



● BOOK OF ABSTRACTS

● DIGITALIZATION FOR
SUSTAINABILITY TRANSFORMATIONS:
CRITICAL PERSPECTIVES,
LESSONS LEARNED, AND
FUTURE PROSPECTS

● September 20-22, 2023

**Centre for Climate Resilience
University of Augsburg**

About the conference

“Digitalization for Sustainability Transformations” is an international, interdisciplinary academic conference hosted and organized by the University of Augsburg (Germany) in collaboration with the Weizenbaum Institute, the German Corporation for International Cooperation (GIZ), and the German Political Science Association (DVPW).

The conference is being held in the context of the foundation of the Centre for Climate Resilience at the University of Augsburg.

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Introduction

Digitalization and sustainability transformation are two of the most significant challenges facing the world today. However, the links between these topics have rarely been addressed from an interdisciplinary perspective. This conference aims to bring together digitalization and sustainability scholars for a vibrant exchange across disciplinary boundaries.

In the face of massive global environmental and sustainability challenges, the potential of digital technologies to foster sustainable development has received increasing attention in recent years. However, the extent to which digitalization (including big data and artificial intelligence) can contribute to solving the world's most pressing sustainability problems, ranging from biodiversity loss to the climate crisis and persistent pollution, remains an open question.

How digitalization can contribute to sustainable development is not just a technological question. It also depends on how the development and use of digital technologies is governed and socially embedded. Further, there is a risk of digital innovations perpetuating the status quo or inhibiting sustainability transformations instead of facilitating change towards sustainable development. These observations serve as starting points for exploring the changing knowledge base and real-world practices that impact sustainability politics and governance in times of digitalization.

The two overarching research questions of this conference are:

How does digitalization transform the knowledge and practices of environmental and sustainability policymaking?

Which forms of digitalization governance are needed to harness its potential for sustainability transformations?

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Wednesday, September 20, 2023

Introduction to the conference (Wed 20, 3.10 pm – 3.30 pm)

Artificial Intelligence for real politics?

A political contextualisation

Rainer Rehak (Weizenbaum Institute, Germany)

The discussion about the disruptive possibilities of a technology called Artificial Intelligence (AI) is on everyone's lips. Companies and countries alike are running multi-billion-dollar research programs to ensure not missing out on the global innovation hunt. Among many other applications, AI is also supposed to aid the necessary large-scale changes to achieve sustainable societies. In order to assess those possibilities, this presentation aims to briefly explain, classify and theorise AI technology, and then politically contextualise these findings in light of the sustainability discourse.

AI, like only few other technologies, is surrounded by almost magical promises aligning well with the long-standing narrative of the imminent digital revolution described by a seemingly recent quote from Hubert L. Dreyfus: "Every day we read that digital computers play chess, translate languages, recognize patterns, and will soon be able to take over our jobs. In fact, this now seems like child's play." The fact that the quote is from 1972 shows how necessary a nuanced analysis of the "AI field" is. In addition, AI is now supposed to be a game changer for the sustainability transformation.

Methodically, this presentation is rooted in technological impact assessments, critical computer science analyses, discourse analysis and philosophy of language. E.g. great caution is needed in the choice of language when discussing AI, as many of the prevailing technical terms historically referenced human activities and abilities but should not be understood as analogies. The terms "act", "decide", "recognise", "understand", "(self-)learn", "know", "train", "autonomy", "predict", and even

"intelligence" are anthropomorphisms and highly misleading. Incorrect terms evoke false associations, fuel unfounded technology fictions, and imply nonsensical or even (societally) harmful applications. Appropriate terms have been suggested, e.g. to use "move", "execute", "detect", "conform to expectations", "dynamic configuration", "data/information", "pre-configuration", "automation", "projection", and "complex data/information processing". This is especially relevant in interdisciplinary contexts or in science communication and politics. However, AI can be classified to show its potentials and also its limitations.

After briefly explaining, classifying and theorising AI technology, the political contextualisation will show, that the potential of AI applications is not only generally largely oversold in the sustainability discourse, but also that AI is often wrongfully treated as a "neutral agent" capable of "optimal decisions", hence distracting from the purely political questions of means and ends. Putting AI at the forefront of the sustainability discourse depoliticises and pseudo-objectifies the necessary collective decision-making regarding the social sustainability transformation.

Panel "Steering the digital and sustainability transition" (Wed 20, 4.45 pm – 6.15 pm)

Navigating ESG risks towards a sustainable digital journey:

Unveiling a 360-degree and pluriversal taxonomy for a regenerative and equitable digital transformation

Gema Del Rio Castro (Universidad Politécnica Madrid, Spain)

Angel Uruburu Colsa, and Camino González Fernández

The convergence of digitalization and sustainability (D&S) has tremendous potential to reshape society, yet it remains poorly understood due to the separate measurement and management of both realms. Digital disruptions pose intertwined ecosocial risks that are largely ignored within digital agendas. Meanwhile,

sustainability efforts are marred by greenwashing, intention-action gaps, breaches between social and ecological spheres, and missing regenerative approaches. The 2030 Agenda lacks integration of digital dynamics affecting ecosocial systems, and the lack of cohesion and convergence jeopardizes the achievement of the Sustainable Development Goals (SDGs).

To achieve a triple transition of socioeconomic systems - digital, ecological, and socially just - we must reflect on the systemic effects and opportunities posed by digital disruptions. An integrated, holistic, and conscious approach merging digitalization and sustainability transformations is urgently needed. This research explores the interplay between digital and sustainability transformations, identifying gaps and relevant factors to describe how digital paradigms affect sustainability across the ESG dimensions.

The methodology combines a comprehensive analysis of D&S agendas and frameworks, scientific literature review, qualitative text mining and topic modeling, along with a survey to experts. Findings reveal caveats in both understanding the nexus and the extant measurement frameworks, which largely overlook sustainability orientations.

This research provides a comprehensive 360-degree taxonomy capturing all key dimensions that characterize a sustainable approach to digitalization with a pluriversal orientation. It also offers a scheme of overarching targets shaping a novel SDG18 devoted to sustainable and fair digital transformation for reinforcing the 2030 Agenda, and a report card to rate and manage digital ESG risks across contexts. By integrating disconnected ideas and approaches, this research provides new insights into the complex issues surrounding sustainable digitalization transformation.

We found a few limitations, including the scarcity of scientific literature, highly heterogeneous measuring frames, lack of experts knowledgeable in both D&S, and shortcomings of text mining techniques.

Nevertheless, the study provides a foundation for a promising research avenue that will need larger efforts to steer the triple transition in close cooperation with stakeholders. By improving our understanding of the D&S nexus, we can better address impacts and opportunities, ensuring that respective digital and SD agendas are aligned and fully reflect the triple transition towards a regenerative and fair future...

Panel "Steering the digital and sustainability transition" (Wed 20, 4.45 pm – 6.15 pm)

Sustainability, key to responsible AI?

Critical overview of a concept and way forward

Marie Francisco (Linköping University, Sweden)

Artificial intelligence (AI) has awakened a lot of interest in the last few years and has spurred discussions on its potential for environmental and social good. These discussions occur among businesses, international organisations, states and academia and are based on existing promising applications. Concurrently, however, AI risks increasing discrimination, and encourages unsustainable consumption and CO2 emissions if left unchecked. It could also favour large companies and state actors, in the United States and China in particular. This could be particularly detrimental to developing states who already struggle with sustainable development. Considering the manifold challenges brought about by artificial intelligence, researchers and businesses have started to use the concept of responsible AI. This latter ought to address concerns for privacy and security, discrimination, democracy and social outcomes in general. On the other hand, the literature suggests that sustainability should be more systematically included in discussions about AI. This entails both the use of AI for complex sustainability problems, but also the sustainability of AI systems themselves. Against this background, this paper uses responsible AI as an entry point to discuss how sustainability aspects are attended to in academic discussions about AI. It is part of a broader research project that seeks to analyse how artificial intelligence is made sense of by actors of the international environmental governance arena.

The aim is to unpack the key components of responsible AI and discuss the interlinkages with sustainability and just transformations. This will be done through a combination of self-administered questionnaires sent to AI experts from various disciplines and a literature review. These two components will then be used as the backbone of a reflection on how responsible AI is defined across disciplines and what its main components and points of contention are.

More specifically, the paper will seek to assess to which extent responsible AI and sustainability are interlinked, which aspects of sustainability are considered, and what avenues they open for potential political framings. The contribution is twofold: the paper will screen how experts make sense of responsible AI (1); and

it will give a solid empirical ground to discuss strengths, shortcomings, and potential alternatives to the concept in regard to sustainability transformations (2).

