

# Integrated Earth System Research Conference 2022 – From Vision to Implementation

## PROGRAMME (Version 12<sup>th</sup> October 2022)

### Day 1 (8<sup>th</sup> November 2022)

Registration: from 11.30 at Foyer House H of Albert Einstein Science Park, Potsdam (GER)

Possibility for lunch: Canteen House H and Café Freundlich

#### A. Plenary session [Main Hall]

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

13.00–13.10: *Welcome and introduction* (Jochen Schanze, Leibniz Research Network 'Integrated Earth System Research')

13.10–13.30: *Recent Earth system dynamics, systemic risks and opportunities* (Keynote) (Johan Rockström & Wolfgang Lucht, Potsdam Institute for Climate Impact Research)

13.30–13.50: *Global economic developments in an Earth system with finite resources* (Keynote) [tbd] (Raimund Bleischwitz, Leibniz Centre for Tropical Marine Research)

13.50–14.15: *Research on our future within the Earth system* (Dialogue between Matthias Beller, Vice-President of the Leibniz Association and N.N., Federal Ministry of Education and Research)

14.15–14.45: Coffee break

#### B. Plenary session 'Theoretical Basis and New Methods and Models of iESR' [Main Hall]

Conveners: Jochen Schanze (IOER), Dieter Gerten (PIK), Miriam Prys-Hansen (GIGA)

Moderator: Edeltraud Günther (UNU-FLORES and DFG, Scientific Council ESS)

*Abstract: The need for a systematic integration of activities, vulnerabilities and capacities of people with their institutional arrangements into the Earth system sciences poses novel and emergent theoretical and methodological challenges, explicit scientific treatment of which is little developed. Thus, the session is dedicated on the one hand to the identification of fundamental theoretical and methodological challenges of an 'Integrated Earth System Research'. On the other hand, interdisciplinary approaches will be discussed between the natural and social sciences as well as the humanities that can pave the way towards a more intertwined study of the Earth system and the societal world. A focus is on novel scientific interfaces that can be qualified for the description and explanation of both biophysical processes of the Earth system and immaterial societal processes relevant for the Earth system. This comprises new ways of explicit inclusion of societal phenomena in coupled modelling of the Earth system, e.g. as a means of exploring safe and just operating spaces and alternative societal transformation pathways. The outcomes are envisaged to identify and critically reflect theoretical basics as well as methods and models of the integrated Earth system research.*

14.45–15.10: *Outline of an 'Integrated Earth System Research'* (Jochen Schanze, Dieter Gerten, Miriam Prys-Hansen, Leibniz Research Network 'Integrated Earth System Research')

15.10–15.20: *The role of the anthroposphere in the geological Earth system sciences* (Friedhelm von Blanckenburg, GFZ & LEOPOLDINA WG Earth system science)

15.20–15.30: *Past Human-Earth System interrelations* (Detlef Gronenborn et al., RGZM)

15.30–15.40: *Grand challenges in socio-environmental systems modelling* (Jonathan Donges, PIK)

15.40–15.50: *Transdisciplinary co-production of knowledge and sustainability transformations: Challenges and ways forward for integrated Earth System Research* (Flurina Schneider, Goethe-Universität Frankfurt & ISOE)

