

TEXTE

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Final report

Digitalisation and Sustainability in the European Union: Steps towards new governance approaches for a twin transition

Summary report of the project “Digitalisation and sustainability at EU level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level”

by:

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Abstract: Digitalisation and Sustainability in the European Union: Steps towards new governance approaches for a twin transition

The European Union envisages intertwining two major developments in one overall process to address the United Nations Sustainable Development Goals in a so-called twin transition. On the one hand, digitalisation is expected to increasingly permeate most areas of everyday work and life in the European Union. On the other hand, the need for a transition towards sustainability is widely recognised, which will require a fundamental shift in production and consumption systems. Digital technologies can support sustainable transitions. However, they have their own environmental and social impacts. Drawing upon a document analysis, an online forum, online surveys, expert workshops, literature reviews, and a final event in Brussels, the research project 'Digitalisation and sustainability at EU level: opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level' aimed to examine ways to move towards a twin transition. Its empirical analysis has shown that current policy work does not often intertwine digitalisation processes with sustainability goals. Looking more deeply at three themes: digital circular economy, digital sufficiency, and environmental justice, the project team developed policy recommendations to strengthen the governance of digitalisation towards sustainability at the European Union and German level in three in-depth studies. Towards the end of the project, it became apparent that the term twin transition should be questioned as it implies equal importance described to a tool (digitalisation) and an objective (sustainability). The research results suggest that the notion of environmental and social justice could form a suitable narrative to pave the way for a reconfiguration of policy designs and instruments that enable a digital and sustainable future for all.

Kurzbeschreibung: Digitalisierung und Nachhaltigkeit in der Europäischen Union: Schritte zu neuen Steuerungsansätzen für eine doppelte Transformation

Zur Adressierung der Ziele für nachhaltige Entwicklung der Vereinten Nationen beabsichtigt die Europäische Union zwei Entwicklungsstränge in einem Gesamtprozess, der so genannten doppelten Transformation, zu verflechten. Einerseits wird eine zunehmende Durchdringung der meisten Lebensbereiche durch die Digitalisierung erwartet. Andererseits wird eine Transformation zur Nachhaltigkeit erforderlich, um menschliches Wohlergehen, Ökosysteme und natürliche Ressourcen langfristig zu erhalten. Digitale Technologien können nachhaltige Transformationen unterstützen. Sie haben jedoch immer auch selbst Auswirkungen auf die Umwelt und die Gesellschaft. Auf der Grundlage einer Dokumentenanalyse, eines Online-Forums, von Online-Umfragen, Experten-Workshops, Literaturrecherchen und einer Abschlussveranstaltung in Brüssel hatte das Forschungsprojekt „Digitalisierung und Nachhaltigkeit auf EU-Ebene: Chancen und Risiken der Digitalisierung für die Umsetzung der Agenda 2030 auf EU-Ebene“ zum Ziel, Wege zu einer doppelten Transformation zu untersuchen. Die empirische Analyse zeigte, dass politische Debatten oft keine Integration von Digitalisierung und Nachhaltigkeit erreichen. Für drei Themen – digitale Kreislaufwirtschaft, digitale Suffizienz und Umweltgerechtigkeit – wurden in vertiefenden Studien Politikempfehlungen für wirksame Steuerungsmechanismen auf europäischer Ebene entwickelt. Dabei stellt sich der Begriff ‚doppelte Transformation‘ selbst als fraglich heraus, da er Gleichwertigkeit für ein Instrument (Digitalisierung) und ein Ziel (Nachhaltigkeit) impliziert. Die Forschungsergebnisse deuten darauf hin, dass der Begriff der ökologischen und sozialen Gerechtigkeit ein geeignetes Narrativ prägen könnte, um den Weg für eine Neukonfiguration von Politikgestaltung und -instrumenten zu ebnen, die eine digitale und nachhaltige Zukunft für alle ermöglicht.