Panel “Steering the digital and sustainability transition” (Wed 20, 4.45 pm – 6.15 pm)

Digital Positionality:

Empowering netizens to navigate ICT for a sustainable and just future

Anna Lena Menne (Humboldt-Universität zu Berlin, Germany)

Alissa Steer, Makēda Gershenson, and Jasmin Anna Awahle

Digitalization has a significant impact on environmental and sustainability policy. However, throughout this transformation, it is essential to understand the social embeddedness of Information and Communication Technology (ICT) as well as individual roles, opportunities, and obstacles. Nevertheless, individuals often lack awareness around the complex historical and social networks of inequity beyond their simplified interfaces, which hinders their political agency. To address this issue, we introduce the concept of digital positionality, representing an individual’s social reality within the planetary sociotechnical network located at the nexus of the earth, society, and ICT. By considering factors such as social identity, resources, habitus, and systemic structures of domination at national and global levels, the concept highlights challenges and opportunities that we all encounter in our personalized environments.

Inspired by a Participatory Action Learning and Action Research (PALAR) approach, our group is developing a reflexivity tool that aims to foster self-awareness around digital positionality from a feminist lens to strengthen political agency in the digital age. Therefore, our research engaged with various social groups in Berlin to understand people’s needs, employing an electronic can phone for collecting ideas, a diverse focus group discussion, and two creative workshops for adolescents.

Our findings indicate that people use ICT despite its typically negative European discourse because they believe it improves their lives through convenience. However, their resulting dependence leads to a loss of self-efficacy and negative emotions, such as guilt and shame. Thus, rather than critically examining their use patterns, people rationalize ICT as essential and thereby passively perpetuate its development without addressing negative impacts. This overall cycle underscores the need for grassroots self-awareness regarding technology use. Our reflexivity tool could serve as a valuable resource by guiding users in creating their digital positionality profile and encouraging a nuanced reflection on ICT’s positive and negative aspects. The tool will offer practical guidance for critically examining ICT alongside use patterns and engaging in collective political action from the bottom up.

Further, incorporating digital positionality into sustainable digitalization policies can foster a responsible and comprehensive approach to technology development that recognizes its environmental and societal implications. We plan to launch the tool as a website and a book in September 2023 to make it easily accessible to a broader audience. By shedding light on the interconnections between material resources, society, and technology, our approach can help individuals take a more proactive role in shaping sustainable and just ICT development.

Panel “Smart cities” (Wed 20, 4.45 pm – 6.15 pm)

Social sustainability and smart cities

Ulrike Zeigermann (Julius-Maximilians-Universität of Würzburg, Germany)

Julia Schwanholz, David Gelantia, and Helene von Schwichow

The rapidly progressing digital transformation permeating all areas of everyday life and the concurrent increasing urgency to seriously tackle sustainability questions have led to a growing research field at the intersection of technology and sustainability. By now, there is a relevant body of research pointing out the potentials of digital technologies to, for instance, fight climate change by increasing the efficiency of renewables or to reduce waste with circular economy approaches. At the same time, questions on the sustainability of digitalization stress the need for more sustainable digital infrastructures, lower digital carbon footprints and the possibility to reuse and recycle digital tools.

The social dimension of sustainability – although an integral part of the common sustainability definitions and frameworks such as the UN SDGs – has often been neglected in digitalization debates and thus remains vague and a subject of competing theorization. While some authors stress intergenerational equity and the possibility of political participation as defining elements, others highlight social cohesion, equity or safety.

This lack of clarity on the social dimension of sustainability can also be observed in the research field of smart and sustainable cities. In response to the continuing unbroken global urbanisation, cities increasingly rely on digital solutions in many areas such as mobility, housing or power supply. Smart city strategies often promise to invest not only in technological efficiency but rather in human, social and environmental capital and therefore to use digital technologies to improve the citizens' quality of living. However, many questions regarding the effectiveness and the actual positive impact of the strategies remain open. We believe that there is a stressing need for a sharp conceptual foundation of the social pillar of sustainability to help us better investigate questions about sustainability in the smart city.

This contribution, thus, pursues the goal to provide a working definition of social sustainability that can be applied to smart city debates, and, to understand which concepts to measure the efficacy of smart city strategies already exist.

Panel "Smart cities" (Wed 20, 4.45 pm – 6.15 pm)

Smart, green, resilient and climate neutral cities in the making

Claus Seibt (University for Economics and Environment Nürtingen-Geislingen, Germany)

This contribution will retell the recent historic course of the past ten to fifteen years of the making-of the smart city debate and agenda in its multiple thematic twists and turns at the European policy and research and innovation programming level.

The European smart city policy agenda was from the beginning like a chameleon: highly adaptive in its programmatic course and always able to take-up new thematic issues and subsume new headwords. From a critical perspective this attitude was not at all favorable. The smart city debate and strategic agenda got in its course very washy driven by techno-economic expectations and promises, while critical social and ethical issues stayed in the dark. The contribution will discuss these issues.

To make a case the contribution will focus on smartness in sustainable urban mobility and transport and critically assess expectations and promises versus the social risks and consequences and techno-utopian attitudes.

Panel "Smart cities" (Wed 20, 4.45 pm – 6.15 pm)

Strengthening the competence of municipal actors in rural areas for the development of user-centric, sustainable digitalization strategies

Andrea Hamm (HNE Eberswalde, Germany, and Weizenbaum Institut, Germany)

Tobias Schröder, Josephine Jahn, Klaus Markgraf, Benjamin Nölting, Julia Struß, and Heike Walk

In the five-year transfer project InNoWest, regions in North-West Brandenburg are to be assisted in working on challenges of sustainability and digitalization as two simultaneously ongoing transformations. An interdisciplinary innovation team of researchers develops and implements municipal sustainability-oriented digitalization strategies together with diverse regional stakeholders. We follow an agile approach in order to be able to react to individual and changing requirements of practice partners. The innovation team will support partners in making digital (environmental) data usable for municipal and corporate decision-making and in strengthening stakeholders' data literacy. To this end, we work with regional actors from municipalities, small and medium-sized enterprises, and civil society in jointly shaping digitalization processes in the interest of sustainable development. The focus is on municipalities in rural areas, as they have a special responsibility for (digital) public services and the development of social and economic digital infrastructure, given the low density of actors. We will enable regional transfer partners to recognize and use digital opportunities for public services, infrastructures and business models in sectors such as energy, mobility, health, environment and agriculture while reducing negative climate impacts and replying to matters of social concern. In a recursive exchange, transfer partners from universities of applied sciences and municipal stakeholders jointly identify needs in an open-ended manner and formulate goals as a basis for local digitalization strategies.

The team works on two levels: a) Digital strategies are (further) developed together in a network, ideas and experiences are exchanged, and promising approaches to solutions are identified. b) These digital projects are designed by the innovation team and transfer partners for local purposes, developed with them, and implemented to address their specific problems and needs.

The talk will share first experiences and observations of this project in an early stage. For example, first challenges appearing before the actual transfer phase, which seem to be symptomatic for research-supported sustainability-oriented digitalization processes in municipalities are discussed:

- Balancing different interdisciplinary approaches (especially from business informatics, computer science, political and social sciences), such as designing elaborate co-creative transformation processes vs. achieving quick results following efficient management practices
- Gaps and uncertainties in transferring theoretically elaborated as well as empirically tested findings from the international literature to local use cases that really meet the needs and capacities of municipal stakeholders
- Consideration of diverse contextual factors of local use cases, such as "smart city" vs. rural regions

Thursday, September 21, 2023

Panel "Climate governance and data" (Thu 21, 10.45 am - 12.15 pm)

Analyzing popular German non-fiction on climate crisis and digitalization:

Diverse or homogeneous?

Jan Doria (Hochschule der Medien Stuttgart, Germany)

In 2015, the world agreed in Paris to limit global warming to 1.5 degrees as an overall political goal, but without delivering concrete solution pathways to it (Übereinkommen von Paris, 2015). These continued to be shaped by the media debate afterwards. This talk is based on a representative corpus of 44 popular non-fiction SPIEGEL bestsellers addressing climate change and the role of digitalization within it published in Germany between 2016 and 2021. Such bestsellers reflect political debates on today's most important topics (Porombka, 2005).

As the analysis will show, the debate represented in this corpus was very homogeneous in terms of authorship. 76 % of authors were male, marginalizing female perspectives. 80 % were German, whereas authors from the global south most affected by the climate crisis lacked completely. Writers, activists, journalists and politicians represented altogether 55 % of authors, lacking voices from the natural sciences (only 12 %), and 90 % have received an academic education, compared to only 18.5 % of Germany's population in 2019 (Statistisches Bundesamt, 2020).