15.50–16.15: Dialogue: *Conceptual and methodological challenges of an 'iESR'*

16.15–16.45: Coffee break

## **16.45–18.15 Parallel sessions:**

### **C.1 Parallel session 'Oceans and their Use in the Earth System' [Main Hall]**

*Conveners: Ulrich Bathmann (IOW), Nils Moosdorf (ZMT) & Helge Arz (IOW)*

*Moderators: Helge Arz (IOW), Nils Moosdorf (ZMT)*

*Abstract: The ocean plays a central role both in the Earth system and in society. It transports and stores water, heat, gases and substances and provides a habitat for a large variety of living organisms. Transport and storage are strongly influenced by the atmosphere and processes on land through rivers and groundwater. Coastal and marine ecosystems provide food for billions of people. Commercial use of the oceans includes large-scale industrial and artisanal fishing, intensive aquaculture for a range of species, global shipping, and tourism by large and growing numbers of people. The Anthropocene is leading to extensive impacts on the world's seas such as rising water temperatures, changing ocean currents, rising sea levels, acidification, pollution from oil, plastics and other substances, and habitat destruction. Together they cause a multitude of indirect consequences. The complexity of the processes involved, the acceleration of change and the importance for humans make the ocean and coasts an important part of the Earth system in the Anthropocene. In this session, we have invited contributions from different scientific disciplines to explore the role of the ocean in an 'Integrated Earth System Research' and to stimulate a respective discussion.*

16.45–17.00: *Introduction* (Antje Boetius, AWI)

17.00–17.10: *The sea and its sediments: a history of earth, climate, and human interaction* (Jerome Kaiser, IOW)

17.10–17.20: *The oceans in a changing climate* (Stefan Rahmstorf, PIK)

17.20–17.30: *Food webs from ocean to land* (Michael Kriegl, ZMT)

17.30–17.40: *The ocean in the global economy* (NN, ...)

17.40–17.50: *Ocean in local social systems* (Barbara Naumann, IASS)

17.50–18.15: Dialogue

### **C.2 Parallel session 'Water Cycle and Inland Water in the Earth System' [Room V1]**

*Conveners: Verena Maleska (IOER), Hans-Peter Grossart (IGB), Dörthe Tetzlaff (IGB), Christiane Fröhlich (GIGA)*

*Moderator: Florian Leese (UDE + WSA)*

*Abstract: Climate-related and anthropogenic drivers are increasingly changing the global water cycle and thus the entire Earth system, including the biosphere. In this context, inland waters play an important role as an integral part of physical, chemical and biological changes in the surrounding landscape. This session focuses on studies that identify the impacts of these changes on the water cycle in the Earth system globally, as well as on the role of inland waters regionally and locally on topics such as: a) landscape component water / landscape water balance; b) inland waters as a central component of the landscape water balance; c) global water cycle and inland waters in the Anthropocene; and d) feedbacks with the atmosphere and thus the climate – exploration through an 'Integrated Earth System Research' approaches. This includes human-related risks such as (i) hydro-climatic risks, e.g. due to increasing frequency of floods or droughts, (ii) chemical risks, e.g. due to eutrophication and pollution, as well as (iii) biological risks, e.g. increasing health burden due to algal toxins etc. In particular, understanding the interactions between the individual Earth system components in the hydrological cycle, including inland waters, is a key basis for future management strategies in the Anthropocene. We invite studies that analyse anthropogenic influences on hydrological, physico-chemical and biological components of the water cycle, as well as the development of sustainable solutions across different spatial and temporal scales.*

16.45–17.00: *Assessing global biodiversity change through space and time with environmental DNA* (Florian Leese, UDE + WSA)

17.00–17.10: *Impact of continental water storage changes on global mean sea-level rise* (Petra Döll, Goethe-University Frankfurt)

17.10–17.20: *Social water aspects in the Earth system* (Terje Tvedt, University of Oslo)

17.20–17.30: *Water cycle and inland water in the Earth system* (Hans-Peter Grossart & Dörthe Tetzlaff, IGB, Verena Maleska, IOER)

17.30–18.15: Dialogue

### **C.3 Parallel session 'Re-Thinking Biodiversity Research in the Earth System to Address the Biodiversity and Climate Crisis' [Room V3]**