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List of abbreviations

Abbreviation	Explanation
AI	Artificial Intelligence
BMWK	Federal Ministry for Economic Affairs and Climate Action (Bundesministerium für Wirtschaft und Klimaschutz)
BMUV	Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz)
CE	Circular economy
CSO	Civil Society Organisation
DG	Directorate-General
DGA	Data Governance Act
DMA	Digital Markets Act
DPPs	Digital Product Passports
DSA	Digital Services Act
EC	European Commission
EGD	European Green Deal
EP	European Parliament
EPR	Extended Producer Responsibility
EU	European Union
FTA	Free Trade Agreement
ICT	Information Communications Technology
IEEP	Institute for European Environmental Policy
IT	Information Technologies
IÖW	Institute for Ecological Economy Research (Institut für ökologische Wirtschaftsforschung)
JRC	Joint Research Centre for the European Commission
NGO	Non-governmental organization
UBA	German Environment Agency (Umweltbundesamt)
WEEE	Waste from Electrical and Electronic Equipment

Summary

The advancements of digitalisation are causing significant shifts in societies and economies, presenting both opportunities and risks for socio-ecological transformations (WBGU 2019). Digitalisation is said to play a vital role in achieving sustainability goals, but it requires active governance to ensure that the production, design, and consumption of digital technologies and other digitalisation processes align with sustainability objectives. The twin digital and sustainable transition is thus a major challenge of the 21st century.

This report summarises the results of the research project called ‘Digitalisation and Sustainability at EU Level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level’, which aimed to extend the German government’s efforts towards the twin digital and sustainable transition beyond its Presidency of the Council of the European Union (EU) in 2020. The research project focused on the concept of social and environmental justice, as reflected in the motto of the 2030 Agenda for Sustainable Development ‘Leave No One Behind’. Conducted between February 2021 and May 2024, research was carried out by the Institute for Ecological Economy Research (IÖW) and the Institute for European Environmental Policy (IEEP) on behalf of the German Environment Agency (Umweltbundesamt – UBA). Funding for the project was provided by the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety, and Consumer Protection (Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz – BMUV). This final report offers an overview of the main findings and activities, along with recommendations for policy makers from the EU and Germany.

Overview and structure of the project

The project was divided into four work packages, each with specific goals.

- ▶ The first work package aimed to gain a deeper understanding of **Germany’s Presidency of the Council of the EU, in particular its efforts regarding the twin digital and sustainable transition** (from now onwards German Council Presidency). By conducting a document analysis of policy and academic documents, specific areas within digitalisation and sustainability were identified as crucial at the EU level and requiring prioritisation in the future. This initial work package also helped to determine the focus of the subsequent work packages. For more information about the first work package please refer to section 3.1 in this report or REPORT 1.
- ▶ The second work package involved conducting two comprehensive studies on the key topics of **digital circular economy** and **digital sufficiency** that were identified in the first work package. The topics were selected due to the central role of the circular economy (CE) within existing EU strategies and the effective, yet untapped possibilities for strengthening environmental and climate protection that digital sufficiency can offer. The studies were based on respective online surveys, expert workshops and subsequent literature reviews, with the intention of establishing these topics as long-term priorities at the EU level. For more information about the topic of digital circular economy please refer to section 3.3 in this report or REPORT 2. For more information about the topic of digital sufficiency please refer to section 3.4 in this report or REPORT 3.
- ▶ The third work package delved into an in-depth analysis of **environmental justice and participation challenges related to the twin transition**. The goal of this work package was to strengthen the inclusion and interconnectedness of civil society organisations (CSOs) through various participation formats to establish the topic of sustainable digitalisation in

European decision-making bodies in the long term and integrate aspects of social and environmental justice in the process. This analysis involved engaging civil society actors through an online forum and expert workshop, as well as a follow-up literature review. For more information about the topic of environmental justice and participation please refer to section 3.5 in this report or REPORT 4.

- ▶ The fourth work package focused on disseminating the research findings and connecting relevant groups of stakeholders to foster discussions in European policy debates. This was primarily accomplished through a **final event** held in Brussels in March 2023. For more information about the final event please refer to section 4 and for reflections on **steps forward** refer to section 5 in this report.

Digitalisation and sustainability in the context of the German Council Presidency

On 1 July 2020, Germany took on the Presidency of the Council of the EU for six months, aiming to advance the topics of digitalisation and sustainability. Through our document analysis, we identified three distinct nexus types that encompass the discussions surrounding digitalisation and sustainability during this period.

1. The first nexus type, known as '**sustainable digitalisation**', focuses on making digitalisation more sustainable.
2. The second nexus type, '**digitalisation for sustainability**', emphasises the use of digital tools and solutions to promote sustainability.
3. The third nexus type, '**digitalisation and sustainability in silos**', highlights that digitalisation and sustainability are often treated as separate issues rather than interconnected concepts.