However, this narrowness in terms of authorship does not necessarily need to be reflected in the books' content. As a close reading of selected examples will show, the corpus contains both books that reproduce patterns of coloniality (Gates, 2021) and reduce the responsibility for social-ecological transformation to a small elite (Lesch & Kamphausen, 2017) as well as books that recommend for example the transfer of practices from the global south (Indset, 2020; Schätzing, 2021).

The talk will conclude with a critical reflection on whether the climate discourse represented in non-fiction SPIEGEL bestsellers between 2016 and 2021 is able to represent diverse perspectives without being diverse in authorship.

Panel "Climate governance and data" (Thu 21, 10.45 am - 12.15 pm)

The power and agency of data in global climate governance

Joshua Philipp Elsässer (Potsdam University, Germany)

Laura Mai

The conversion of real-world phenomena into data for processing and analysis is generally regarded as a technical, a-political, and universal mode of governing in climate crisis. The emerging reliance on sophisticated surveillance technologies and advanced data processing methods in global climate governance, however, raises urgent questions about the power and agency of data. Examples include global climate databases, such as the UNFCCC's Global Climate Action Portal; transnational data-collection efforts, for instance through cross-border alliances like the Covenant of Mayors; satellite-based emission monitoring systems, such as Climate

TRACE; or platforms which have begun to explore the potential of machine learning, such as AI for the Planet. Mobilizing data, and related data collection and processing technologies, each of these initiatives produces climate change as a particular governance problem.

Adopting a critical perspective, this paper explores how data are mobilized in such efforts to render the climate governable: Which presuppositions make data-driven climate governance possible? How are data produced? What are the motives and means for feeding data into governance processes? And who and what do data (dis-)empower? Approaching these questions, the paper offers a cross-disciplinary literature review spanning international relations, critical data studies, human geography and socio-legal scholarship. As a first step in developing a larger collaborative research project, the literature review foregrounds the social, cultural, and legal dimensions of data use in global climate governance. Our aim is to explore in which ways data-driven governance may solidify existing hierarchies and problematic dynamics of in- and exclusion, and how it risks reinscribing technocratic assumptions about what it means to govern in times of climate crisis.

Panel “Climate governance and data” (Thu 21, 10.45 am – 12.15 pm)

Analysing actors' interests in data governance and its implications to sustainable electronic commerce

Africa Kiiza (Universität Hamburg, Germany)

Characterized by big data, digitalization is increasingly the substratum of much of social, economic and political activities, marking the advent of what is popularly known as the digital economy. The primacy of data cannot be overemphasised given that seven out of the top ten companies globally, by market capitalization, are data-centric. These companies have created new business models of data monetization by leveraging platform user data to provide targeted advertising services or e-commerce. One of the disciplines gaining academic and policy discourse is how to govern data, its flow across the border, concentration and accumulation and how this impacts countries' 'gainful participation in e-commerce. This is because data is an essential raw material for the digital economy. Governments are pushing for adopting data governance aspects like restrictions on cross-border data flows by entering into international agreements that facilitate data flows.

Whether digitalization will contribute to a country's sustainable e-commerce participation depends on the actors involved and their interests. These actors include consumers, traders, researchers, and policymakers/regulators. The ecosystem of data governance actors is populated by a wide range of diverse actors who have created a complex and multifaceted digital ecosystem cutting across all industries, markets, and societies. A key problem manifesting in data governance is the differing interests of these actors in different negotiating forums i.e., whether, in a bid to facilitate e-commerce, cross-border data flows should be restricted (guarded) or conditioned. This is because some actors e.g., big tech are the “ruling class” of the digital world and have the power to push for data governance rules in e-commerce negotiations which can consolidate their exploitative business model in the digital economy, quash competition and cement their first mover advantages. Other actors, or the newcomers, may require data governance rules which are designed to nurture them and protect them from unfair competition from big tech, in order to increase start-up e-commerce platforms.

This paper will analyze the interests of actors in data governance and how this determines sustainable participation in e-commerce by countries. It will assess the power relations shaping data governance proposals in trade agreements and how this ultimately affects the nature of countries' sustainable engagement in e-commerce. The paper will contribute to the discourse on the political economy of data governance and a transformative digitalization.

Panel “Climate governance and data” (Thu 21, 10.45 am – 12.15 pm)

Sustainability narratives in digitalization research funding

Mario Angst (University of Zürich, Switzerland)

Prevailing narratives around sustainable digitalization have many blind spots. For example, recent research has forcefully asserted their overreliance on efficiency strategies in comparison to sufficiency and consistency strategies for sustainability transformations (D4S 2023). Further, societal discourse often disregards structural changes at the societal macro-level detrimental to the potential for sustainability transformations brought about

by digitalization (Angst and Strauss 2023). Research on sustainable digitalization in many ways mirrors these shortcomings (Santarius and Wagner 2023).

In this article, we follow up and expand on recent work surveying the state of sustainable digitalization research by Santarius and Wagner (2023) who analyzed papers presented within the scope of the ICT4S conference. We expand on their methodology by increasing the scope to analyze all funded research on digitalization by the Swiss National Science Foundation (SNSF), based on a recent open data initiative by the SNSF.

Allocation of research funding is a crucial governance instrument. Decisions to fund or not to fund certain areas and directions of research allow for agenda-setting and shape narratives around complex societal challenges. Given the blind spots in prevailing narratives around the societal challenge of sustainable digitalization, regular critical assessments of patterns in research funding are therefore needed.

To identify narratives around sustainable digitalization emphasized in research funding by the SNSF, we develop a Natural Language Processing pipeline to identify funded research on digitalization more broadly among a set of 84'232 positive funding decisions between 1975 and 2023. We then employ a supervised learning approach to categorize digitalization research within a) the theoretical framework proposed by Santarius and Wagner (2023), b) within SDG categories building on OSDG 2.0 (Pukelis et al. 2022) and c) use an unsupervised learning approach based on BERTopic to inductively identify cross-cutting narrative dimensions.

By cross-classifying digitalization research in this way, we are able to identify potential biases and effective narratives employed by researchers in research funding decisions. This enables us to highlight crucial neglected areas for research attention.

Panel “Agriculture, digitalisation, and democracy” (Thu 21, 10.45 am – 12.15 pm)

What the f#\$d? Landscape digitisation linking food choices and production

Joshua Zeunert (UNSW Sydney, Australia)

The environmental impact of food is of growing interest, however, it is a topic influenced by large agri-food industry concerns. In Australia, agriculture is the continent's largest land use, and livestock production alone occupies a spatial area commensurate with the entire European Union. Australia's urban regions constitute 86% of the population base but occupy only 0.5% of the total land area. Most of this population is highly concentrated in several large suburban conurbations, which equates to geographic separation from food production environments. This results in an ongoing decline in food and agricultural literacy.

Unlike the European Union, Australia's agricultural policy wholly skews 'competitive productivism', equating to highly-concentrated industries and sectors, industrial-scale production, and failure to support small and medium producers. While advocates for corporatised agri-food systems seek to wash such a food system as incredibly efficient, this chiefly exists in relation to direct human labour required on farms. Industrial agribusiness is actually incredibly inefficient in terms of embodied energy in food and the greenhouse gases emitted. This is especially the case in a continent as geographically isolated as Australia, which exports three-quarters of agricultural output vast distances overseas. Cascading environmental impacts and accelerating landscape degradation as externalities of industrial agri-production can be hard to visualise.

This research presents a world-first landscape digitisation project geared to national-scale food and agricultural sustainability transformations. Titled 'FOOD | LANDSCAPES | AUSTRALIA', it is an online archive featuring 850 aerial videos spanning all Australian states and territories, all commodities and major agri-industries, and all scales of commercial farming. This digital repository is titled such because as Wendell Berry observes, "eating is an agricultural act" (Berry 2010). Its name suggests its research question: to what extent can national-scale digitisation of food-producing landscapes link consumers with the landscapes generating their food?

The archive stems from comprehensive field research conducted in 2021-23. The videos can be interactively viewed based on user-selected arrangements of nine key themes, each existing as virtual exhibition rooms in digitised 360-degree agricultural landscapes. The rooms range from standardised government agricultural classifications to major livestock sectors and meats, a geotagged national map showing the 850 videos, to scenes of environmental degradation in 'farm it like you stole it'.