*Conveners: Bernhard Misof (LIG), Andrea Mulch (SGN), Susanne Fritz (SGN)*

*Moderators: Bernhard Misof, LIB; Susanne Fritz, SGN*

*Abstract: The obvious biodiversity, climate and societal crises – as an entanglement of geosphere, biosphere and anthroposphere – urgently demand a re-thinking of our approaches to understand causes and effects of environmental change. For a holistic approach guided by actions from various research fields (Life Sciences, Earth Sciences, Medicine, Economy, Climate and Social Sciences) we need to establish global and open science networks, standards and platforms. For example, we need to foster the establishment and availability of integrative open science platforms – as part of an 'Integrated Earth System Research' platform – with approaches interweaving biological and non-biological disciplines, and with increasingly complex data structures and qualities. Key to an innovative research and action-oriented employment of this open platform and data will thus be new creative approaches to connect them, and thereby to address new integrated research questions particularly by employing new data and hypotheses retrieval technology. This needs to be globally extended including research and data on e.g. climate, water systems, (bio-)economy, environmental changes, social and cultural aspects like urbanization or migration. Internationally connected, we may face future global challenges – being scientifically effective, solution-oriented, and participative including knowledge transfer.*

16.45–17:00: *Biodiversity research as agents of social transformation* (Bernhard Misof, Leibniz Institute for the Analysis of Biodiversity Change LIB)

17.00–17.10: *Trapping the atmosphere in geo-materials* (Stefan Peters, LIB)

17.10–17.20: *Ecological restoration as a tool out of multiple crises – examples from grassland restoration* (Vicky Temperton, Leuphana University Lüneburg)

17.20–17.30: *Collectomics* (Karsten Wesche, Senckenberg Museum Görlitz)

17.30–17.40: *The 10MustKnows: Ensuring access and open use of research data* (Christoph Häuser, MfN)

17.40–17.50: *Taxonomy and species knowledge as key factors in biodiversity research* (Ralph S. Peters, LIB)

17.50–18.15: Dialogue

#### **Social event**

19.00–...: Reception and dinner and get together at the Potsdam downtown Mercure hotel (buffet and soft drinks are included in the registration fee; participation requires respective indication during the registration procedure)

**Day 2** (9<sup>th</sup> November 2022)

08.30–09.00: Arrival

**D. Plenary session** [Main Hall]

*Moderator: Miriam Prys-Hansen (German Institute for Global and Area Studies)*

09.00–09.15: *Wrap up Day 1* (Dieter Gerten, Potsdam Institute for Climate Impact Research)

09.15–09.40: *Protecting Global Environmental Goods: The European Way* (Eugénia da Conceição-Heldt, Technical University of Munich)

09.40–10.05: *Global Earth and world governance; social equity* (Frank Biermann, Utrecht University)

10.05–10.30: Coffee break

**10.30–12.00 Parallel sessions:**

**E.1 Parallel session 'Earth System Change and Conflict: Politics of Scale and the Governance of the Earth System'** [Main Hall]

*Conveners: Claas Schneiderheinze (IfW), Stefan Kroll (PRIF)*

*Moderator: Miriam Prys-Hansen (GIGA)*

*Abstract: International cooperation among sovereign actors is an important prerequisite for both countering the causes and consequences of environmental change as well as preventing conflicts. Yet, at the same time, multilateral cooperation within international institutions has been in crisis in the recent past. It was not only in the pandemic that national approaches dominated international ones. The current paradigm shift in international security (but also, for instance, supply chain management) is also reinforcing a trend toward global de-coupling and de-globalization. In order to "translate" natural science-based solutions into societal processes of regulation or sustainable transformation pathways, research needs to begin analyzing how specific (crisis) spaces are defined and which actors have political agency in these spaces. What are the implications of these disentanglements and potential fragmentations for the management of global crises? To what extent do shared environmental risks or concrete threats also offer an opportunity for new forms of cooperation beyond geopolitical and ideological antagonisms? Considering the planetary patterns of environmental and other crises, this panel discusses these developments with references to different literatures and research arenas, including "politics of scale" (i.e. the construction and de-construction of new spaces of governance), historical precedents and path-dependencies, economics and migration.*

10.30–10.45: *Introduction* (Claas Schneiderheinze, IfW & Stefan Kroll, PRIF)

10.45–10.55: *Global environmental justice* (Felix Anderl, Philipps-Universität Marburg)

10.55–11.05: *Conflict-climate interrelations in holocene European societies* (Detlef Gronenborn, RGZM)

