus University Rotterdam

Speakers

Petra Jansen
University of Regensburg

Lorena Eulgem
German Institute of Development and Sustainability (IDOS)

Ute Thiermann
Imperial College London

Session Abstract

Climate change, biodiversity loss, and natural resource exhaustion are some of the multi-pronged crises of our times. Black swan events like a global pandemic or long-brewing geopolitical tensions resulting in destructive wars add to insecurities. Coping with uncertainties and environmental change can affect human mental health and sense of well-being. Following Setha Low (2016: 146), emotions are key elements in the creation, interpretation and experience of our environments. Often lacking factual knowledge, our emotions influence how we think, understand our situation, and make decisions (Volz and Herwig, 2016). In other words, our emotions help us to react to the uncertain events around us. However, the vital role of emotions in people's lives to interpret is often ignored or overlooked in sustainability science to date. Moreover, emotions are similarly not acknowledged sufficiently in practice, e.g. by policymakers, project planners, and others, often framing emotional dimensions as 'irrational' and 'irrelevant' in the dominating, yet incomplete, paradigm of decision- and policymaking. Emotions are explored in a range of socio-psychological processes, but in the context of policymaking, they have remained low profile. The consequences of undervaluing how public policies generate different types of emotions often lead to violent protests e.g. due to public resentment of climate and energy policies (Rohse et al. 2020). Emotional and embodied reactions to change (e.g. of places and familiar environments) have been known as vital responses to human (perceived) threats to their connectedness to place. Previous research has provided evidence for the interaction between connectedness to place with environmental stewardship and place care, which can serve as a relevant trigger for pro-environmental engagement (Raymond et al. 2021). The concept of connectedness with nature, as well as feeling and expressing empathy and compassion are integral to the notion of an 'inner sustainability.' This aligns with studies showing that connectedness to nature (Whitburn et al., 2020) and compassion are linked to sustainable intentions and behavior (Pfattheicher et al., 2016). In parallel to conceptualizations from scientific domains such as environmental and social psychology, sociology, and sustainability science, practitioners have proposed the Inner Development Goals (IDGs) framework. The IDG initiative, a non-profit organization, provides a practical framework for inner development that aims to support achieving the Sustainable Development Goals 2030. However, it lacks further critical evaluation of its theoretical underpinning and actual effects. While connectedness is incorporated into this practice framework, the role of emotions for 'inner sustainability' remains vague and calls for further research.

4.15 Institutionalization of Participatory and Transdisciplinary Research at the Macro-, Meso-, and Micro-Levels of the Science System: Towards a Coordinated and Consolidated Implementation Strategy in Germany

Chairs

Audrey Podann
Technical University Berlin

Daniel J. Lang
ITAS, KIT; Gesellschaft für transdisziplinäre und partizipative Forschung (GTPF)

Session Abstract

The importance of participatory and transdisciplinary research for promoting relevant societal changes towards sustainability and at the same time generating innovative scientific knowledge has been increasingly discussed and generally recognized, particularly in the field of sustainability science. Relevant progress has been made in this area, including (i) the initiation and implementation of funding programs focusing on participatory and transdisciplinary research approaches, (ii) the theoretical and methodological underpinning of such approaches at the interface between science and society, and (iii) the empowerment of actors (both researchers and stakeholders outside of academia) to engage in these research approaches through capacity-building formats as well as by incorporating corresponding modules into university curricula (e.g. teaching basics of participatory and transdisciplinary research or involving students in project-based research formats in which stakeholders outside of academia are actively involved). Despite the progress that has been made in this area, particularly in German-speaking countries, there is still a lack of consolidation of the various approaches, and it still seems that participatory and transdisciplinary research has not yet achieved the status of a fully established and "equal" research practice that complements the more classic research practices in the scientific landscape.

This consolidation and establishment are central goals of the "Society for Participatory and Transdisciplinary Research" (Gesellschaft für transdisziplinäre und partizipative Forschung - GTPF), founded in May 2023. One of the GTPF's working groups is addressing the question of how participatory and transdisciplinary research can be (further) institutionalized in the German-speaking research landscape. As a first step, the group has formulated a short position and reflection paper that summarizes core aspects and strategies for institutionalizing these research practices at the macro level (e.g. research policy), the meso level (e.g. organizational strategies and overarching standards), and the micro level (e.g. efforts and strategies of individual researchers and teachers).

4.16 Just Bio? Intergenerational Justice, Biodiversity Loss, and the Sustainable Bioeconomy Transition

Chair

Ulrich Schurr
Institute of Bio- and Geosciences - Plant Sciences (IGB-2), Forschungszentrum Jülich

Speakers

Marius Bartmann
German Reference Centre for Ethics in the Life Sciences (DRZE), University of Bonn

Michael Bernstein
Austrian Institute of Technology (AIT)

Dirk Lanzerath
DRZE, University of Bonn

Jens Mutke
Bonn Institute for Organismic Biology (BIOB), University of Bonn

Tade Spranger
Center for the Law of the Life Sciences (CLLS), University of Bonn

Key points of discussion

The idea of a bioeconomy transition brings to the fore issues of technology-nature relations while requiring answers to the questions of ethical implications in sustainable development. To foster interdisciplinary dialogue and work towards feasible implementation of long-term solutions, we brought together a diverse group of researchers for a roundtable session and discussed how an intergenerationally just bioeconomy can be designed and implemented. The main discussion points, arguments, and findings were the following:

- A big ethical challenge is how to balance conflicting objectives that emerge when implementing bioeconomic strategies, particularly regarding intergenerational justice.
- An important topic is the participation of many stakeholders discussing the vision that bioeconomy can deliver for the future.
- The predicted changes to our ecosystems (e.g. biodiversity loss) due to climate change in the coming decades are alarming.
- International law 'only' obliges states and therefore needs to be transformed into binding legal requirements at national and supranational level.
- The Do No Significant Harm Principle (DNSH) of the EC Sustainability Taxonomy regulation (2020) has problematic aspects, such as glossing over imprecision, ambiguity or uncertainty, attempting to address a trans-scientific issue with science alone, and presuming equivalence of benefits and harms.

Conclusion and action items

- Bioeconomic strategies are not per se sustainable; everything depends on how bioeconomic strategies are implemented.
- Bioeconomy is more than technology. We need to address the way we live and how we develop human activities within the "spaceship Earth" in an integrated way.
- If nature conservation concerns are not considered, land consumption, e.g. for wind power and the intensification of agriculture as part of the bioeconomy, can have a significant negative impact.
- Challenges such as biodiversity loss or climate change cannot be solved regionally or nationally but require a global strategy. International law therefore has a central role to play in this respect.
- For implementing the Do No Significant Harm Principle (DNSH) it is helpful to consider new modes of research and innovation governance and practice, such as diversifying significant harm, allowing for ambiguity and "staying with" significant harm.

4.17 Interdisciplinary perspectives on the impact of climate change on workplaces and health and safety at work

Chairs

Adrien Thomas
Luxembourg Institute of Socio-Economic Research (LISER)

Nadja Dörflinger
Federal Institute for Occupational Safety and Health (BAuA)

Speakers

Nadja Dörflinger
Federal Institute for Occupational Safety and Health (BAuA)

Anja Kirsch & Jule Klink
Free University of Berlin

Robin Pelkner
Federal Institute for Occupational Safety and Health (BAuA)

Christian Wille
Vereinte Dienstleistungsgewerkschaft (Ver.di)

Key points of discussion

This session has addressed the impact of climate change on workplaces and workforces along two lines. First, climate and decarbonization policies generally affect employment, as jobs in carbon-intensive industries and manufacturing are likely to be particularly affected. Frequently, the resulting tensions are described as 'jobs versus environment-dilemma'. Second, the consequences of climate change (e.g. higher temperatures, greater UV-radiation) affect working conditions and raise the need to adapt workplaces to ensure the sustained protection of workers.

The session convenors Nadja Doerflinger and Adrien Thomas introduced the topic of the session. They provided an overview of current research on the interconnections between climate change and the world of work before sketching directions for further research.

Anja Kirsch and Julia Klink presented a case study on the participatory transition process of an automotive supplier plant focused on developing new products and customers, with the involvement of management, the works council and the local trade union.

Robin Pelkner focused on the institutional setup and looked at structures related to occupational health and safety in times of climate change. He scrutinized to what extent the existing setup is suitable for the sustained protection of workers and identified areas in which actions are possibly needed.

Christian Wille (Ver.di) provided a comment from the perspective of Germany's second largest trade union, highlighting the need to analyze how workers' attitudes towards the green transition are shaped by the labor process.

The presented results and the commentary, as well as the ensuing discussion with the audience, underline the need to look more closely at workplaces and respective climate mitigation and adaptation strategies to sustain the protection of workers. Employers and trade unions can engage in social dialogue over measures to address the challenges raised by decarbonization, such as the retraining of workers, investments in new lines of activities and adequate support measures for job transitions. Debates around the Just Transition also raise the question of the revitalization of public infrastructure and the (re)definition of a "good life".

4.18 1. Urban Human-Nature Partnerships: From a Positive Vision to Sustainable and Flourishing Realities | 2. Where Does Sustainability Science Meet the Humanities in Leveraging Change?