Links: <https://www.foodlandscapes.com.au/>

Panel “Agriculture, digitalisation, and democracy” (Thu 21. 10.45 am – 12.15 pm)

Potential and limitations of climate modeling for agricultural land use planning

Hannah Jona von Czettritz (Leibniz Centre for Agricultural Landscape Research, Germany)

Questions around crisis-proof food supply have increasingly become core political issues in recent years. As indicated by the latest IPCC Assessment Report (2021), the agricultural production debates that have arisen also need to discuss issues around climate-induced uncertainties. In addition, the growing demand for regional food production is increasingly competing for land which can be used, for energy production or other ecosystem services. The National Peatland Protection Strategy of the Ministry of Food and Agriculture (BMEL), which was adopted in 2022, increases the pressure especially on agricultural land further (BMEL 2022).

Regional land use planning aims to designate areas with high agricultural productivity for agricultural use and reduce ground sealing. Even though the agricultural sector is becoming increasingly digitalized, regional land use planning is still predominantly limited to historical soil assessments not taking into account climate-induced risks. Widely available data, such as simulated future climate and plant growth data could give a better basis for regional land use planning taking into account both current and future production conditions. In order to do justice to the increasing relevance of climate-robust areas, the use of these digital tools is needed. Regional planning needs a procedure for land use designation based on the latest scientific findings for the evaluation of climate-robust agricultural land, while sustainability aspects such as short transport routes, the role of peat soils and an increasing demand for regional food supply must not be neglected.

This study compares the results of traditional regional planning designation criteria and a novel approach based on simulated future production scenarios in a case study area in north-east Germany. Results are evaluated economically to compare the impact of different land allocations on farmers' incomes. In addition, opportunities and constraints are compared in terms of stakeholder acceptance and technical limitations to the policy implementation.

Results show that on a statewide basis, the various assessment approaches result in largely overlapping areas. Indicating that historical soil assessments lead to satisfactory results under future climate conditions. A closer look reveals deviations in especially less productive areas, which can lead to major economic losses under future climate change. A more differentiated designation of areas entails increased bureaucracy and potentially delays in implementation. Nevertheless, a workshop with local stakeholders from politics and practice showed that despite the novelty of the approach the social acceptance appears to be very high.

Panel “Agriculture, digitalisation, and democracy” (Thu 21. 10.45 am – 12.15 pm)

Democratizing the agri-food system?

Potentials and limits of emancipatory AgTech Innovations

Sarah Hackfort (Humboldt-Universität zu Berlin, Germany)

The paper focuses on the relationship between digitalization and sustainability in the agri-food system. It raises questions about power relations inherent in the architecture and design of digital infrastructures and technologies, such as lock-ins and its role for a democratization in the agri-food system. It also focuses on how they can be overcome and discusses the potential for emancipatory innovations.

Digital transformation has arrived in the food and agricultural system, with big data and digital technologies playing an increasingly prominent role in food and biomass production. Currently, this trend is dominated by innovations for large-scale, capital-intensive industrial production, which has serious negative socio-environmental impacts. However, alternative food networks, peasant movements, and technology developers are envisioning a different future of agricultural production, developing alternative digital technologies that challenge the mainstream smart farming innovations and promote a socio-ecological transformation of the food and agricultural system.

This paper presents empirical research from Germany and Canada on such "digital innovations from below," including open-source software solutions, farmer-driven apps, hackable field robots, and cooperative digital platforms that support community-supported agriculture and agroecological farming. It explores the potential of these digital technologies for emancipatory change, linking critical technology theory, STS and critical food studies. It assesses the extent to which these innovations can be perceived as emancipatory, their potentials and limitations, and how they contribute to a socio-ecological transformation of the agri-food system. As well

as presenting findings from empirical research, it also addresses key questions from critical (technology) theory about the relationship between society, democracy, and technology, including the possibilities and limits of "democratic interventions" (Andrew Feenberg 2017) and the appropriation of digital technologies under the given political economy of the agri-food system.

Panel "Agriculture, digitalisation, and democracy" (Thu 21, 10.45 am – 12.15 pm)

How AI affects different dimensions of democracy over time:

A reflection on AI's impact on the societal pillar and SDG16

Ahmed Maati (Technical University of Munich, Germany)

In recent years, two adjacent transformations have captured the attention of many policymakers and academics. The progressive reliance on digitization and digital technologies in different facets of life has been simultaneously accompanied by heightened interests in pursuing sustainable development goals and building sustainable societies. In this context, a promising body of interdisciplinary research debates the opportunities and risks AI poses for sustainability as well as the need for a more sustainable AI (i.a: Kaack et al. 2022; Rohde et al. 2021; van Wynsberghe 2021). Existing works, however, do not offer a holistic evaluation of AI's impact on the development of just, peaceful, and inclusive societies and institutions (SDG16); they rather focus on AI's impact on specific elements of the social sustainability pillar and in isolated instances in time.

In this paper, we claim that democracy is a necessary condition to fulfill the SDG16 goals. We combine knowledge from democratic theory with existing empirical works from the literature on AI and sustainability as well as AI and democracy to build a conceptual framework – a theory of how AI will impact different dimensions of democracy over time. In doing so, we formulate several testable hypotheses of how AI impacts the various dimensions of democracy in several different ways in the short, medium, and long runs. That way, we complement existing works (i) with a comprehensive theory of how AI impacts the societal pillar of sustainability, and (ii) with a more nuanced account of AI's impact on several dimensions of democratic rule over different time spans.

Panel "Smart energy" (Thu 21, 1.45 pm – 3.15 pm)

Buildings are key for climate change:

Building the (digital) knowledge base and driving action

Jonas Schoenefeld (Institute for Housing and Environment Darmstadt, Germany)

Michael Hoerner

Successful climate action must rapidly address the world's building stock. According to the UNEP 2021 Global Status Report for Buildings and Construction, buildings accounted for about 37% of global energy-related CO₂ emissions in 2020. Yet, the information and knowledge base has been insufficient to drive effective governance to reduce building-related energy demand and greenhouse gas emissions. Especially the category of non-residential buildings, including for example offices, hospitals or factory buildings, has been woefully ignored.

To remedy this situation, the new DataNWG approach used a novel, nationally representative sampling methodology based on the geospatial data infrastructure (GDI-DE) to estimate the energy-related nature of the non-residential building stock in Germany. It now provides a new, digitalized and statistically valid knowledge base for policy development. However, given the EU's key role as a regulator of buildings, data on a single Member State are nowhere sufficient. Scaling the successful approach to the EU level will be required to match the scale of the information on buildings with the governance at this level.

To do so, this paper considers the (informational) governance of a range of other efforts, such as the Copernicus CO₂ monitoring and the implementation of the INSPIRE directive, to suggest how the DataNWG approach could be governed and scaled to the European level in order to match this level of governance. In so doing, it focuses not only on the finance and the coordination of the data collection with a view to enabling informational governance, but also on possible existing data sources, which may help to generate the relevant information around the EU Member States, including the INSPIRE directive.

Panel “Smart energy” (Thu 21, 1.45 pm – 3.15 pm)

Public opinion on smart energy technologies

Eva Fleiß (University of Graz, Austria)

Stefanie Hatzl

In order to meet the international, EU and national targets, the decarbonization of the energy system is required. In addition to providing a secure energy supply, increasing the share of renewables, and improving energy efficiency, the European Green Deal also underscores the importance of a digitalised energy system. In this context, smart energy technologies (SET) - such as smart meters or home energy management systems - are considered to expedite the energy transition, as they offer new possibilities to manage energy demand and supply, especially considering the increasing share of renewable energy sources and increasing decentralization.

Previous studies have predominantly investigated drivers and barriers for individuals' adoption decisions or their intention to adopt a specific SET, using either qualitative or quantitative research designs. The present study explores prevalent opinions of the lay population regarding the general topic of SET in more detail based on the public discourse.

We do so by combining a mixed-methods approach with a survey study. First, the Q method was used to explore different viewpoints on SET. Based on an extensive qualitative content analysis of 284 social media posts, eight categories were built inductively (such as: cost, data protection, automatization, energy crisis, sustainability). 36 Q-statements were subsequently formulated, whilst considering a balance for each category regarding positive and negative formulations. The Q-statements were slightly revised based on suggestions during a focus group discussion. The subsequent Q-sort was done by 25 respondents, who were asked to what extent these statements are (not) in line with their personal opinion, and to sort them accordingly on a bell-shaped template. Preliminary results of the factor analysis indicate that three different viewpoints on SET prevail, which emphasize either (i) their purpose to save energy, (ii) their smartness and comfort, or capture (iii) scepticism, especially because of data protection concerns.