11.05–11.15: *Climate, migration, and place-based, intersectional vulnerabilities* (Christiane Fröhlich, GIGA)

11.15–11.25: *Governing global supply chains in the context of conflicts and climate change* (Frauke Steglich, KfW)

11.25–11.35: *Ecological security and planetary/local scales* (Patrick Flamm, HSFK & Jürgen Scheffran, Universität Hamburg [tbc])

11.35–12.00: Dialogue

## **E.2 Parallel session 'Bioeconomy in the Earth System' [Room V1]**

*Conveners: Maren Dubbert, Heidi Webber, Anette Ruml*

*Moderators: Maren Dubbert, Heidi Webber, Anette Ruml*

*Abstract: In the context of climate change, critical losses in biodiversity and excessive energy, nitrogen and phosphorus use, bioeconomy strategies emerge as a required reconfiguration of the economy. Yet, critical knowledge gaps exist around the implications of bioeconomy developments for extreme poverty alleviation, food and nutrition security. Indeed, understanding what safe and just operating spaces for a sustainable bioeconomy are, requires integrated cross-system, cross-scale and cross-region assessments to anticipate and monitor bioeconomy drivers, outcomes and impacts. In this session we will explore required frameworks to assess bioeconomy contributions within the full SDG space. We will investigate required integrated modeling and monitoring methods to quantify tradeoffs and synergies between sustainability indicators (e.g. SDGs and implications for planetary boundaries) as well as approaches to bridge such science to transdisciplinary co-design research to inform workable solutions and policies throughout the whole supply and demand system.*

10.30–10.35: *Introduction* (Anette Ruml, GIGA & Maren Dubbert, ZALF)

10.35–10.55: *Integrated assessment needs for a bioeconomy* (Hermann Lotze-Campen, PIK)

10.55–11.05: *Accounting for shocks and disruptions: climate, pandemics and wars* (Heidi Webber, ZALF)

11.05–11.15: *Monitoring progress towards SDGs and planetary boundaries* (Jörg Freyhof, MfN)

11.15–11.25: *Novel products and innovation in assessments* (Ludger Wessjohann, IPB)

11.25–11.35: *International framing & national policies: necessary policy instruments & cross scale interactions* (... [tbc])

11.35–12.00: *Dialogue: Research agenda for consistent cross-scale and sector bioeconomy assessments*

## **E.3 Parallel session 'Urban-Rural Interlinkages in the Earth System' [Room V3]**

*Conveners: Barbara Warner (ARL) & Mike Müller-Petke (LIAG)*

*Moderator: Moderator: Mike Müller-Petke (LIAG)*

*Abstract: The global megatrend of urbanisation accelerates the consumption of resources, consolidates networks and dependencies and changes material flows at different scales. The processes and challenges in regional urban-rural contexts are (i) conditioned by global contexts, but (ii) can also facilitate solutions for a global level. We will discuss which challenges for urban-rural systems arise from the integral perspective of the Earth system, and which impacts result from rapidly changing urban-rural systems for the Earth system, its stability and suitability for habitation. Against the background of these relevant cross-scale interrelationships, we will identify characteristics and present challenges for urban-rural systems. The thematic focus will be on climate change mitigation and adaptation, land take and use, agri-food systems, and material flows. We will discuss how different perspectives can be brought together and how cross-level concepts such as telecoupling or resilience may be used in an 'Integrated Earth System Research'. Which governance arrangements can be target-oriented and effective for sustainability transformation? Specific thematic approaches will be used to identify and expand areas of investigation and discuss them against the backdrop of governance and participation.*

10.30–10.45: *Framings, approaches and realities of agri-food system transformation: An urban-rural perspective* (Anette Piorr, ZALF)

10.45–10.55: *Urban-rural interlinkages: impact for regional and global transformation: Contributions for an iESF* (Barbara Warner, ARL)

10.55–11.05: *Mapping knowledge within and beyond urban ecology* (Jonathan Jeschke, FU Berlin)