We observed that debates on these nexus types primarily revolved around four key areas: environment, mobility and transport, digital economy, and recovery, while other topics, such as the food industry, consumer protection, inclusion, and international cooperation received less attention in these discussions:

- ▶ Debates in the area '**environment**' were primarily concerned with nexus type 1, especially the sustainability of applications of artificial intelligence (AI) and data centres, and opportunities of reducing the number of discarded information and communication technologies (ICT). Nexus type 2 was mainly linked to broader EU policy processes and strategies such as the EU Biodiversity Strategy for 2030 (EC 2020a) and the Farm to Fork Strategy (EC 2020b). Topics that could be addressed more strongly within the EU in the future are increasing recycling rates, incorporating a right to repair, addressing the data intensity of software (e.g., data sufficiency) and encouraging the longevity of devices.
- ▶ Debates in the area '**mobility and transport**' focussed on nexus type 2, including two policy initiatives that were started by the German Council Presidency: the Passau Declaration and the New Mobility Approach (German EU Council Presidency 2020; Schlimpert and Heinson 2020). The objective of these policy initiatives was to promote research and development in automation, with the goal of expanding the availability of charging infrastructure for alternative fuels and transitioning freight transport from road to rail. In the future, there is potential for a stronger emphasis to be placed on shifting passenger transport from road to rail, utilising digital tools as a facilitator. This shift should not only concentrate on freight transport but also explore the use of digital tools to minimise passenger transportation.
- ▶ Debates in the area '**digital economy**' mainly was on nexus type 1, especially on enabling fair taxation and fair competition as well as securing the EU's digital sovereignty to be able

to reach (economic) sustainability within the digital economy. The importance of establishing an open, transparent, and secure digital ecosystem, was emphasised to ensure digital sovereignty over infrastructures and data pools. Future debates in this area should incorporate environmental sustainability considerations into discussions and regulatory frameworks for the digital economy.

- Debates in the area ‘**recovery**’ consistently emphasised the need for EU recovery measures to be implemented in a manner that supports rather than undermines the goals of the digital and sustainable transition. The twin transition is widely regarded as a crucial element in guiding recovery endeavours. In the future, there are potentials for a closer integration of funding for recovery initiatives with the objectives of promoting a simultaneous digital and sustainable transition.

In conclusion, our analysis reveals that during the German Council Presidency, efforts were made to elevate the importance of the twin digital and sustainable transition in several discussions. Nexus type 1, focusing on sustainable digitalisation, received significant attention, while nexus type 2, the integration of digitalisation and sustainability, emerged as a central objective within EU recovery funding. However, the analysis also indicated that a significant portion of the debates tends to address digitalisation and sustainability as separate entities rather than considering them together (as indicated by nexus type 3). Therefore, further exploration is necessary to examine the interplay between these two transitions and how they mutually shape and influence each other.

Three core issues for digitalisation and sustainability: Circularity, sufficiency, and justice

Based on this analysis, the project has focussed on three distinct yet interconnected themes: circularity, sufficiency, and justice. These themes hold the potential to support a digital and sustainable twin transition.

Digital circular economy involves shifting from a linear to a circular economy, rethinking production and consumption patterns (e.g., Hedberg and Šipka 2020) to make them more sustainable. Digitalisation plays a crucial role in this transition through data collection and exchange. However, the governance of circularity and information flows is often overlooked in policy approaches and potentials remain largely untapped.

Digital sufficiency aims to decrease resource and energy demand from ICT production and application. The guiding principle of sufficiency acknowledges that technological innovation alone cannot solve societal problems. Instead, it emphasises a frugal use of digital technologies and considerations of resource limitations (Santarius et al. 2022). Digital sufficiency also contributes to sustainable production and consumption by promoting alternative business models that prioritise social wellbeing and participation. Central actors include businesses, policy makers, educators, and civil society. Integrating digital sufficiency into policy agendas can support the twin transition. Strong policy action is necessary to address environmental and social implications and justice issues associated with digitalisation and sustainability.

Justice and participation challenges are interconnected with the twin transition. Justice issues must be embedded in digital policy formulation and governance to prevent environmental injustices throughout the product life cycle. Digital tools can enhance citizen participation in environmental decision-making but precautions must be taken to avoid deepening the digital divide (e.g., Perez-Morote et al. 2022). Effective corporate due diligence, sustainable trade agreements, and strengthened enforcement of environmental and labour standards are essential for promoting justice in the twin transition. These measures should bridge the gap between the rhetoric of ‘leaving no one behind’ and existing digitalisation policies.