Second, a quota-representative survey (n=800) was carried out in Austria in February 2023 to provide detailed information about whether specific viewpoints are shared by different groups of individuals (considering e.g. their values, preferences or sociodemographic characteristics), and whether a specific viewpoint prevails. Preliminary descriptive results suggest that two opinions – (i) emphasizing the purpose of SET to save energy as well as (ii) the scepticism, especially because of data protection concerns – are preferred (by about 40% of respondents each). In contrast, the viewpoint that smart energy technologies characterize a modern, smart household and increase comfort, is preferred by about 20% of the respondents.

Panel “Smart energy” (Thu 21, 1.45 pm – 3.15 pm)

Determinants of electricity consumption by private households.

Results of a scoping review on smart meter usage

Caroline Dotter (OTH Regensburg, Germany)

Private households are the third-largest consumers of electricity in Germany in 2021 (BDEW 2022). To identify and interpret possibilities to modify electricity consumption, as well as to appropriately design policy responses to electricity price rises, it is relevant to assess the scope of potential changes for private households. The authors performed a scoping review to identify drivers of household electricity consumption in the context of smart meter usage. Based on this, we can differentiate between factors possibly to be changed in the short and medium term and factors possibly less open to adaption.

The scoping review was conducted following the PRISMA statement guidelines. The common feature of the twelve included studies is the integration of smart meter data on electricity consumption. The sample size of the individual studies varies between eleven to 5000 private households. We identified socio-demographic, housing-related and device-specific factors determining the electricity consumption of private households.

Sociodemographic factors were most frequently presented as influencing variables for electricity consumption. Most studies included age (9 of 12), number of household members (8 of 12), employment (8 of 12), income (7 of 12), and education (6 of 12). Gender, number of children, teenagers, adults, or number of retired persons in the household, possibility of home office, hours spent at home, and belonging to a specific social stratum

were considered by fewer studies. None of the included studies asked for the occupation of household members.

Housing-related variables were included in a smaller number of studies. Available floor space (6 of 12) and type of housing (4 of 12) were the variables most frequently analyzed. Electricity consumption is also driven by the number of devices in use. Studies covered these variables the least and at different levels of disaggregation. It is possible to differentiate between the effect of devices for home appliance, IT access, and entertainment.

Eight of the twelve studies additionally clustered households according to user types. Clustering followed different strategies: some studies clustered only based on energy consumption and consumption patterns, while others included socio-demographic variables such as employment, belonging to a certain social stratum etc. Both approaches should be combined to appropriately identify user types and effectively address different households.

Panel “Smart energy” (Thu 21, 1.45 pm – 3.15 pm)

Policy implications of digitalisation pathways for lower energy demand

Noam Bergman (University of Sussex, United Kingdom)

Tim Foxon

This paper describes insights from a research project on the future impacts of ICT (information and communication technology) on energy consumption. Existing research has shown that while digitalisation has the potential to enable significant reductions in carbon emissions, this is not the current trajectory, as decarbonisation of supply and energy efficiency improvements are being outpaced by the rapid expansion of digital goods and services. We have examined future pathways and scenarios which consider both digitalisation and transitions to sustainability. We find first, that insufficient attention is paid to rebound effects of digitalisation, whereby efficiency improvements can drive higher levels of consumption. And second, that different pathways have very different impacts for energy demand, as well as for well-being and other sustainability goals (Bergman and Foxon 2022). We conclude that governance and policy have a central role to play in directing the digital transformation towards sustainability.

We suggest an approach to sustainable digitalisation drawing on the concepts of responsible digitalisation – which highlights the need for digitalisation to work towards wellbeing and social and environmental benefits, as opposed to maximising individual benefit (Noussan and Tagliapietra 2020); and sufficient digitalisation, which questions the need for complete digitalisation due to the high environmental cost of ICT, and calls for limiting digitalisation to where its social and environmental benefits are clear (Colaço 2021).

Based on these principles, we analyse potential policy measures for digitalisation and energy demand in three areas – data; household devices; and transport. We propose policy principles for steering digitalisation towards sustainability, including: regulation for value and accountability; moving beyond technical efficiency to a systemic approach; considering social change and the sources of energy demand; and the need for directionality and leadership in the digital transformation. Finally, we apply these principles to critique UK and EU policy, which despite strong legal frameworks on climate change mitigation, have a low interventionist approach to digitalisation and sustainability, avoiding questions relating to the use of these technologies and relying primarily on market mechanisms.

Panel “Sustainable organizational development through ICT” (Thu 21, 1.45 pm – 3.15 pm)

Stay grounded, go virtual?

Potentials and challenges of transforming knowledge intensive organizations towards sustainability through an increased reliance on virtual solutions

Anna Schreuer (University of Graz, Austria)

Romana Rauter, Kathrin Winkler, Annina Thaller, and Eva Fleiß

In view of climate change, all sectors of the economy face the challenge of rapid decarbonization. In spite of optimism over dematerialization that may ensue from the emergence of a ‘knowledge society’, the carbon impact of knowledge-intensive organizations and businesses has proven substantial – not least because of the way research, innovation and technology development have become so closely tied to the practice of extensive air travel, the most emission-intensive form of travel.

The COVID-19 pandemic, however, forced researchers and business professionals alike to stay grounded and resort to virtual solutions as an alternative to face-to-face meetings. As COVID-related travel restrictions have now largely been lifted, the question arises under what circumstances these digital solutions may be retained and help transform work-related practices towards sustainability. This paper therefore explores the experiences made with virtual solutions by researchers and business professionals during the pandemic, and what potentials and challenges they see for greening their practices through a continued reliance on these technologies. We present and compare the results from a survey among academic staff at three Austrian universities and a survey among Austrian business professionals, complemented by qualitative interviews with Austrian business representatives with key roles in travel and/or sustainability management.

While the willingness to use virtual solutions in academia has risen sharply during the pandemic, their perceived suitability strongly depends on the type of event they are employed for. In particular, a large share of respondents remains skeptical towards the suitability of virtual solutions for academic conferences – the most important reason for academic air travel. While benefits of virtual conferencing, such as climate friendliness, the elimination of travel time or a broad participation base are acknowledged, difficulties in building and maintaining networks, limited scholarly exchange and the lack of full immersion in the event remain core areas of concern. First insights from businesses draw a similar picture, also highlighting the importance of personal meetings for customer acquisition or trust building, for example. Virtual reality, however, is considered a promising technology that might increasingly replace physical meetings for purposes like on-site audits in the future. Our findings thus identify both barriers to transforming knowledge-intensive organizations towards sustainability through continued reliance on virtual solutions, as well as more optimistic visions and expectations concerning future developments in this area.

Panel “Sustainable organizational development through ICT” (Thu 21, 1.45 pm – 3.15 pm)

Sustainable digital co-creation in the public sector:

Establishing practices and measuring outcomes

Noella Edelmann (University of Continuing Education Krems, Austria)

The Tallinn Declaration on e-Government (Council of the European Union 2017) emphasises that digital transformation should foster resilience and sustainability of public administrations, while the European Commission (European Commission 2021) points out that policies should empower people and businesses. Information and communication technologies (ICTs) have created opportunities to digitally transform the relationship between Public Sector Organisations (PSOs), citizens and other stakeholders. In the PSOs, sustainability is also seen as a key element for management, strategic planning and organizational change (Jaspers and Steen 2019). According to Zuo, Jin (Zuo, Jin, and Flynn 2012) sustainability in the public sector reports can cover financial aspects, but also compliance with standards and stakeholders' requirements. To achieve this compliance, however, PSOs need to understand what sustainability is, which, in the co-creation context, means knowing who the users are, their needs and demands. It also means there needs to be a clear differentiation between sustainable co-creation processes in the organisation and sustainable co-created outcomes. We therefore aim to address the research gap noted in the literature on sustainability in the public sector, that is, how sustainability is understood in the public sector understood and what is its role in co-creation processes and outcomes. Thus, the first research question we aim to address is: How can sustainability in the public sector be defined and what indicators can be used to measure it? As the co-creation of public services is seen contributing to the development of sustainable digital processes in organisations and achieving sustainable outcomes, the second question we address is: What co-creation processes and sustainable outcomes are associated with the digitalization of co-creation in the public sector?