11.05–11.15: *Water demand and water function in the urban-rural perspective* (Traugott Scheytt, TU Bergakademie Freiberg)

11.15–11.25: *Impact of urbanisation on construction material consumption: Results of a global analysis and insights into a case study of a dynamically growing urban region* (Georg Schiller, IOER)

11.25–12.00: *Dialogue*

12.00–13.00: Lunch break [Canteen] including poster session [Foyer]

## **F. Plenary session 'Data and Tools for an iESR' [Main Hall]**

*Conveners: Markus Stocker (TIB), Veronika Grupp (Leipzig University), Claus Weiland (SGN)*

*Moderator: Markus Stocker (TIB)*

*Abstract: Data standardisation efforts and research data infrastructure development have a long history in the Earth System Sciences (ESSs). This is partly because past observational data cannot be collected twice, motivating, thus, systematic collection, curation and publishing to enable and support reuse. Moreover, ESS data reuse is not complicated by data privacy regulation. Finally, many communities in ESSs have been cultivating an open culture, where data sharing has long been common practice. With the introduction of the FAIR data principles, research data management (RDM) is experiencing a global alignment of practices and technologies in ESSs, and for research data it ensures a global, distributed space of inter-disciplinary interoperable research data. For an 'Integrated Earth System Research' it is thus crucial to stay current with the state of the art in RDM; ensure principles, best practices, technologies are adopted and implemented in the research practices and infrastructures; and ensure the researchers interact with national and international initiatives on RDM (e.g., NFDI, RDA, EOSC). This session will provide a state-of-the-art introduction to RDM and exploitation of managed data in ESS. Based upon, it aims to draft an agenda for RDM in an 'Integrated Earth System Research'.*

13.00–13.15: *Interdisciplinary data and tools reuse: Challenges and opportunities* (Markus Stocker, TIB)

13.15–13.25: ... [tbd] (Jonas Grieb, SGN)

13.25–13.35: *Linking Social Science Data with Earth Observation Data* (Alexia Katsanidou, GESIS)

13.35–13.45: *NFDI4Earth - supporting cultural change and new tools for RDM in Earth System Sciences* (Veronika Grupp, Leipzig University)

13.45–14.00: Dialogue, next steps, conclusions

## **G. World café 'Agenda for an iESR' [Main Hall + Klaus Hasselmann Hall House A56]**

*Conveners: Jochen Schanze, Dieter Gerten, Miriam Prys-Hansen*

*Abstract: The world café provides a forum for interdisciplinary identification and specification of corner stones of an 'Integrated Earth System Research'. Each table is requested to identify gaps and research demands referring to (i) approaches reaching across spatial and temporal scales and societal levels involving both the biophysical Earth system and the societal world with their dynamic interdependencies; (ii) research-based reasoning of evaluation references such as planetary boundaries and planetary justice, and means of their societal negotiation, implementation and monitoring; and (iii) transformative approaches covering interrelated Earth system and societal world knowledge, research-based target knowledge and sustainability transformation knowledge. Each table addresses one of the plenary and parallel session themes as well as open topics. The forum is arranged in presence at the conference venue and online in breakout groups. Discussions are moderated by a table chair. Selected key results will be reported to the audience at the end of the session.*

14.00–16.00: Introduction [Main Hall], walk to the world cafés through the Albert Einstein Science Park, table discussions including coffee and cake [House A56], walk back to the main hall, table reports]

## **H. Plenary session 'Conference Conclusions and Closure'** [Lecture Hall House A56]

*Conveners: Jochen Schanze, Dieter Gerten, Miriam Prys-Hansen*

*Abstract: The final plenary session starts with a wrap up of the plenary and parallel sessions of day 2. It then draws initial conclusions from the conference organisers including an outlook on future activities for establishing an 'Integrated Earth System Research'. The conference will be closed acknowledging contributors and supporters.*

16.00–16.30: Wrap-up, conclusions and outlook, and closure

### **Media event**

National and international media will be invited and informed about the initial key outcomes of the conference via a press release and a media briefing.