Speakers and co-chairs

Martina Artmann
University of Applied Sciences Weihenstephan-Triesdorf

Jessica Böhme
Institute for Practical ekoPhilosophy (IPeP)

Christoph Woiwode
Leibniz Institute of Ecological Urban and Regional Development; Indian Institute of Technology Madras

Agnieszka Komorowska
University of Kassel

Andra Milcu
Arcadie Botnaru
Kassel Institute for Sustainability

Jorrit Holst
Free University of Berlin

Key points of discussion

- Until very recently, the humanities have been left outside the mainstream discourse on transformative change as their relevance seems less pronounced and not fitting positivist linear frameworks. The past shows that the hitherto dominant modes of researching and ultimately governing transformation(s) are not enough for society, including science, to respond to the current polycrisis. For science to be able to guide and steer sustainability transformations, all disciplines are needed. But how do the humanities fit in the context of bringing about systemic change?
- The humanities can engage with some of the blind spots of sustainability science, namely with inner dimensions of sustainability, and can contribute to target (also called normative or orientation) knowledge and to transformation knowledge
- In this line, it is worth remembering that each scientific contribution gives rise to a story around it, just as an atom story was born the same moment the 'atom' was discovered
- As another example, despite an overall 'negative' perspective on enlightenment in the sustainability science community as it was historically and it is contemporarily instrumentalized for various purposes, the humanities can promote a more nuanced and 'discriminating' insight into the enlightenment for sustainability science
- Human-nature partnership is mainly discussed in environmental philosophy. But what does such a paradigm shift from an anthropocentric to ecocentric worldview mean when it comes to urban transformations?
- To address deep leverage points, sustainability science needs to address the role of human-nature relationships and their underlying paradigms, worldviews, and values. In particular, the role of inner transitions and its entanglement with external (urban) change needs greater attention.
- Addressing ecocentric worldviews needs innovations in scientific methods as well as inter- and transdisciplinary collaborations including arts. Bridging topics such as relational health and sustainable diet and food production that emphasizes the deep entanglement between the human and more-than-human world can strengthen an understanding of what human-nature partnership does mean in practice.

Conclusion and action items

We identified the need for funding and a coordinated network of researchers and practitioners working with inner dimensions and human-nature partnerships of sustainability and their subsequent transformations.

4.19 Discussion on the Need and Possible Founding Options for a DACH Association for Sustainability

Chairs

Stefan Lechtenböhmer
University of Kassel

Harald Heinrichs
Leuphana University Lüneburg

Daniel J. Lang
Karlsruhe Institute for Technology (KIT)

Speakers

Sarah Ryglewski
Minister of State at the Federal Chancellery

Dan Brown (online)
National Sustainability Society; University of Washington

Short inputs

Eva Schäfer
DG hochN

Krischan Ostenrath
Netzwerk Grüne Arbeitswelt

Thomas Korbun
Ecornet

Jana Schultz
23grad – Netzwerk Umwelt- und Nachhaltigkeitswissenschaften e.V.

Michael Flitner
artec Sustainabilty Research Center, University of Bremen

Sven Pastoors
Humboldt hochN

Key points of discussion

Do we need an umbrella organization for sustainability research, education and practice?

Two keynote speeches by Sarah Ryglewski, German State Minister for Sustainability Policy, and Dan Brown, President of the National Sustainability Society in the US, set the context for the discussion on the potential need for an umbrella organization for sustainability science and practice.

Sarah Ryglewski introduced the recently adopted sustainability strategy of the German Federal Government as a key instrument of German sustainability governance. To accompany the implementation of the strategy, sustainability science is needed as a partner and driver. From her point of view, an umbrella organization could serve as a focal point and fulfil an advocacy role for sustainability (science).

Dan Brown explained the process of setting up the National Sustainability Society in the USA, which was founded only one year ago, and its current organizational structure and functioning. The NSS is seeking international partner organizations to strengthen sustainability science and professional practice inter- and trans-nationally.

The following speakers focused on the potential added value of an umbrella organization and possible overlaps with existing organizations in the field. Overall, the discussion was divided, with arguments in favor and skepticism about the idea of an umbrella organization.

Main aspects of potential added value were:

- Providing a single point of contact for policy makers on sustainability issues, thereby increasing the visibility and lobbying power of the issue.
- To establish academic and professional standards for teaching and mainstreaming sustainability in higher education and vocational training.
- To promote methodological knowledge at all levels of education.
- Fostering individual and institutional cooperation in the field.

Critical aspects mentioned were:

- There are already many specific sustainability institutions in research, business and civil society. There would be a high risk of overlap and unwanted competition.
- Science policy has a weak position in policy making. It is unclear whether a new organization could improve this.

- There are so many sustainability challenges "everywhere". Wouldn't it be better to solve them rather than create a new organization?
- Should a new organization be a network of networks or a single membership organization?
- What is the benefit of combining academic and business sustainability issues?

Conclusion and action items

Further improving the institutionalization of sustainability education and standards in academia and beyond seems relevant and promises added value.

There was no strong support for the creation of a new umbrella organization.

The conveners will work on further networking and institutionalization of sustainability, possibly with a focus on the science system first.

4.20 Assessing Risks and Benefits of Technologies in Scenarios for Sustainability Transformations (DKN Working Group "RiskTransScens")

Chairs and speakers

Sabine Fuss
Potsdam Institute for Climate Impact Research (PIK)

Pia-Johanna Schweizer
Research Institute for Sustainability (RIFS)

Hermann Held
University of Hamburg

Jana Sillmann
University of Hamburg

Speakers

Lukas Tank
Kiel University

Gundula Hübner
Martin Luther University Halle-Wittenberg

Key points of discussion

Continuous impacts of global warming are better understood now, and extreme events are becoming more frequent and intense, justifying the need for significant mitigation and adaptation efforts. Shrinking carbon budget and delays in peak emissions point to exceeding the Paris climate goals in the near future.

- Addressing these challenges requires transformative action, including the rapid scaling of technologies. But technologies may have impacts beyond their implications for CO_2 emissions –both positive and negative–and will be affected by the impacts of climate change and extremes. Scenarios help explore different pathways toward a more climate-resilient future but often lack comprehensive risk-risk and risk-benefit assessments considering both climate and technology risks and benefits.

RiskTransScens proposes joint innovations in integrated assessment along three dimensions:

- Pool expertise from climate resilience and technology assessment communities, ii) develop metrics to assess the intended effects of technological solutions in the context of global warming impacts as well as unintended side-effects, especially regarding extreme events, and iii) substantiate the above with contextualised stakeholder dialogues, to evaluate scenarios based on societal impacts.

Climate Change and Extremes (Impulse 1, Jana Sillmann):

- In 2024 many regions in the world were warmer than between 1990 and 2020.

- Extreme events can impact our climate change mitigation options.
- Mitigation can also be counteracted by adaptation (e.g. using non-renewable energy for air conditioning).
- IPCC risk framing: risk = potential for adverse consequences for human and ecological systems, recognizing the diversity of values and objectives associated with some systems.
- IPCC AR6 WG2: Risks can actually be increased by responses to climate change, so the hazard-vulnerability-exposure concept of AR5 has been expanded to also include responses.
- Every region faces more severe and/or cascading/compounding risks: No region is spared!
- Direct effects trickle down to other sectors (e.g. through food prices).
- Climate change challenges the achievement of other SDGs.
- In turn: reduce vulnerability by improving on other SDGs.
- Tipping points in environment can also trigger tipping points in society.

Decision-making/scenarios/assessment (Impulse 2)

Hermann Held:

- To what extent does mitigation/adaptation improve local situations?
- Downscaling, comparing technology and warming impacts, precautionary environmental targets where impacts are hard to predict.
- Two examples of zooming into regional climate and asking whether this complies with a Paris-compatible world also locally.

Lukas Tank:

- Many assessments claim to assess feasibility of climate response options only. However, the primary relevance of some of the issues they cover is not feasibility, but desirability.
- A non-transparent combination of feasibility and desirability is highly problematic.

Governance/society (Impulse 3)

Gundula Hübner:

- Integrated assessment model (Hübner et al 2023: economic impacts, attitude to energy transition, planning process, impact on nature and residents, social norms & acceptance)
- It is important to realize that the debate often overemphasizes economic impacts (e.g. farmers not liking windmills though they bring lots of revenue).

Pia-Johanna Schweizer:

- Take the societal component of risk into account: linking back to Jana having pointed out that response has been added to hazard-vulnerability-exposure component.
- Decision-making on risk: IRGC Risk Governance Framework (2017). Risk governance cannot be a linear process but needs to be iterative. Individuals and society may come to decisions in different ways.
- Pre-assessment/problem definition, appraisal, management, characterization & evaluation (circular)
- Transdisciplinarity: the risk-tandem framework by Parviainen et al. (2024)

Discussion/Audience

- Not just highlight inequality, but what we do to actively correct this and by that make it economically efficient. We need to be brave.
- It is not about improving technologies per se: We have a problem with acceptance of technology, and we have learned that only engagement can accelerate deployment. What is the right timing?
- The “precautionary principle” presentation seemed to be a bit one-on-one: not only tech-environment comparison, but also societal impacts. What are we accepting against what? On the other hand, the precautionary principle aspect was missing from the governance angle.
- Connectedness to society is a recurrent theme in this conference. People do want change, so we should ask them how they would implement it.
- How does your framing fit into the risk-governance model? What about multi-functions, how to include? Build on existing environmental assessment framework? Can we ultimately compare the different techs/options in that framework?
- Don’t take climate as the main entry point these days: it’s economics!
- Work with counterfactuals.

Action items

Potential follow-up: All participants signaled interest in catching up on further discussion on the topic, some also indicated they would want to be actively involved in further activities such as proposal writing.