To support organizations' understanding and move towards sustainability, Bertella, Lupini (Bertella et al. 2021) recommend collaborations such as workshops involving academics and practitioners, but also pilot owners can contribute significantly (Baldassarre et al. 2020). In order to answer this research question, we used a multi-method approach including three workshops in 2022-2023 with experts from academia, PSOs, and public administrations involved in 4 European pilots to discuss sustainability in the context of co-creation and a survey. The analysis of the data shows that the sustainability of co-creation of services involves identifying technology needs and gaps, supporting innovation, capacity-building, and dissemination. They perceive that ensuring the sustainability of co-creation requires organisational change regarding technical support arrangements, organisational processes and developing expertise. At the same time, the relationship to

external stakeholders must be developed and sustained, and all stakeholders must engage in continuous learning. These results help to identify sustainable digital co-creation processes and granular indicators for measuring sustainable co-created outcomes.

Panel “Sustainable organizational development through ICT” (Thu 21, 1.45 pm – 3.15 pm)

Revealing the socio-ecological effects of digital infrastructures and shaping digitization in a more sustainable way

Sigrid Kannengießer (University of Münster, Germany)

Digitization causes tremendous socio-ecological effects that can be identified along its infrastructure: The production of digital technology has severe impacts on the people involved and the environment as resources are extracted under conditions harming or destroying workers' lives and the environment. The same applies to the conditions in which workers manufacture the devices. Also, the use of digital technologies and especially online communication has negative socio-ecological impacts because the server farms needed are mainly running with fossil energies, emitting high amounts of carbon dioxide, contributing to climate change. Moreover, the circumstances under which digital technologies are disposed of are harming people's lives and the environment as the devices are often disposed of improperly in waste dumps in African or Asian countries. Regulations such as the Supply Chain Law or the Baseler Convention provide a legal framework that should avoid these socio-ecological effects but reality looks different and people and the environment are damaged or even killed/destroyed through the effects of digitization.

But there are different initiatives with which civil society actors try to reduce these effects and shape digitization in a more sustainable way. These initiatives either try to shape the production of digital technologies in a more sustainable way by extracting resources and manufacturing digital devices under fair working conditions or they address the use of the devices by e.g. prolonging the life-span of the devices through repairing the technologies – thereby avoiding the production of new technologies and an early disposal of the devices. The above summarized socio-ecological effects are the background of these media practices aiming at sustainability as the actors involved in the initiatives know about these effects and draw their motivation from changing these circumstances.

The presentation shows results of a qualitative study (using different methods such as interviews, observations, content analysis) in which 1) the sustainable production of media technologies was analyzed using the example of the Fairphone, a smartphone which should be produced under fair working conditions with resources that are extracted the same way. And 2) a sustainable use of digital devices was examined focusing on the repairing of digital devices in Repair Cafés, public events in which people meet to repair their objects of everyday life (mainly electronic devices).

The study shows that the actors producing/using the Fairphone as well as the ones repairing the digital devices are aware of the severe socio-ecological effects of digitization and try to contribute shaping digitization in a more sustainable way with their media practices. But the analysis also reveals ambivalences regarding the aims and practices of the actors that will be discussed in the presentation as well.

Panel “Sustainable organizational development through ICT” (Thu 21, 1.45 pm – 3.15 pm)

Data co-constructions:

Digital urban governance for sustainable smart cities

Mennatullah Hendawy (Ain Shams University, Egypt, and Impact Circles e.V., Germany)

Starting in 2013, there started to be a shift in the way smart cities are envisioned from an initially traditional techno-centered approach that is top-down towards socio-centered approaches that are more bottom-up and citizen-driven (Hendawy and Kormann da Silva, forthcoming). Some of the work on smart cities that emerged since then include the work of Lee and Lee (2014) on the "Citizen-Centric Smart City", the work of Oliveira Neto and Kofuji (2016) on the "Inclusive Smart City", and the work of the anthropologist Katrien Pype's work (2017) on "smartness from below".

In a previous article (Hendawy and Kormann da Silva, forthcoming), we suggested that this shift highlights the ways in which more interdisciplinary and less technical fields started to advocate that technological systems and interventions should have greater awareness and promote greater involvement of users' needs, desires, and understanding. In this context, we call for more hybrid forms of smartness that ensure the balance and

recognition of both top-down and bottom-up smart city ideation and planning. The question that remains, is how to achieve this balance.

In this article, I use the framework of knowledge co-production and apply it to the use of data in smart cities as a way forward to create a balanced socio-technical urban setting. In doing so, the article acknowledges that the co-constructed digital-urban governance of smart cities has the power to facilitate sustainability and equity in urban development.

Friday, September 22, 2023

Panel “ICT for circular economy” (Fri 22, 9.15 am – 10.45 am)

Drivers and barriers in the transformation of SMEs towards more circularity

Lena Brüch (Fraunhofer-Institut für Angewandte Informationstechnik FIT, Germany)

Anja Lindemann, and René Reiners

Climate change, resource scarcity and fragile supply chains strained by crises are bringing the linear economic system to its limits. The circular economy is a sustainable alternative to the linear economic system (Bocken et al., 2016; Ellen MacArthur Foundation, 2013). It aims to use resources efficient through waste avoidance (Rizos et al., 2017), long-term value retention, the reduction of primary material use and closing the material and energy flows. If the potentials of the circular economy are used in a targeted manner, companies can have significant competitive advantages, among other things through more efficient production, as well as through independence from fragile supply chains (De Jesus, 2018).

The transformation towards more circularity involves a great effort for all companies. Small companies in particular find this change difficult (Gennari, 2022). The aim of this paper is to provide a structured examination of German manufacturing SME-specific drivers and barriers in Germany that favor or inhibit the transformation to a circular economy. Tan et al. (2022) define drivers as all factors that contribute positively to the transformation to a circular economy, synonyms could be “enablers” and “accelerators”. They define barriers as everything that hinders the transformation to a circular economy, synonyms could be “constraints” or “challenges”.

To identify drivers and barriers semi-structured interviews were conducted with manufacturing SMEs in Germany. These were carried out as part of funded projects dealing with the target group of SMEs, for example the “Mittelstand-Digital Zentrum WerkNetzWerke”. The statements that could be found on barriers and enablers were structured based on the categories suggested by Rizos et al. (2016). The results from the interviews show that German manufacturing SMEs are exposed to high competitive pressure and that the implementation of circular economy measures strongly depends on the raw material used, the product manufactured and the customer sector. Furthermore, the categories derived from the literature were extended, especially the increasing effort of employees due to circular economy measures, seems to be an important barrier for German manufacturing SMEs regarding the change to a circular economy. This work with structured drivers and barriers explicitly for German manufacturing SMEs serves as a basis for formulating measures, such as how digital technologies can help overcome these barriers and strengthen the drivers.

Links: <https://www.mittelstand-digital-wertnetzwerke.de/>

Panel “ICT for circular economy” (Fri 22, 9.15 am – 10.45 am)

Understanding digital enablers for a circular future

Al-Amin Dabo (University of Northampton, United Kingdom)

This paper explores the transformative potential of digitalisation in advancing sustainability within the circular economy framework. The study investigates how digital enablers can drive sustainable practices and solutions. In doing so, it highlights the opportunities for effective governance and policy interventions by identifying key actors driving the discourse on digital transformation and sustainability in the context of circularity, and exploring their evolving roles and interests. Additionally, the study considers the potential impact of

technology framing on the adoption and mainstreaming of certain digital solutions, while also considering the potential marginalization of social innovations.

The study contributes to a comprehensive understanding of how digitalisation can accelerate the transition to a circular future, unlocking sustainability potentials. The findings inform policymakers, industry stakeholders, and researchers about the opportunities and considerations necessary for harnessing digitalisation to foster sustainability in the circular economy.

Panel “ICT for circular economy” (Fri 22, 9.15 am – 10.45 am)

Managing value network reconfiguration impacts on circularity and sustainability through digital product passport and data spaces

Alexander Schneider (Fraunhofer FIT, Germany)

Industry 4.0 and its effect on digitization within companies paves the way to make Circular Economy (CE) a reality and make value chains and value networks more sustainable. The calculation and prediction of the impacts of changes e.g., in value chains on the environmental and sustainability impacts are currently not very clear. For this, we must go beyond just calculating the carbon footprint and base such calculations on the limited data available.

In this paper, we show the existing challenges and how using the Digital Product Passport (DPP) and Data Space technologies embedded in federated digital ecosystems enable more sustainable practices through a more holistic approach in value networks and digital ecosystems.

For manufacturing companies, it is vital to balance their approach on making production more sustainable while maintaining or increasing their competitiveness. This can be achieved by enhancing process resilience and usage of Big Data and artificial intelligence to identify gaps and business opportunities, improve decision-making as well as support better matchmaking of companies to increase circularity.