Resources to consider

Hübner, G., Leschinger, V., Müller, F. J. Y., & Pohl, J. (2023). Broadening the social acceptance of wind energy – An Integrated Acceptance Model. Energy Policy, 173, 113360. https://doi.org/10.1016/j.enpol.2022.113360

Parviainen, J., Hochrainer-Stigler, S., Cumiskey, L., Bharwani, S., Schweizer, P.-J., Hofbauer, B., & Cubie, D. (2025). The Risk-Tandem Framework: An iterative framework for combining risk governance and knowledge co-production toward integrated disaster risk management and climate change adaptation. International Journal of Disaster Risk Reduction, 116, 105070. https://doi.org/10.1016/j.ijdrr.2024.105070

4.21 Why Is Climate Mitigation and Adaptation So Slow? Perspectives From the Social Sciences, the Humanities, etc. (German Climate Consortium, DKK)

Chair

Tilman Santarius
German Climate Consortium (DKK)

Speakers

Antje Bruns
Academy for Territorial Development in the Leibniz Association (ARL)

Daniela Jacob
Climate Service Center Germany – GERICS, Helmholtz-Zentrum Hereon

Mark Lawrence
Research Institute for Sustainability (RIFS)

Angela Oels
DKK; Centre for Climate Resilience, University of Augsburg

Jan Wilkens
CLICCS (Climate, Climatic Change and Society), University of Hamburg

Key points of discussion

- The scientific fact of anthropogenic climate change as well as the need for political action enjoys wide-spread acceptance in politics the world over. Nevertheless, global greenhouse gas emissions are still rising from year to year. Political action as well as changes in production and consumption patterns are too slow overall.
- Key questions of this session: 1. Why are politics, companies and societies failing so spectacularly to slow/mitigate climate change and to adapt to its impacts? 2. What are places of hope? Which current interventions in the status quo have the greatest transformative potential? 3. How can we improve science-policy communication and co-production to achieve greater impact in public debates and political processes? 4. Which theoretical perspectives and methods from the listed disciplines are particularly suitable for generating new insights to accelerate climate action?
- At the beginning, this session was informed by scientific findings regarding these questions from a conference directly preceding the Sustainability Science Summit at the Centre for Climate Resilience, University of Augsburg (February 17-19, 2025). The preceding conference was entitled

"Implementation crisis in climate mitigation and adaptation and possible solutions: Social science/humanities perspectives on liberty, democracy and transformation" and brought together the state of research from the social sciences, the humanities, law, economics, theology and psychology.

- Angela Oels and Mark Lawrence, who participated in the preceding conference, brought insights of the Augsburg conference to the wider sustainability science research community and put them up for discussion in this session.
- Angela Oels highlighted that over the past 30 years, problem framings of climate change have been too narrowly defined by economics and the natural sciences. We need to democratize and pluralize the processes in which we develop knowledge for climate futures.
- Antje Bruns emphasized the role of change agents - in the political-administrative system, civil society and companies. Their collaboration creates impact.
- Mark Lawrence advocated the co-production of knowledge not only with decision-makers but also with society and other stakeholders in new and innovative formats.
- Daniela Jacob emphasized the need to allocate responsibility.
- Jan Wilkens linked the discussion to the findings of the recent Hamburg Climate Futures Outlook. He emphasized the need to tackle injustices and inequalities as a central issue to enable transformative change.

Conclusion and action items

- Social science and humanities offer uncountable insights why politics, companies and societies are failing to mitigate climate change and to adapt to its impacts in a sufficient time frame. However, this body of research also offer manifold insights regarding which initiatives did work, and what places of hope.
- The global and national network of Sustainability Science researchers provides a strong basis to better interlink research from natural sciences, social sciences and humanities. This strong inter- and multidisciplinary approach may be transferred to the narrower field of climate research.

4.22 Towards Green AI in Medicine

Hosts

Peter Boor
RWTH Aachen University

Martin Strauch
RWTH Aachen University

Speakers

Loïc Lannelongue (online)
University of Cambridge

Cristina Richie (online)
The University of Edinburgh

Raghavendra Selvan (online)
University of Copenhagen

Peter Boor
RWTH Aachen University

Key points of discussion

Artificial Intelligence (AI) is already widespread in medical research, and it is about to revolutionize clinical practice and health care. AI methods can be employed to analyze large medical data collections, diagnose disease or perform prognosis of disease progression. At the same time, the growing energy consumption and CO_2 emissions associated with both development and large-scale application of AI models become a concern. AI promises benefits for the patient, but does this inevitably come at the cost of accelerating climate change?

In this session, experts from computer science, medicine and ethics have presented their specific views on environmentally sustainable AI, discussing how to reconcile the benefits of AI in medicine with the environmental cost. The key findings were that the methodology to quantify the environmental cost is already available, and that developing computationally cheaper and more ecologically sustainable AI models is possible already today. However, the awareness of the environmental costs of AI, both in algorithm/software development and in healthcare policy, remains the bottleneck. Software developers tend to choose the best-performing method, even if a small improvement comes at a large environmental cost, and healthcare policy makers are not yet focusing on the sustainability aspect of medical AI.

Conclusion and action items

As a follow-up to the conference session, the session chairs, speakers and further authors from science, as well as healthcare policy have therefore written an editorial article, to be published in a medical journal: “Environmentally Sustainable AI for Medicine: Balancing Benefits and Environmental Costs”. The goal is to raise awareness of the environmental cost of medical AI before the large-scale rollout of such software in daily operational use.

4.23 Transdisciplinary Interface Management in Transformational Sustainability Research Projects - Good Practices, Institutionalization, and Training

Co-organizers

Katja Brundiers
Research Group for Transformational Sustainability Science, University of Freiburg

Chantal Krumm
Flurina Schneider
Institute for Social-Ecological Research (ISOE)

Felix Beyers
Research Institute for Sustainability (RIFS)

Nina Kulawik & Dörte Peters
Sustainability Innovation Campus (ICN), University of Freiburg

Andra Milcu
Kassel Institute for Sustainability

Viola Hakkarainen
Leuphana University Lüneburg; University of Helsinki

Karoline Augenstein
Center for Transformation Research and Sustainability (TransZent), University of Wuppertal

Alexandra Ramey
University of Freiburg

Speakers

Philip Bernert
Research Institute for Sustainability (RIFS)

Holger Hoff
Field of Excellence Climate Change, University of Graz

Anne Nelissen & Iris Bos
Community Hubs, Utrecht University

Braden Kay (online)
Community-City-University Partnership City of Tempe and Arizona State University

Annika Weiser
Karlsruhe Institute of Technology (KIT)

Stefanie Meyer
Leuphana University Lüneburg

Anna Häring
Eberswalde University for Sustainable Development

Melanie Mbah
Institute for Applied Ecology (Öko-Institut)

Summary

This session presented empirical evidence on transdisciplinary interface management of transformational sustainability science research projects and explored pathways to strengthen and institutionalize this practice at universities around the world. Transdisciplinary interface management (TIM) facilitates the collaboration between scientists and practitioners from policy, business, and civil society with the aim to co-create effective solutions to urgent sustainability challenges of our time. TI-Managers are individuals with expertise and training in managing this interface. In this session, existing transdisciplinary interfaces were reviewed, and a proposed TIM training program was discussed. Participants were invited to provide critical input and feedback on the concepts of TIM and TIM training based on their own experiences, including success factors and challenges to institutionalization, as well as quality criteria for TI-Management.

Key points of discussion

- Introduction/clarification of concept of Transdisciplinary Interface Management (TIM)
- Mechanisms and pathways for institutionalization of TIM
- Following a model from Krumm et al. (in review), participants indicated what “phase” of embedding their transdisciplinary interface is in, using Mentimeter.

- Participants represented organizations at diverse phases: many reported being at a pre-mobilization phase, i.e., having no structured TIM; another cluster saw themselves at the middle phase "establishing work structures, embedding position in organization."

Participants were asked for success factors for institutionalizing TIM. Main themes:

- Support from within the organization (especially from those with power/authority)
- Support from community of other TI-Managers (within and outside of organization)
- Funding that is available to support transdisciplinary work at the right time
- Personal qualities of those involved: passion, commitment, motivation, persistence

Participants were asked for challenges to institutionalizing TIM. Main themes:

- Questions of placement, structure, and role for TIM (e.g., scope of responsibility, needed competences/qualification, job profile – especially for those who work on university-wide initiatives with projects that span a very wide range of topics)
- Perceived risks of hiring TI-Managers included: overburdening the role; short time frames to show impact; and potentially "outsourcing" responsibility for co-production
- Communication challenges: lack of common language and understanding of TIM; divergent expectations from society and practice
- Collectively, these themes pointed to the necessity of institutionalized TIM.
- Dr. Braden Kay (USA) gave an example of a transdisciplinary interface established within the City of Tempe, Arizona as a city-university-community partnership. This allowed aligning and coordinating various science-practice research projects and community interest groups among one programmatic effort of co-developing the City's Climate Action Plan as well as associated programs and infrastructures.

Participants were asked to complete this sentence: "A TI-Manager has fulfilled their role if…." from 13 Mentimeter responses, these clusters of quality criteria emerged:

- …they facilitated the production of actionable knowledge. o …scientists & practitioners were brought together in fair collaboration & co-production. o …they contributed to institutionalizing td collaborations (beyond single projects).

The session ended with an open discussion, e.g., around the question "When did you feel the urge to build a training program? Why was it necessary?" Participants shared:

- Office for organizing transdisciplinary student projects needed better coordination, in part, to prevent overburdening practice partners
- University needed to create consistency and comparability across research projects o Research of Krumm et al. (in review) showed, the need of scientists for TIM and for new and practicing TI-managers to receive or deepen their training to improve td quality
- Surveys showed need to develop career pathways for td researchers and practitioners
- Training brings attention to often unspoken TIM responsibilities

Conclusion and action items

- TIM training aims to contribute to increasing the quality of transdisciplinary sustainability research projects through professionalizing TIM and building durable networks
- A TI-Manager should not be viewed as an "outsourced" function for TIM, rather as an integral part of the research team, supported by colleagues and appropriate structures.
- Session collected insights from participants via Mentimeter informing the TIM training
- A community of practice for TIManagement is forming; session chairs collected email addresses via online form to keep in touch, exchange insights and good practices.

4.24 Designing and Monitoring Impact-Oriented Sustainability R&I Funding

Chairs

Katharina Helming
Leibniz Centre for Agricultural Landscape Research (ZALF)

Susanne Bührer
Fraunhofer Institute for Systems and Innovation Research (ISI)

Rainer Walz
Fraunhofer Institute for Systems and Innovation Research (ISI)

Speakers

Gabriela Wülser
Swiss Academy of Arts and Sciences (SCNAT)

Katrin Ostertag
Fraunhofer Institute for Systems and Innovation Research (ISI)

Summary

One of the most effective ways to support sustainable development is to establish integrated research and innovation funding programs. However, conducting sustainability-oriented research and assessing the impact of this research is complex. We discussed essential features of public research funding, monitoring and impact generation in support of sustainable development. Improving impact literacy and planning for impact early in the research design process are key points in sustainability research and innovation.

Key points of discussion

- Impact oriented design: Embracing complexity, ensuring societal pertinence and planning for impact
- Impact oriented monitoring: Balancing process criteria with output, outcome and impact criteria
- Impact oriented assessment: The role of innovation functions and fostering mechanisms for generating impact

Conclusion and action items

- Advance impact literacy at all levels from individual researcher to project to program to institution to research funding
- Apply tools for impact orientation as part of the research design
- Integrated impact orientation in the research awarding system

4.25 Sustainability Science Meets Development Studies: How Can Synergies Between Both Research Programs Be Strengthened?

Chairs

Katja Bender
International Centre for Sustainable Development (IZNE), Bonn-Rhein-Sieg University of Applied Sciences (H-BRS)

Sebastian Heinen
IZNE, H-BRS

Susanne von Itter
European Association of Development Research and Training Institutes (EADI)

Speakers

Alfredo Saad-Filho
Queen's University Belfast

Stefanie Meilinger
IZNE, H-BRS

Basile Boulay
EADI

Inputs

Alfredo Saad-Filho

Development studies (DS) is a multidimensional and contested research area, shaped by global discourses and events. Orthodox DS is still much shaped by mainstream economics, including neoliberal positions. Heterodox DS has taken different approaches, including most recently strong de- and postcolonial positions. Sustainability and the environment have been neglected for years but have come at least partially to the forefront in some arenas of DS.

Degrowth is a popular concept, but it is decisive how it is defined. If it is meant as general, global degrowth, all low- and middle-income countries will reject it. If it is meant as degrowing the rich economies, then many may be on board. However, in this understanding, it essentially becomes a question of (re)distribution.

Stefanie Meilinger

Sometimes, sustainability and environmental studies neglect technological aspects of systems. That is where sustainable engineering comes in.

There are fruitful opportunities for DS and Sustainability Science (SuSc) to collaborate, for example in the latter's subfield of sustainable engineering. For example, there was EnerSHelf, an interdisciplinary project at the health-energy nexus, where solar panels were installed at rural health facilities in Ghana to provide off-grid electricity. The project examined and resolved (where possible) both technical and political economy constraints.

Basile Boulay

There are several examples of successful interdisciplinary research originating in DS but encompassing SuSc aspects, such as research on decolonial fire governance in Kenya using participatory theater methods and political economy research on soybean farming in Latin

America, examining how powerful interests ensure a continuation of policies that are both resisted by large shares of the local population and devastating to the environment.

Group discussions

- There are synergies between DS and SuSc in terms of methodology, e.g. participatory methods, scenario development, simulation, power dynamics.

- Normative and ethical questions are central to both study fields. Key questions such as “How much paternalism is justified?” and “How can people be convinced/compelled to act in certain ways?” are highly relevant to both fields.
- There are also synergies in terms of concepts, e.g. planetary boundaries (holistic perspective on what is needed) and political economy (causes why rationally useful things do not happen and they may be made to happen)
- Funding for joint inter- and transdisciplinary work is rare, may be hard to access, and is very competitive
- While interaction between DS and SuSc is happening, there are still not too many points of contact, maybe also because both fields are already heterogeneous and interdisciplinary.
- Their respective strong interdisciplinarity makes it difficult to integrate them in university education.
- Early-career researchers in DS and SuSc must take care to advance in their specific discipline, while their fields are interdisciplinary, making it harder for them.
- Therefore, collaboration between researchers across the two interdisciplinary fields of DS and SuSc is particularly challenging.
- There is a normative need to work together, e.g. in terms of reducing resource use.

Conclusion and action items

- Discussions showed that there exist considerable synergies and complementarities between development studies and sustainability science.
- These connections can and need to be harnessed in more purposeful collaborations.
- We aim to develop the dialogue further by reflecting on the session in an EADI blogpost, staying in contact with the session participants, and organizing further discussions and perhaps writing a (joint) paper on the topic.

4.26 Interactive Spatial Tools for Socially Inclusive Integration of Energy Transitions and Ecosystem Restoration

Co-chairs

Fritz Kleinschroth
Institute of Environmental Planning (IUP), Leibniz University Hannover; Department of Environmental System Sciences (D-USYS), ETH Zürich

Xuezhu Zhai
D-USYS, ETH Zürich

Yilin Huang
D-USYS, ETH Zürich

Eva Lieberherr
D-USYS, ETH Zürich

Christina von Haaren
IUP, Leibniz University Hannover

Summary

The session on interactive spatial tools for socially inclusive integration of energy transitions and ecosystem restoration underscored the importance of participatory planning in achieving sustainable development goals. The session's focus was on leveraging innovative spatial tools to balance energy infrastructure development with ecological and social priorities.

Key points of discussion

- Enhanced Accessibility and Interpretability of Spatial Data: There was a consensus on the need to make spatial information accessible to a broader range of stakeholders. Projects like those using drone-based imagery in Laos and Zambia demonstrate the potential for technology to democratize landscape planning, allowing local communities, farmers, and public administrators to participate meaningfully in decision-making processes.
- Integration of Generative AI for Engagement: The discussion highlighted how generative artificial intelligence, as applied in the RE-FLECT project, can facilitate the development of participatory scenarios for ecosystem restoration. AI provides new pathways for engaging stakeholders by allowing real-time visualization of potential restoration outcomes, thereby fostering a more inclusive planning environment.
- Collaborative Tools for Renewable Energy Planning: The Vision:En 2040 project's interactive GIS tool was discussed as a model for enabling municipalities to allocate renewable energy infrastructure thoughtfully. By involving stakeholders in the tool's design and implementation, the project exemplifies how collaboration can drive the transition to renewable energy while considering local land use and conservation priorities.
- Narrative Scenarios in GIS for Holistic Planning: Insights from the TREBRIDGE project showcased the use of narrative scenarios within GIS mapping to address natural hazards and resource management in the Swiss Alps. This approach highlights the importance of integrating qualitative and quantitative data to create comprehensive planning models that encapsulate ecological, economic, and social dimensions.

The session concluded with a hands-on workshop on the participatory GIS tool Vision:En. Based on this experience, the audience discussed and emphasized the importance of interactive spatial tools in fostering socially inclusive planning processes. The discussions recognized the need for further development of the tools to enhance their usability and effectiveness, ensuring that diverse stakeholders are empowered to contribute to sustainable energy transitions and ecosystem restoration efforts effectively.

Conclusions

- Interactive spatial tools can significantly enhance stakeholder engagement and facilitate more inclusive decision-making processes.
- There is a need for continuous development of these tools to improve their accessibility, usability, and flexibility in various regional and contextual applications.
- Collaborative design involving local stakeholders is crucial for creating tools that address local challenges and priorities effectively.

4.27 Exploring Pathways for Integrating Disciplinary and Transdisciplinary Research in Real-World Laboratories to Enhance Transformative Science (DKN Working Group "LinkLab")

Chairs

Daniel J. Lang
Annika Weiser
Veronika Stein
Institute for Technology Assessment and System Analysis (ITAS), Karlsruhe Institute for Technology

Workshop summary

The workshop was set in the context of the DKN working group "LinkLab", which focused on strengthening meaningful links between disciplinary and real-world lab research. The central focus of the workshop was the discussion of a series of theses that had been developed based on the working group's work (including a systematic literature review and a roundtable discussion that took place in January 2025). The theses were structured into three thematic clusters, each highlighting different aspects of how to make the link between disciplinary research approaches and real-world labs as transdisciplinary research settings mutually beneficial. The session began with an introduction to the DKN working group LinkLab, outlining its objectives, aims, research questions, and working approach, as well as the defining characteristics of real-world laboratories that had been the foundation for the group's work. This set the stage for the detailed examination of the theses in three thematic clusters: (1) Integration, (2) Reflection and Learning, and (3) Validity and Causality. For each of the clusters, three theses were discussed in small groups in a world café format. Additionally (4), participants had the chance to ask questions about the working group's work and suggest further aspects for discussion in a fourth group. The goal within each break-out group was to provide feedback on and further discuss the theses. The workshop concluded with a joint fishbowl discussion to collect and discuss the insights and define potential further steps to advance sustainability science in this respect.

In the Integration cluster (1), the theses explored the complex relationship between disciplinary depth and transdisciplinary openness. The Reflection and Learning cluster (2) focused on how real-world labs challenge and enrich disciplinary research by fostering mutual learning, critical reflection, including questioning disciplinary boundaries, and transformative experiences. In the Validity and Causality cluster (3), the discussion centered on how real-world labs advance traditional disciplinary research by integrating real-world complexity, normative orientations, and external validity. This raised questions about whether and how real-world labs might serve as "the better laboratory" for specific cases.

The fishbowl discussion started by pointing out problems with terms such as normativity, validity, and causality. It was argued that this terminology plays a particular role in transdisciplinary research and may be used or interpreted differently than in traditional disciplinary sciences. Participants suggested incorporating more of the underlying scientific logic to overcome language barriers—not only between academic disciplines but also between researchers and practitioners (where the latter is often the focus in transdisciplinary settings like real-world labs). Furthermore, the challenge is not just about establishing a common language but also about finding better ways to communicate mutual benefits. Moreover, it was noted that disciplinary and inter-/transdisciplinary research should be seen as a spectrum and building upon each other, rather than separate/complementary approaches. The discussion also touched on questions related to validity, drawing on insights from philosophical pragmatism: the question is not simply "does it work?" but rather "who decides whether it works?". In disciplinary research, this decision

typically rests with the researchers, whereas in real-world labs, it shifts more towards a joint decision with practical communities. This potential clash—which may be a "competitive tension" between disciplinary and transdisciplinary research—was highlighted as an issue that needs to be addressed without compromising the essence of transdisciplinarity.