One of the biggest challenges in calculating the impacts on sustainability and circularity within value networks is data availability and quality. Often publicly available data is missing or not available on a fine-grained level. This affects both necessary "static" data such as the type and amount of raw materials being used in the production process as well as "dynamic" data like energy consumption, range and type of transportation etc.

Innovative tools like Digital Twins, the DPP and the Data Usage Control mechanisms of Data Spaces have the potential to enhance the interoperability and integration of data sources to increase matchmaking capabilities between companies.

But additional research on governance structures and trust frameworks for the digital ecosystem is needed to support trustful data exchange while ensuring sovereignty over the shared fine-grained data which companies traditionally don't want to share with others. Digital Twins can substitute data generation in cases where real world data is not available yet while improving data accuracy by tapping into the data streams available in the Data Space to enable better analysis and calculation of sustainability indicators.

Therefore, this paper describes how more sustainable practices can be enabled through digital tools and technologies, seamless interoperability and integration of systems but also the associated research challenges.

Panel “ICT for circular economy” (Fri 22, 9.15 am – 10.45 am)

Selecting transformative policies in the twin transition:

A situational approach

Daniel Wurm (Wuppertal Institute for Climate, Environment and Energy, Germany)

Although digital technologies hold significant transitional potential, bringing together digitalization and sustainability might require policy intervention to drive systemic change. Building upon the framework introduced by Wanzenböck et al. (2020), we delve into how digital technologies (could) support the transition towards a circular economy and the energy transition to explore the problem-solution-space of the twin transition.

Leveraging (first) insights from 20 expert interviews and two expert workshops, our aim is to address the wickedness of problems and solutions across various dimensions (technological, economic, socio-cultural, regulatory) and extract insights to inform comprehensive policy formulation. In doing so, our study bridges the existing gap between transformative policy making and the twin transition.

Initial findings highlight that while the structure of problems and solutions across these cases exhibits substantial similarities, the diversity between both cases in consensus-building, role clarity, and availability of knowledge regarding these problems and solutions necessitates a nuanced approach to policymaking. We identify four strategies that policy makers need to be able to apply: start the debate, connect to solve, apply to pinpoint, roll out solutions. Our approach enables policy makers to choose the right strategy in the right situation to enable systemic innovation and shape the twin transition.

Panel “Data-driven resource control” (Fri 22, 9.15 am – 10.45 am)

**Unveiling motivations and abilities for adopting the Internet of Things (IoT)
environmental monitoring:
Digital opportunity or a threat?**

Tanya Baycheva-Merger (University of Freiburg, Germany)

In light of Industry 4.0, advanced digital technologies have been propagated to improve environmental governance through enhanced access to environmental information. However, the adoption process is complex and faces many challenges. It depends on the motivation and ability of actors, and actor-centered approaches can provide valuable insights into their perceptions and preparedness for adoption.

In this study, we used the Motivations and Ability (MOTA) framework to explore whether local actors in Germany are motivated and sufficiently equipped to adopt IoT monitoring systems for forests and water. We conducted a quantitative survey to explore the current state of adoption and actors' perceptions of threats, opportunities, and financial, institutional, and technical capacities.

The results show that the adoption of IoT monitoring systems for forests and water in Germany is still in its infancy, with many local actors still unaware of their existence. Those who are aware, however, view the IoT systems as a digital opportunity rather than as a threat, particularly for enhanced information access and the development of more effective policies and strategies. Yet, data privacy and information misuse remain as main concerns, and the lack of coherent digital strategies, insufficient funding, and technical capacities are seen as significant adoption barriers.

The results emphasize the need to improve our understanding of the political context and to investigate how governance affects the adoption of advanced digital technologies. The study provided new avenues for research to better understand these technologies not only as tools for environmental governance but also as its object.

Panel “Data-driven resource control” (Fri 22, 9.15 am – 10.45 am)

Behavior, compliance and attitudes to digital and traditional control methods

Florian Diekert (University of Augsburg, Germany)

Linda Nøstbakken and Andries Richter

Successful management of natural resources relies on compliance with rules and regulations. Compliance in turn relies on the perceived legitimacy of the existing rules and regulations, the effectiveness of monitoring and enforcement, and on the positive feedback loop between legitimacy and effectiveness. Against the backdrop of increasing incentives to violate rules and regulations in modern fisheries, there are concerns that traditional control activities relying on physical inspections, are no longer effective in safeguarding sustainability. Modern control activities, which make use of digital technologies, such as camera surveillance on vessels, remote monitoring (drones, planes, satellites) and real-time monitoring of catches with automated data recording, may offer a promising alternative to enforcement officers conducting physical inspections.

This paper presents evidence from a large-scale survey among Norwegian fishers, investigating (i) attitudes towards traditional and digital control activities, and (ii) how expectations about and experiences of physical inspections affect compliance behavior. We also investigate the role of behavioral factors on compliance, such as risk aversion, which we measure with an economic experiment. While we cannot document an effect of risk aversion on compliance behavior, we find that having experienced more controls in the past and perceiving the likelihood of future control as higher, significantly reduce violations. We also find that survey respondents appreciate traditional enforcement measures, while they have mixed attitudes towards digital control activities.

Panel “Data-driven resource control” (Fri 22, 9.15 am – 10.45 am)

Emerging ‘Technological Zones’ at the climate-biodiversity interface: Nature tech coming to ‘rescue’ NBS?

Anouk Fransen (Utrecht University, The Netherlands)

As governments, businesses and civil society increasingly turn to ‘Nature-Based Solutions’ (NBS) as central means to govern the intertwined crises of biodiversity loss and climate change, a particular form of expertise is jostling for attention in this crowded policy arena – Nature Tech. Nature Tech or ‘Smart’ Tech involves tech-enabled tools such as eDNA, algorithms, AI machine learning, and other forms of tech-enabled measurement, observation and prediction, aiming to enable, accelerate or scale-up NBS. While these Nature Tech initiators are making claims that they are the ‘sexy bits’ of nature conservation, coming to ‘rescue’ NBS hurdles, yet work is needed to interrogate these claims and their politics. Research increasingly points to risks with these Tech developments, such as its simplifying tendency and lack of nuance gained by human judgement and its ability to replace other forms of expertise. Through these spaces of circulating technical artefacts - ‘technological zones’ – some NBS are qualified as being part of the zone, while others are excluded. These emerging technological zones can accelerate and intensify agency in specific (tech-enabled) directions, with undetermined, dynamic and potentially radical implications for how governing nature is accomplished in the future. Yet, we lack an understanding of how these actors are jostling for attention, how legitimacy is sought, and if authority is granted within these crowded NBS arenas.

Using a Foucauldian approach, this paper seeks to explore the ways in which governance is accomplished and the ways in which power is contested and orchestrated. As Nature Tech’s ability to become ‘authorised devices’ relies on whether they are seen as the ‘right’ or ‘appropriate’ way of governing nature, this research aims to reveal how these emerging Tech devices are seeking to attain and sustain legitimacy, even in the face of resistance. Based on research undertaken through engaging with these spaces by observing, listening and interviewing, attending virtually and in-person conferences and webinars, this paper reveals multiple strategies for how Nature Tech aims to become the ‘appropriate’ way of governing nature. By steering agency in particular (tech-enabled) directions, it reveals how NBS are being ‘technologised’ within these zones, meaning that those who can be calculated and qualified through technology become regarded as ‘trustworthy’ – with potentially radical implications for how climate-biodiversity governance is accomplished.

Panel “Data-driven resource control” (Fri 22, 9.15 am – 10.45 am)

Harnessing connected and automated mobility for sustainable urban futures

Emilia M. Bruck (Technical University Vienna, Austria)

Connected and automated vehicles (CAVs) have come to represent one of the technological megatrends potentially causing significant urban and spatial change in the decades to come. Amidst the reignited euphoria for self-driving vehicles, sparked by scientists and technology companies at the turn of the millennium, municipal planning authorities and public agencies are called upon to prepare and manage the complex and likely messy transition to a future with automated mobility. However, the resources and capacities of planning professionals to be proactive, or better yet, to translate identified policies into action, vary significantly among municipalities and regions eager to have a stake in how pathways to automated vehicles unfold at the local level.

This paper presents insights from an empirical case study conducted on planning initiatives for CAVs in the Greater Toronto Area in Ontario, Canada. To challenge common claims of external disruption brought on by automation, the analysis centres on the transformative potential of endogenous change processes, promoted by creative agency and social learning. The case study reveals the capacity of planning actors in the GTA to create and recreate their environment by altering existing forms of practice. It shows that changing the means of planning may be pivotal to ensuring that local and regional pathways to automated mobility are aligned with broader collective interests such as a more sustainable urban mobility. However, it also uncovers how the larger planning environment, political power relations and spatial conditions may likewise constrain such efforts.