Another issue, especially with reference to the panel discussion "Transformation in Sustainability Science – Transformation of Sustainability Science", was a perceived asymmetry between disciplinary and transdisciplinary research. On one hand, effective transdisciplinary research is considered to require robust disciplinary foundations; on the other, disciplinary research can stand on its own, having been established for centuries. Consequently, disciplinary research often appears more "justified". To enhance value on both sides, an approach could be training researchers in transdisciplinary research to facilitate this process. This also involves reflecting on the metaphors we use to describe these approaches.

A further point raised was the importance of relationships and trust ("where do we make time for relationships?"). This aspect is crucial yet often neglected. Building strong, long-term relationships among researchers and practitioners fosters trust, commitment, and scalability, which is essential for sustaining collaborative processes and achieving (tangible) outcomes from such relationships.

Finally, a concluding remark highlighted the need for transdisciplinary approaches like real-world labs: certain questions, especially complex ones of the 21st century, cannot be effectively explored within traditional disciplinary frameworks. Similarly, real-world labs can expose the limitations of disciplinary knowledge production, challenging claims about the need for a theory of change in such settings.

The workshop results will feed into a discussion paper that will be formulated to nurture the community's discourse on the issue. Participants of the workshop were invited to contribute.

4.28 Knowing Better, Doing Better: Stocktaking of the UN Agenda 2030

Co-chairs

Sandra Venghaus
Forschungszentrum Jülich; RWTH Aachen University

Daniel M. Kammen
University of California, Berkeley; Johns Hopkins University

Speakers

Magdalena Klemun
Hong Kong University of Science and Technology; Johns Hopkins University

Youba Sokona (online)
African Institute for Sustainable Energy and Systems Analysis

Rega Sota
RWTH Aachen University

Key points of discussion

"Science and Policy Innovation for the Just Energy Transition" (Daniel M. Kammen)

Current policies are on track to lead to a projected 2.5 – 2.9 ° C increase, far above the acceptable scenarios of keeping post-industrial temperature rise well below 2ºC by 2100 and pursue efforts to keep it below 1.5ºC. A large part of the climate story focuses on the comparison and quantification of climate impacts between alternative scenarios. However, such a story is insufficient.

Given the disparate climate impacts by different income groups and the challenge of mobilizing diverse groups, if the climate challenge is to be seriously tackled, justice considerations must be part of any attempt at a solution. Although the UN Agenda 2030's Sustainable Development Goals (SDGs) include justice in the definition of sustainable development, the goals are far from being operationalized and the world is not on track to meeting them.

In meeting the SDGs or framing their post-2030 substitutes, it is essential to look beyond technological progress, into investigating and affecting the social determinants of technological diffusion. It is equally important to introduce social incentives, akin to well-established science prizes. Finally, innovation should extend to low-income settings in the form of new technologies, such as mini-grids or new procurement mechanisms, such as performance-based contracting.

"The role of technology choices in shaping SDG linkages: Recent advances and knowledge gaps" (Magdalena Klemun)

65% of SDG targets are severely off track, underscoring the urgent need to harness SDG synergies while managing trade-offs. While SDG linkages have been studied, few approaches examine their structural drivers, including technological factors. Understanding how these linkages are influenced by technology choices and context-specific implementation is crucial for designing interventions that are effective across diverse settings, and for developing technologies that maximize SDG impact.

Among existing approaches for conceptualizing linkages, three emphasize the underlying mechanisms: (1) System dynamics applications, (2) investment analysis tools, and (3) bottom-up, technology-centric approaches. Focusing on the third, our approach begins by selecting a technology that advances a primary SDG (e.g., solar PVs for SDG 7) and then disaggregates the technology into the industries and services required for its production and deployment. By mapping these industries to relevant indicators and tracing the relationships between them, we can construct linkages to other SDGs. This method enables us to understand how technology-driven differences in manufacturing and implementation practices influence relationships between environmental, social, and economic SDGs.

When applied to a sample of energy technologies, this approach reveals that synergies tend to outweigh trade-offs, consistent with prior work. However, the intensity of synergies and trade-offs varies across technologies, both within a single SDG and across multiple SDGs. These differences stem, for example, from varying reliance on high-tech industries across technologies. Future research can extend this approach to further explore how specific technology characteristics shape SDG linkages. Moreover, technology-centric approaches can complement other strategies to enhance indicator frameworks, improving their capacity to capture SDG-relevant technology traits.

"Knowing Better, Doing Better: Stocktaking of the UN Agenda 2030: How can we bridge the gap between knowledge and action?" (Youba Sokona)

Countries are not on track to meet the SDGs, and this regression has been compounded by challenges such as COVID-19, wars and economic instability. Global temperatures passed the 1.5 benchmark in 2024, wealth inequality has increased while gender inequality persists, and geopolitical conflicts have disrupted progress. It is essential to integrate SDGs into long-term national policies, establish public-private partnerships in clean energy, and mobilize climate finance. There must be increased investments in climate-smart agriculture and indigenous systems of knowledge should be emphasized when implementing solutions.

"Quantitative methods to analyze SDG interlinkages: An account of the challenges" (Rega Sota)

The UN Agenda 2030 emphasizes the interactions between SDGs but does not offer guidelines for studying them. Early attempts at studying interlinkages were limited to qualitative or simple scoring methodologies. Quantitative methods have gained ground, with correlation, network analysis and econometrics methods comprising a substantial number of publications. However, these methods show weaknesses in the accuracy of their terminology (e.g., correlation), emphasize visualization rather than precision (e.g., networks) or the use certain instruments for unintended purposes (e.g., information compression algorithms). It is necessary to pursue theoretically sound methods, to move beyond simplicity of methods and results as the primary criterion to choose SDG interlinkage methods and to discard the "synergy/ trade-off" dichotomy.

4.29 Session of the New DKN Working Groups

Chair

Birgit Peters
University of Trier

Speakers

Matthias Kranke
University of Kassel

Daniel Reimsbach
University of Paderborn

Christian Wolf
TH Köln University of Applied Sciences

Johan Lilliestam
University of Erlangen-Nürnberg

Birgit Peters
University of Trier

Key points of discussion

The DKN working group speakers in attendance presented an overview of their respective group, sketching the point of departure and expected directions. The topics included:

- Rethinking Sustainable Development Through Post-Growth
- Green Skills for Implementing Public Policy Programs
- Reforming European Biodiversity Protection
- Critical Materials for the Energy and Climate Transition: Local Sustainability and Global Development of Georesources
- Resilient Circular Economy in a Global 5.0 Context

There were several questions from the audience directed at each speaker. They pointed toward further aspects of research, such as to include ESG-biodiversity reporting into questions regarding the reform of European biodiversity protection, or to define what skills are or could be considered green. Members of the audience also pointed toward the global justice problems underlying resource exploitation. Finally, responses from the audience included praise for the selection of the research question of the Green Skills working group.

Conclusion and action items

Since all Working Groups just started their work, the session presented a unique possibility to further reflect on the proposed topics and the underlying research questions.

4.30 Future Earth Discussion Session

Chair

Laura Altstadt
Climate Service Center Germany - GERICS

Moderator

Henry Wu
Climate Service Center Germany - GERICS

Speaker

Jakob Lundberg
Future Earth Sweden Hub

Summary of presentation by Jakob Lundberg, Future Earth Sweden Hub

The presentation focused on Future Earth's efforts to address global sustainability challenges through international collaboration and transdisciplinary research. The presentation and subsequent discussion highlighted the importance of evidence-informed decision-making and the need to strengthen global sustainability science. Future Earth aims to bring together rigorous and relevant scientific knowledge on global sustainability challenges. This involves fostering transdisciplinary research and ensuring that decision-making is informed by robust evidence. The organization works on both global and local scales, involving around 30,000 people worldwide.

Future Earth emphasizes the importance of connecting global North and South, as well as national and local networks. Future Earth coordinates 27 global research networks and produces synthesis reports for bodies like the European Commission, aiming towards sustainable transformation. Future Earth also focuses on building and mobilizing networks, particularly supporting early career researchers and those from low- and middle-income countries

Group discussion summary

The group discussion explored practical aspects of coordinating global sustainability efforts. Comments and questions from the audience touched on the challenges of national committees with a global perspective, the diversity of global research networks and international project/program offices, and the value of cooperation in times of shifting geopolitical agendas, among others. The need for more organizational support for joint initiatives was raised as well.

The interactive discussion also touched on the integration of planetary health into Earth science and the efforts to connect these fields. The Ten New Insights in Climate Science were highlighted as essential research findings to support decision-making in a critical decade, guiding potential future foci for sustainability science.

4.31 Planning Cultures and Cultural Dimensions of the Energy Transition

Chairs

Thomas Weith
Research Institute for Regional and Urban Development (ILS)

Melanie Mbah
Institute for Applied Ecology (Öko-Institut)

Speakers

Thomas Weith
ILS

Sarah Friese
ILS

Jonas Marschall
ILS

Melanie Mbah
Institute for Applied Ecology (Öko-Institut)

Alexandra Doernberg
Leibniz Centre for Agricultural Landscape Research (ZALF)

Felix Zoll
ZALF

Ingo Uhlig
Institute for Climate Protection Energy and Mobility (IKEM)

Summary

In the first part of the Session, Melanie Mbah showed some initial results on regional identities and requirements for participation in planning of the BMWK funded PlanTieFEn-project. For that, she presented findings resulting from transdisciplinary collaboration with practitioners in three model regions: Ruhr, Western Pomerania and Upper Rhine. This showed that regional identities in rural areas often refer to landscape characteristics and its value for income generation. Also highlighted and seen as important from the audience were local experiences regarding energy production and participation (financial as well as procedural). Participation forms need to be regionally adapted. From the ILS side, there was an input on the planning and participation processes including experiences from several expert interviews, also from BMWK funded PlanTieFEn-project. It was shown that the formal process has the weakness of a late public participation when the main planning decisions are already made. The discussion showed that this is well known for decades but the increasing number of requirements for plans seems to be heading towards real improvements. There are some regulations and concepts on financial participation at the authorization level but for this, there is also a need of evaluation and improvement.

Alexandra Doernberg and Felix Zoll presented findings on the societal acceptance of agrivoltaics (AV) from their BMBF funded project SynAgri-PV. Their research, based on expert interviews (n=31) and a survey (n=1000), explored AV's role in balancing energy transition and agricultural land use. Key benefits identified included protection of special crops and livestock, additional income for farmers, and decentralized energy production. However, concerns were raised about negative impacts on landscape aesthetics, on biodiversity, and on the agricultural land market (prices, access).

It was emphasized that the acceptance rate is higher for smaller AV systems, for installations along transport infrastructure, and for measures that are implemented to reduce the visibility of AV systems. Photovoltaic (PV) systems should primarily be installed on roofs, in industrial and conversion areas. The results emphasized the importance of transparent planning, early public participation, and financial involvement of municipalities. Trust in local actors, such as farmers and municipal utilities, was found to be higher than in large investors or energy companies.

From a planning perspective, the need for site-sensitive expansion, biodiversity-friendly facility design, and coordination between agriculture and energy sectors was stressed. While agrivoltaics present a promising solution for dual land use, the findings indicate that procedural and distributional justice are key factors for successful implementation and long-term societal acceptance.

Main points

- Importance of past experiences
- Potential of renewable energies to become part of regional identities
- Demographic situation as part of the regional identity
- Other relevant criteria besides identity for regional acceptance
- Conflict between financial profit for some and regional identity for others

Conclusion and action items

- Network analysis needed for identifying key players in regional settings (building trust)
- New ways of communication needed for transparent an integrated inclusion of different types of knowledge
- Social and cultural aspects need more attention in planning processes, especially via suitable participation formats (building trust)
- Local and regional benefits need to be realized, oriented towards the common good, in order to contribute to the success of the energy transition
- Regional conditions need to be considered for a successful and socially accepted energy transition

4.32 Sustainability at the Origin: Mining as a Global Transformation Field

Chair

Anna Schomberg
Kassel Institute for Sustainability, University of Kassel

Speakers

Luíza Cerioli
Kassel Institute for Sustainability, University of Kassel

Victor Maus
Institute for Ecological Economics, Vienna University of Economics and Business

Andreas Gutmann
Kassel Institute for Sustainability, University of Kassel

Anna Schomberg
Kassel Institute for Sustainability, University of Kassel

Key discussion points

- In the first part of the session, the speakers presented their specific disciplinary view on the topic of mining, i. e. extractivism in Latin America and the Maghreb, global mining indicators from satellite imagery, environmental impacts of mining, resource demands of sustainable industry transformation, potential of innovative mining technologies as well as sustainable mining law.
- The presentations were accompanied by a Mentimeter poll to determine the respective home discipline of the participants and the connection to the topic of mining. Fortunately, we had a very diverse group, although overall they did not have a very specific connection to the topic of mining.
- The original aim of the discussion was to answer the questions of whether mining is an underrepresented topic in sustainability transformation and, if so, how the topic can be established in research and teaching. These questions were to be documented with the help of a live protocol on a MIRO board, but technical reasons made this difficult. Above all, however, the discussion was so lively that we did not want to interrupt it in favor of a rigid discussion plan.

- A large part of the discussion revolved around methodological issues, in particular the use of satellite data for global monitoring of the environmental impact of mining at the level of individual mines, i. e. how can satellite data be used to distinguish between used and unused extraction.
- As the discussion progressed, it centered around various common and well-known issues related to mining, which clearly showed us that more effort is needed to understand and bring together the many different perspectives, especially those we had not yet covered. Answering the questions of whether a new research field "sustainable and transformative mining" is needed and how it can be implemented can only be the second step after a broader addressing of as many relevant perspectives and actors as possible.
- Current political developments and their impact on funding opportunities for further research on the topic were also discussed.
- The engagement of the audience was great and determined by huge interest, while the reactions and feedback were overall positive regarding the importance of the topic and the organization of the session. One topic that was missing from our interdisciplinary selection of different approaches to the topic of mining, and which was pointed out to us by the audience, was the link to circular economy methods for making mining more sustainable. We were made aware of possible collaborations with working groups in the field of material flow accounting and resource use as well as mining and have taken up the relevant contact details.

Conclusion and action items

- To keep the momentum going, all participants will be invited to an updated MIRO Board to continue working on the key issues.
- The next, medium-term step is to work on a joint paper, which will be led by Anna Schomberg and to which all interested participants have been invited as co-authors.
- A possible long-term step is the collaboration in a Horizon Europe proposal and project by Anna Schomberg and Victor Maus, which is to be submitted in September of this year.

4.33 Joint Session

33.1. Freshwater Ecosystems and Biodiversity: A Truly Cross-Cutting Topic, Missing at Future Earth

Speakers

Sonja Jähnig & Sibylle Schroer
Leibniz Institute of Freshwater Ecology and Inland Fisheries

Summary

- The Freshwater Ecosystem and Biodiversity topic can be judged as a truly cross cutting topic for the Future Earth network; it can help to interconnect the existing Global Research Networks (GRN) and Knowledge Action Networks (KAN) and empower their political voice.
- Policies such as the Water Framework Directive, the Habitat Directive and the Nature Restoration Law need not only expertise on freshwater itself, but also on landscape, society, economic benefits and many other social science related subjects.
- Networking is the key and can be of benefit for the target of restoring 25.000km of free-flowing rivers as well as the different policy demands within Future Earths' GRNs and KANs.

Key points

- The Freshwater Ecosystem and Biodiversity topic can be a useful tool for interconnecting many topics concerning ecosystem services, nature-based solutions and nature restoration.
- Networking can help member states how to judge on the cost-benefit calculation of barriers and the potential removal.
- Networking with the Freshwater Ecosystem and Biodiversity topic and the existing Future Earth GRNs and KANs can empower impact on policies, as arguments from different perspectives can be given.

33.2. Safe, Healthy and Environmentally Friendly Ship Recycling Through Automation

Speaker

Stefan Groß
Robotics and Mechatronics, RWTH Aachen University

Comments and questions from the audience

- How can the findings on how products should be designed for automated recycling be better implemented and what are the political implications? One idea could be the creation of corresponding technical norms and standards that a product must fulfill if it is to be sold in Europe.
- How can jobs in ship recycling be preserved despite automation? The project only automates sub-processes in ship recycling and workers are still explicitly involved, e.g. via teleoperation.
- What is the lifetime of a commercially used vessel? It is 20-30 years. This explains why it is important to have new robotic systems that are capable of processing ships from other decades, as we cannot wait until the corresponding changes arrive on the product side at the end of a ship's life cycle.

Key points

- Ship Recycling is still dangerous for environment and workers
- The SHEREC project aims to improve those conditions by automation systems
- To overcome obstacles in recycling processes, we need new robotic systems and automation solutions on the one hand, and designed products for automated recycling on the other.

33.3. Co-Creation: More Than a Trend? Building an Interdisciplinary Approach to Joint Understanding Across Sustainability Research Stream

Speakers

Mahsa Motlagh & Ina M. Sieber
Kassel Institute for Sustainability, University of Kassel

Summary

- Co-creation is widely used across sustainability research but is understood and applied differently across disciplines. The presentation examines how co-creation can be effectively defined, operationalized, and measured in an interdisciplinary framework. The goal is to develop a conceptual

roadmap that accommodates disciplinary differences while maintaining core principles of co-creation.
- The presentation begins by mapping the various definitions, interpretations, and conceptual understandings of co-creation across sustainability-related disciplines and research processes. Instead of forcing a fixed definition, the research advocates for a roadmap that can be adapted across disciplines while maintaining core co-creation principles.
- Presenters asked the audience three questions: 1. Where does your interpretation of co-creation fit in? 2. How do we balance disciplinary diversity with shared understanding? 3. Should co-creation remain discipline-specific, or do we need a roadmap toward shared understanding?

Key points

- Advancing a shared understanding of co-creation across sustainability research, as a conceptual roadmap can provide structure and allow flexibility. The discussion reinforced that interdisciplinary collaboration is essential to refining and operationalizing co-creation in sustainability research.
- There is a need to broaden the scope of sustainability research domains included in co-creation mapping. Expanding the framework will capture a wider range of applications, providing a more comprehensive interdisciplinary analysis and a deeper understanding of patterns, challenges, and opportunities across disciplines.
- This session set the stage for expanding the research framework, refining methodologies, and enhancing interdisciplinary collaboration to ensure co-creation is better understood, mapped, and operationalized across sustainability sciences.

4.34 Metrology and Reliable Measurement Results Supporting Smart and Sustainable Decisions

Co-chairs

Joanna Freyse
Fabian Plag
Olav Werhahn
Physikalisch-Technische Bundesanstalt (PTB), Germany's National Metrology Institute

Speakers

Céline Pascale
Federal Institute of Metrology (METAS), Switzerland

Anita Przyklenk
Mareike Wilms
PTB

Moderator

Julia Tesch
PTB

Key points of discussion

Reliable measurements are essential for evidence-based policy, environmental monitoring, and resource-efficient manufacturing. Examples were brought from the perspective of advanced manufacturing and climate and ocean observations including aspects of circular economy. For all those aspects, data reliability and comparability is crucial and therefore the concept of metrological traceability is a key factor for achieving long term insights and control on the measures fostering sustainability goals.

Regarding implications to policy matters, the session pointed out that there's a need for harmonized standards to support sustainable production, and that international acceptance of measurement results and measurement standards is the backbone for regulations on recycling and emission control.

There was an active panel discussion on citizen science, industry needs, and regulatory challenges, questions ranged from the communication of uncertainty to specific needs in 3D printing quality control.