In a telling moment of asynchronicity in which technological setbacks have significantly altered the timelines for commercialization of CAVs, the study shows how policymaking has taken over the pace of technological innovation in some places. However, it also argues that the merit of this time lag needs to be recognized as an

opportunity to expand the narrow focus on technical performance and open up space for social innovation in urban planning and governance. Whether the advent of automated vehicles reinforces the status quo in transportation and exacerbates existing challenges, or instead fosters environmentally and socially sustainable mobility visions, greatly hinges on the capacity of planners to redirect social practices that stand in the way of implementing transformative policies and concepts.

Imprint

Publishers

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Hardenbergstraße 32
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Editorial Management

Andrea Hamm, Rainer Rehak

Layout/Graphic Design

Moritz Buchner, Andreas Langner, Karen Fischäder

Typesetting

Julian Pütz

CALL FOR PAPERS



20th–22th September 2023

**DIGITALIZATION FOR
SUSTAINABILITY TRANSFORMATIONS:
CRITICAL PERSPECTIVES,
LESSONS LEARNED, AND
FUTURE PROSPECTS**

An international, interdisciplinary academic conference hosted by the University of Augsburg (Germany) in collaboration with the Weizenbaum Institute for the Networked Society, the German Corporation for International Cooperation (GIZ), and the German Political Science Association (DVPW)

PLACE

**Centre for Climate Resilience,
University of Augsburg (near Munich),
Germany**

DATE & TIME

**20 September 2023, 3 pm to
22 September 2023, 1 pm**

GUIDING QUESTIONS

Digitalization and sustainability transformation are two of the most significant challenges facing the world today. However, the links between these topics have rarely been addressed from an interdisciplinary perspective. This conference aims to bring together digitalization and sustainability scholars for a vibrant exchange across disciplinary boundaries.

In the face of massive global environmental and sustainability challenges, the potential of digital technologies to foster sustainable development has received increasing attention in recent years. However, the extent to which digitalization (including big data and artificial intelligence) can contribute to solving the world's most pressing sustainability problems, ranging from biodiversity loss to the climate crisis and persistent pollution, remains an open question.

How digitalization can contribute to sustainable development is not just a technological question. It also depends on how the development and use of digital technologies is governed and socially embedded. Further, there is a risk of digital innovations perpetuating the status quo or inhibiting sustainability transformations instead of facilitating change towards sustainable development. These observations serve as starting points for exploring the changing knowledge base and real-world practices that impact sustainability politics and governance in times of digitalization.

The two overarching research questions of this conference are as follows:

- \ How does digitalization transform the knowledge and practices of environmental and sustainability policymaking?
- \ Which forms of digitalization governance are needed to harness its potential for sustainability transformations?

KEYNOTE SPEAKERS



Planning a Just Transition from Coal in India: Digitisation of Data and the Possibility of Subversions in Mineral Resource Governance

Ph.D. Radhika Krishnan is an Assistant Professor with the Human Sciences Research Group, IIIT Hyderabad, India. She has been working in the broad domain of political ecology and technology studies for the past two decades. An electrical engineer by training, her interest in studying the interface between technological regimes, local communities and ecologies led her to shift her research focus to the social sciences. During her tenure at IIIT she has been working on the ways in which digital tools can be integrated into research on issues around mineral extractions, specifically coal. Currently she is collaborating with colleagues from Sweden, Australia and the UK on two projects on 'Just Transitions' in India.

Algorithmic Climate Governance: Reproducing hegemony or radical transformation?

Dr. Ruth Machen is a Lecturer in Urban Planning at Newcastle University (UK), researching the political implications of digital technologies in climate change governance. A human geographer by background, with former policy experience, her work draws from empirical research in the UK and USA on the use of digital models, platforms and interfaces in the making of climate policy. Focusing on unpacking the politics of knowledge at the climate science-policy interface, she draws from environmental governance scholarship, postfoundational political theory, and critical digital scholarship in human geography and STS. She has also contributed to debates on research impact and the role of critical scholarship in societal transformations.



Sustainability imaginaries by design

Dr. Roy Bendor explores the capacity of design to disclose alternative social, political and environmental futures. With a background in media studies, philosophy of technology, and environmental communication, he is currently Assistant Professor of Critical Design at the Faculty of Industrial Design Engineering at Delft University of Technology (Netherlands). Roy is also Fellow of the Urban Futures Studio at Utrecht University, former editor of the sustainability forum in the ACM's magazine Interactions, and author of Interactive Media for Sustainability (Palgrave, 2018).



Digital futures with civic tech initiatives and their relationship with narratives on environmental issues and civic participation

Ph.D. Teresa Cerratto Pargman is a Human-Computer Interaction (HCI) professor at the Dept. of Computer and Systems Sciences at Stockholm University (SU). With a background in Psychology, Pedagogy, and Cognitive Science, she conducts conceptual and empirical studies on emerging technologies and practices in the public sector drawing from perspectives on the philosophy of technology and science and technology studies. She is interested in contributing methodologically to studying digital transformation for a sustainable planet. Teresa is a member of the Executive Committee and Associate Director of Societal Outreach at Digital Futures in Sweden.



CALL FOR PAPERS

We welcome disciplinary diversity and invite theoretical, empirical, and methodological contributions dealing with, but not limited to, the five main themes of the conference:

1. Understandings of the digitalization-sustainability nexus

How is sustainability understood and discussed in the context of digitalization? What notions of digitalization exist in the field of environmental sustainability? What understandings of both concepts have emerged to tackle so-called (super-)wicked sustainability problems? What are the policy implications of these different framings, narratives, and discourses? How is the nexus between digitalization and sustainability made “governable”?

2. Analysing the actors, discourses, and politics of the digitalization-sustainability nexus

Which actors drive the discourse on digital transformation and sustainability, and how has this changed over time? What are the prevailing interests and discourse/ actor coalitions? Are there patterns of coloniality? How and to what extent are issues of digital transformation and sustainability contested and politicized but also normalized and depoliticized? How is technology framed in the debate around digitalization and sustainability? How and why are certain technological solutions featured and mainstreamed while others – especially social innovations – are marginalized?

3. Designing digitalization policies and technology to foster sustainability

What digital solutions have been proposed and for which sustainability challenges? What forms of data governance are needed for sustainable development? How can human-centred design enable sustainability transformations? How does and should regulation influence sustainable technology design? Which policies at the digitalization-sustainability nexus have been adopted

by political actors, how have they evolved, and what outcomes do they deliver? How can digital transformation be achieved while respecting social welfare, the limits of the planet, and the need for democratic participation? What differences in policies and outcomes can be observed in different countries around the world, and how can these differences be explained?

4. Studying polity, power, institutions, and decision-making procedures

How do the use of digital technologies and the data resulting from it change decision-making practices in the field of ecological sustainability policy? Which sites and procedures govern the nexus between digitalization and sustainability? Which power structures (e.g. monopolies) hinder or enable decision-making at the interface between digitalization and sustainability? What kinds of power relations are inherent in the design of digital technologies? To what extent are patterns of territorial and structural coloniality and extractivism at work? What is the potential for democratizing decision-making processes (e.g. through social innovations or civic tech solutions)? Which new legal and organizational forms may allow civil society to participate in political decision-making?

5. Using digital methods to understand sustainability transformations

How can digital and AI-based social science methods enhance our understanding of sustainability transformations? How can digital technologies be used to gather, analyse, and interpret data on sustainability and governance? What are the technological and epistemological limitations of digital methods? How can these methods be made available to and benefit people in the Global South and the Global North?

HOW TO APPLY

SUBMISSION

We invite scholars from a variety of disciplines, including political science, sociology, science and technology studies (STS), communication and media studies, human geography, law, philosophy, computer sciences, design research, and related disciplines to present their research at this conference. Abstracts of 350–400 words should be submitted along with the complete contact information of the authors (full name, position, institutional affiliation(s), e-mail) here:

<https://cloud.weizenbaum-institut.de/apps/forms/RpWq9bPwZwHcdkfY>

DEADLINE

Deadline for abstract submission: 30 April 2023

Acceptance notifications will be sent out before the end of May.

CONTACT

If you have questions about the conference, please e-mail digital@ccr.uni-augsburg.de.

Main organizer and local host: Prof. Dr. Angela Oels, Centre for Climate Resilience, University of Augsburg, Germany

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