Science-based decisions are more important than ever for politics and society, and the need for an open dialogue and more transparency about scientific processes has been identified for a wide age of target

groups from childhood to adults. Interactive science education, citizen science and school collaborations illustrate how early involvement supports data literacy. Formats with high personal involvement will become increasingly necessary, and especially the metrology community can be a bridge. One's own measurements lead to more confidence in the results and help to build up a basic understanding of how science works, including awareness of measurement quality (calibration, uncertainty, traceability).

Conclusion and action items

Metrology is foundational for smart, sustainable and inclusive decision-making – across outreach, manufacturing and environmental monitoring. However, all speakers emphasized the role of stakeholder involvement and traceability to SI as key of sustainability. Creating awareness of data quality by addressing calibration, uncertainty assessment and metrological traceability, is a general goal of metrology science outreach, but is particularly important when it comes to citizen science projects in which data is collected on a large scale, and which should ultimately be comparable with each other. Building cooperations and stronger co-operation in outreach issues between them could be a possibility. Follow-up discussions with interested parties for a further exchange are welcome.

4.35 We're All in This Together: Shifting Roles of Scientists in the Socio-Ecological Transformation

Chair

Pavel Kambersky
IMBE-CNRS; French National Committee for Future Earth

Speakers

Gabriela Wuelser
Swiss Academy of Arts and Sciences (SCNAT); Swiss National Committee for Future Earth

Wolfgang Cramer
IMBE-CRNS; French National Committee for Future Earth

Anke Schaffartzik
Central European University; Austrian National Committee for Future Earth

Nana-Maria Grüning
Charité Berlin; Scientist Rebellion

Key points of discussion

This session was presented under a roundtable discussion format, with the four speakers having a 5-10-minute presentation, followed by an hour-long discussion with the audience. The session aimed to continue the talks about the Science-Policy interface which already had taken place in other sessions, but by taking another starting point. One could summarise the talks in one question: 'If we were to admit that our efforts at influencing policymaking are failing, what can scientists do beyond that?'

The first speaker, Gabriela Wuelser, outlined the different roles scientists can take within the science-policy interface. Based on her experience with the Swiss initiative Klimadialog, she argued that the most effective approach is one where knowledge is co-produced, in which the spectrum of possible roles for scientists expands.

The second speaker, Anke Schaffartzik, challenged the notion of scientific expertise. While scientists are specialists in their fields, they do not have all the answers. She encouraged the scientific community to acknowledge uncertainties and focus more on listening rather than stubbornly providing solutions.

The third speaker, Wolfgang Cramer, argued that the first step is to recognize the failure to influence policymaking, which then allows scientists to abandon the illusion of neutrality, which has long been assumed to grant credibility. Only then can researchers fully embrace emotions and explore alternative paths forward - including radical action, which history has shown to be highly effective.

The final speaker, Nana-Maria Grüning, built upon Cramer's speech, emphasizing that scientists hold significant influence and societal respect – privileges that come with responsibilities. She urged scientists to identify and wield their tools of power, highlighting street protests as an efficient such tool. She also shared how personally liberating it can be to actively stand up for one's beliefs.

The discussion with the audience was designed not just as a Q&A but as a space for participants to share their feelings and opinions. The interactions were lively, with many expressing personal views on activism, sometimes emotionally. While some defended activism, others were more critical, questioning its effectiveness compared to existing models and voicing concerns about its potential impact on the scientific community's credibility. Some participants also shared their own experiences, whether as activists or as individuals who have chosen not to engage in activism.

Two main future directions emerged from the discussion:

- The conversation on the science-policy interface and collaboration between National Committees can continue at upcoming Future Earth events, starting with SRI 2025.
- Nana-Maria expressed interest in organizing more practical sessions on activism with her colleagues from Scientist Rebellion. She highlighted that conferences focusing on diagnosing problems in the scientific community have one big problem: they often lead to feelings of hopelessness. To address this, she proposed adding a capacity-building component to future sessions, where experienced scientist-activists provide practical guidance for those interested in engaging in activism.

4.36 Advancing Sustainability in Teaching and University: Best Practices and Challenges

Chairs

Franziska M. Hoffart
Stefan Lechtenböhmer
Kassel Institute for Sustainability, University of Kassel

Robert Lepenies
Karlshochschule International University

Sven Pastoors
Humboldt hochN

Sonja Knobbe
[tra:ce] International Center for Sustainable and Just Transformation, Witten/Herdecke University

Speakers

Sarah Wedde
Kassel Institute for Sustainability

Key points of discussion

- Supporting evidence or specific examples (e.g. case studies)
- Methodologies/tools or technological aspects
- Practical implications or applications (potential impacts or significance)
- Challenges or limitations
- Ethical and justice-related considerations
- Policy implications
- Summary of the most important questions and answers
- Audience engagement, reactions, or feedback

Conclusion and action items

- To keep the momentum going, are there potential collaborations, future directions
- Action items or follow-up tasks identified during the session

5. Summit Conclusion

A critical challenge in advancing sustainability science lies in the tension between sustainable development and political processes. Sustainable development is often perceived as a threat, particularly when it challenges entrenched interests. While such tensions are, to some extent, a natural accompaniment to transformation processes, recent developments are cause for concern. Since 2015 – when the UN Agenda 2030 and its Sustainable Development Goals received broad endorsement from all member states – both global and national discourses on sustainable development have grown more polarized, and the dialogue between sustainability science and politics has become increasingly strained. A formidable yet compelling challenge for our scientific community will be how to counteract this troubling trend and (re)establish productive, trustworthy science-policy interfaces.

The following paragraphs offer some reflections in this direction.

The need for orientation in sustainability science

This important summit reminded us of the urgency to explore emerging topics, prioritize sustainability research, and further improve interdisciplinary dialogue. Over the past decade, the composition of the field has shifted significantly. Social sciences and humanities now play a more prominent role alongside the natural sciences, reflecting a growing recognition that sustainability challenges are deeply intertwined with societal structures and human behavior.

Given the intensifying climate crisis, the need for effective mitigation strategies and adaptive frameworks has never been more pressing. This urgency calls for a fundamental rethinking of research management structures to ensure they evolve in step with our changing demands. We must ask ourselves: Do our current systems still serve us effectively? And how can we make research processes more sustainable?

To address these questions, it is crucial to establish a shared understanding of what constitutes "sustainability science." This includes clarifying its core principles, methodologies, and goals. Only with strong disciplinary voices and a unified academic community can we move forward with purpose and coherence.

Financial support and careers in sustainability science

Sustainability science is fundamentally about human capital. The development of attractive career pathways in sustainability science is crucial. Funding remains a significant concern, and we must confront structural challenges – such as those posed by the German Wissenschaftszeitvertragsgesetz – that risk driving talented individuals away from the field. We cannot afford to lose this talent due to financial constraints or limited career prospects. Therefore, it is imperative that the structure of the scientific community evolves to support and retain the next generation of sustainability researchers.

Communication of scientific results

Effective and targeted communication is a cornerstone of impactful sustainability science. This raises the important question of how effective communication can best be established through cooperation among scientific and professional organizations, the media, and other intermediaries.

The commonly used term "science-policy interface" is often criticized for being too narrow. We must also engage with non-policy sectors of society. As scientists and citizens, we have both the right and the duty to participate actively in public discourse.

The importance of collaboration

In light of these challenges, collaboration emerges as a key principle. The problems we face are too complex and interconnected to be solved in isolation. We must therefore strengthen our commitment to working together across disciplines, sectors, and borders.

Importantly, we must recognize that we do not operate in a science bubble. The realities of the world – from local to global levels – shape and influence scientific inquiry. In response, we must meet this new reality with resilience, unity, and a renewed spirit of collaboration. This collective effort gives us hope.

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Stellungnahme: Nachhaltigkeitsforschung dringender denn je!

Erklärung des Deutschen Komitees für Nachhaltigkeitsforschung (DKN)

Berlin, 20. Februar 2025

Das Deutsche Komitee für Nachhaltigkeitsforschung (DKN) ist ein vom Präsidium der DFG mandatiertes Beratungsgremium. Das Mandat des DKN umfasst die Weiterentwicklung der wissenschaftlichen Nachhaltigkeitsagenda durch die Identifikation und Ausarbeitung strategisch wichtiger Themen in der Nachhaltigkeitsforschung und deren Integration in die internationalen Plattformen Future Earth und WCRP. Das DKN ist nationaler Ansprechpartner für die internationalen Entwicklungen und Aktivitäten, die im Rahmen dieser internationalen Plattformen/Forschungsprogramme durchgeführt werden, und bringt hierzu die Natur- und Sozialwissenschaften zusammen.

Ausgangspunkt

Die großen globalen Herausforderungen unserer Zeit – Klimawandel, Artensterben, Ressourcenknappheit, Gerechtigkeit – erfordern wissenschaftlich fundierte Lösungen. Nachhaltigkeitsforschung liefert das dafür nötige Wissen: Sie untersucht, wie Gesellschaft, Wirtschaft und Umwelt langfristig, auf gerechte Weise und unter Berücksichtigung globaler Verflechtungen in Einklang gebracht werden können. In Deutschland hat sich in den letzten Jahrzehnten eine starke Forschung zu Nachhaltiger Entwicklung etabliert. Heute gehört Deutschland international zu den Vorreitern – mit einer einzigartigen Kombination aus naturwissenschaftlicher, technischer, sozial- und geisteswissenschaftlicher Expertise. Diese Forschung trägt dazu bei, das Erdsystem besser zu verstehen, innovative Technologien zu entwickeln, Fragen der Ungleichheit und Armut adäquat zu adressieren und gesellschaftliche Transformationsprozesse zu begleiten. Nachhaltigkeitslösungen entstehen jedoch nicht im Elfenbeinturm der Wissenschaft. Der enge Austausch mit Politik, Wirtschaft und Gesellschaft ist entscheidend, um Forschungsergebnisse in die Praxis zu bringen. Transdisziplinäre Forschung – also die Zusammenarbeit von Wissenschaft und Praxis – hat in Deutschland bereits viele erfolgreiche Initiativen hervorgebracht. So trägt die Forschung zur Effizienzsteigerung von Solar- und Windkraft dazu bei, den Ausbau erneuerbarer Energien voranzutreiben. Wissenschaftliche Analysen helfen, den Einsatz von Pestiziden zu reduzieren und gesunde Böden zu erhalten. In der Stadtentwicklung entstehen neue Konzepte für klimafreundliche und lebenswerte Städte, etwa durch Begrünung, Mobilitätswende und Kreislaufwirtschaft. Dank gezielter Förderprogramme des Bundes und der Länder konnten solche Projekte wachsen und einen echten gesellschaftlichen Beitrag leisten. Doch in politisch bewegten Zeiten droht der Elan nachzulassen. Kürzungen in der Forschungsförderung, fehlende politische Unterstützung oder kurzfristige wirtschaftliche Interessen könnten eine der wichtigsten Grundlagen Nachhaltiger Entwicklung gefährden. Das droht aktuell in den USA durch das radikale Vorgehen der Trump-Administration. Deshalb braucht es in Deutschland und Europa eine langfristige und verlässliche Finanzierung der Nachhaltigkeitsforschung, den weiteren Ausbau nationaler und internationaler Kooperationen zwischen Wissenschaft, Politik und Gesellschaft sowie die stärkere Integration wissenschaftlicher Erkenntnisse in politische Entscheidungen. Deutschland hat gezeigt, dass Forschung ein Motor für Nachhaltigkeit sein kann. Jetzt ist es an der Zeit, diesen Weg entschlossen weiterzugehen – für uns und kommende Generationen.

1. Wissenschaftlich fundiert analysieren, faktenbasiert handeln!

Nachhaltigkeitsforschung ist von zentraler Bedeutung, um die komplexen ökologischen und sozialen Herausforderungen, mit denen Deutschland, Europa und die Welt heute konfrontiert sind, zu bewältigen. Der massiv gestiegene Problemdruck durch den Klimawandel, der Verlust der biologischen Vielfalt und die zunehmende soziale Ungleichheit fordern die Entwicklung neuer Lösungen. Ohne wissenschaftlich fundierte Analyse und praktisch anwendbares Wissen können diese krisenhaften Herausforderungen nicht wirksam angegangen werden. Aussitzen oder politisch motiviertes Ignorieren oder gar Verleugnen helfen wenig und verstärken die Krisen und Probleme. Daher sind faktenbasierte, wissenschaftlich fundierte Handlungsempfehlungen entscheidend, um politische Entscheidungen zu treffen, die insgesamt

- Umwelt, Wirtschaft und Soziales integrierend - nachhaltig sind. Wissenschaft in enger Zusammenarbeit mit gesellschaftlichen Akteuren kann hier Orientierung bieten, die Handlungsspielräume eröffnet und gleichzeitig die Risiken der multiplen Krisenphänomene minimiert – von Epidemien, Klima- und Naturkatastrophen bis hin zu gesellschaftlichen Konflikten. Dies zeigt sich beispielsweise in der Forschung zu erneuerbaren Energien, die entscheidende Grundlagen für die Dekarbonisierung der Industrie und der Gesellschaft insgesamt erarbeitet.

Nachhaltige Lösungen entstehen jedoch nicht nur durch die Bereitstellung von Daten und Wissen allein, sondern auch durch die Erprobung und Umsetzung in die Praxis. Das bedeutet, dass politisches Handeln und wirtschaftliche Entscheidungsträger*innen auf die Ergebnisse der Forschung angewiesen sind, um effektive Maßnahmen zu ergreifen. Der Druck, insbesondere durch Klimawandel und Biodiversitätsverlust, zwingt uns zu einer schnellen Entwicklung und Umsetzung von Strategien, die nur durch präzise und fundierte wissenschaftliche Erkenntnisse realisiert werden können. Ohne eine gezielte Förderung der Forschung könnte Deutschland in seiner Rolle als führende Nation in der internationalen Klima- und Nachhaltigkeitspolitik zurückfallen und wichtige globale Verantwortung einbüßen.

2. Exzellente Wissenschaft erfordert gesicherte Finanzierung

Exzellente Wissenschaft benötigt eine transparente und solide finanzielle Unterstützung, um ihre Arbeit kontinuierlich und auf hohem Niveau auszuführen. Die Komplexität der aktuellen Herausforderungen verbietet es, sich mit kurzfristigen, oberflächlichen Lösungen zufrieden zu geben. Nur langfristig angelegte und ausreichend finanzierte Forschungsprojekte ermöglichen kontinuierliche Erkenntnisgewinne und deren praxisnahe Anwendung. Die Förderung von nachhaltigkeitsorientierter Forschung ist daher nicht nur eine Frage des wissenschaftlichen Fortschritts, sondern auch der politischen Weitsicht. Insbesondere in Bereichen wie der Entwicklung neuer Technologien zur Emissionsminderung oder der Analyse von sozialen Prozessen und der Verhaltensweisen von Menschen sind fundierte und langfristige Forschungsstrategien nötig, um relevante und wirksame Beiträge zur Bewältigung der Nachhaltigkeitsherausforderungen zu leisten.

3. Wirksame Nachhaltigkeitsforschung braucht Unterstützungsstrukturen und Koordination

Für die Wirksamkeit der Nachhaltigkeitsforschung sind unterstützende Strukturen und Koordinationskapazitäten in den Einrichtungen der Wissenschaft und des Wissenschaftsmanagements aber auch darüber hinaus unabdingbar. Gesellschaftlich relevante Wissenschaft und Forschung brauchen den Austausch von Erkenntnissen und die Vernetzung von Wissenschaftler*innen untereinander sowie institutionalisierte Schnittstellen mit gesellschaftlichen Akteuren. Durch die enge Kooperation zwischen Universitäten, Forschungseinrichtungen, zivilgesellschaftlichen Gruppen und der Wirtschaft können praxistaugliche und innovative Lösungen entstehen, die wesentlich für die Lösung der Nachhaltigkeitsherausforderungen sind. Das zeigt sich beispielsweise in der Forschung zur Kreislaufwirtschaft, wo Hersteller, Verpackungsunternehmen, Verbraucherverbände und Recyclingunternehmen neue Lösungen zu Fragen der Nutzung seltener Metalle und Materialien erarbeiten. Interdisziplinäre, kollaborative Forschungen zu umfassender Anpassung an Klimawandelfolgen und innovative Formen des Biodiversitätsschutzes in Ländern des Globalen Südens eröffnen neue Perspektiven auf planetare Herausforderungen. Diese Zusammenarbeit und Vernetzung brauchen politische wie gesellschaftliche Unterstützung, rechtliche Rahmung und finanzielle Förderung.

4. Disziplinübergreifendes und transdisziplinäres Forschen und Problemlösen sind unerlässlich

Die Nachhaltigkeitsforschung muss maßgeblich disziplinübergreifend und transdisziplinär gestaltet werden. Gerade in der engagierten Zusammenarbeit von Praktiker*innen und Wissenschaftler*innen verschiedener Fachrichtungen entstehen nachhaltige Antworten auf die Fragen von heute und morgen. Die Herausforderungen des 21. Jahrhunderts erfordern nicht nur technologische Innovationen, sondern auch begleitende gesellschaftliche, wirtschaftliche und politische Veränderung, um einen tiefgreifenden Wandel z.B. zur Klimaneutralität zu erreichen. Ein Beispiel für solch eine transdisziplinäre Herangehensweise ist die Forschung zur nachhaltigen Stadtentwicklung, die sowohl Klimaveränderungen

und technologische Innovationen in Architektur und Bauwesen als auch Wohngewohnheiten sowie weitere soziale und kulturelle Aspekte berücksichtigen muss.

5. Freiheitliche Demokratien müssen faktenbasiert und wissenschaftlich fundiert entscheiden – nicht auf Fake News und Verschwörungstheorien setzen

Schließlich ist eine freiheitlich-demokratische Gesellschaft auf wissenschaftlich fundierte Informationen und Analysen für zukunftsweisende politische Entscheidungsprozesse angewiesen. Freiheitliche Demokratien müssen sich auf verlässliche, von der wissenschaftlichen Gemeinschaft überprüfte Analysen stützen – nicht auf Fake News oder Verschwörungstheorien. Sowohl auf nationaler als auch auf internationaler Ebene dürfen Entscheidungen nicht auf Basis populistischer oder ungesicherter Behauptungen und gefühlter Wahrheiten getroffen werden. Angesichts der globalen Dimension multipler Krisen müssen sie zudem umfassend globale Vernetzungen und Interdependenzen analysieren, um gerechte und transparente Lösungsvorschläge mit einer planetaren Dimension erarbeiten zu können. In Zeiten von Informationsflut und Meinungsmanipulation insbesondere durch Social Media braucht es eine starke und unabhängige Wissenschaft. Diese zu fördern und im Hinblick auf ihre gesellschaftlichen Beiträge zu einer Nachhaltigen Entwicklung zu fordern, ist eine unverzichtbare Aufgabe von Politik und Gesellschaft.

Die Mitglieder des DKN

Daniela Jacob, Climate Service Center Germany (GERICS), Helmholtz-Zentrum Hereon
Michael Bollig, Universität Köln
Aletta Bonn, Helmholtz-Zentrum für Umweltforschung (UFZ)
Anna-Katharina Hornidge, German Institute of Development and Sustainability (IDOS)
Thomas Potthast, Universität Tübingen
Markus Reichstein, Max-Planck-Institut für Biogeochemie
Britta Renner, Universität Konstanz
Jakob Rhyner, Universität Bonn
Bernd Siebenhüner, Carl von Ossietzky Universität Oldenburg

Deutsches Komitee für Nachhaltigkeitsforschung in Future Earth (DKN), Geschäftsstelle
c/o Climate Service Center Germany (GERICS)
Helmholtz-Zentrum Hereon
Fischertwiete 1
20095 Hamburg