The three themes have been examined in greater depth and will be outlined in section 3.3, 3.4, 3.5.

Digital circular economy

The CE aims to redirect production and consumption patterns towards repair, reuse, remanufacturing, and recycling. The EU recognises the need for this transition to decouple economic growth from resource consumption (EC 2019). However, its potential remains largely untapped (Circle Economy 2022). Digitalisation can support the implementation of a CE, especially through product tracking and data exchange.

The expert workshop on the digital circular economy explored key factors, such as product tracking, data exchange, circular business models, and actor networks. In particular, the importance of improved digital information flows along circular value chains through digital product passports (DPPs) and governance for circularity were subsequently examined through a literature review. DPPs play a vital role, enabling stakeholders to access and utilise product information for design and industry processes as well as sustainable consumer choices. Effective governance for the digital circular economy involves data management (relating to aspects like data ownership, security, and privacy), standardisation (relating to common data standards and technological integration of different data management systems), and empowerment (relating to the governance of relationships between actors) along the circular value chain. Based on these findings, recommendations for EU and German policy makers were outlined to support the development of a systemic and coherent strategy for a digital circular economy within the EU.

Recommendations on a digital circular economy for EU policy makers:

- ▶ Strengthening a participatory, inclusive and equitable approach to circularity by empowering consumers to take an active role within a digital circular economy
- ▶ Facilitating transparent data exchange by exploring options for standardisation and developing the DPP as a governance instrument
- ▶ Exploring possibilities to allow for data altruism while respecting intellectual property rights and privacy regulations for all stakeholders

Recommendations on a digital circular economy for German policy makers:

- ▶ Gaining new perspectives on developments towards a CE based on a twin transition by putting its governance at the centre
- ▶ Working towards the establishment of data infrastructure for digital data collection and exchange
- ▶ Advocating for coherent digital and sustainability policies for the twin transition that frame digitalisation as an enabler for circularity and sustainability

For more information see section 3.3.

Digital sufficiency

Digital sufficiency aims to meet human needs while minimising resource-intensive ICT production, deployment, and disposal. It complements the EU's digital and sustainable twin transition, focusing on reducing production and consumption levels. Four dimensions – hardware, software, user, and economic sufficiency (Santarius et al. 2022) – were explored:

- ▶ **Hardware sufficiency:** reducing the environmental impact of physical ICT devices by using fewer devices for extended periods of time
- ▶ **Software sufficiency:** minimising data, computation, and energy intensity by using or omitting appropriate software solutions
- ▶ **User sufficiency:** reducing avoidable ICT consumption while promoting sufficiency-enabling applications
- ▶ **Economic sufficiency:** supporting economic practices that prioritise the common good over economic growth

The expert workshop emphasised that digital sufficiency should consider multiple aspects of sustainability, going beyond mere environmental considerations, and highlighted the role of digital sufficiency in energy security and sustainable consumption patterns. Based on these findings, recommendations for EU and German policy makers were developed to introduce the concept of digital sufficiency into the policy realm and point to its potentials for sustainability.

Recommendations on digital sufficiency for EU policy makers:

- ▶ Raising awareness among policy makers at all levels about the significance of sufficiency - induced narratives in digitalisation to move towards a twin transition
- ▶ Supporting the development of digital innovations towards digitalisation as a public and common good
- ▶ Strengthening voices from civil society in the governance of the twin transition to be able to address diverse societal needs and sustainability challenges

Recommendations on digital sufficiency for German policy makers:

- ▶ Widening the role of civil society within the German Digital Strategy, whilst finding formats to enable citizen participation in governance processes
- ▶ Learning from the introduction of the repair bonus and index, whilst aiming to implement a national repair bonus system
- ▶ Accelerating and strengthening the significance of sufficiency criteria in European ecodesign labelling and regulation
- ▶ Promoting open standards for software products and platforms unlock the full potential of engaged software engineers and developers
- ▶ Setting up data governance models towards the public and common good and climate protection whilst considering data volume and traffic
- ▶ Supporting and recognising the role of digital platform cooperatives to move towards commons-based digitalisation and value-based platform economies

For more information see section 3.4.

Justice and participation

Environmental justice focuses on fairness in decision-making and the environmental impacts of policies in Europe. The concept has expanded to include climate justice, minority rights, and equitable distribution of environmental quality and burdens (Antal 2022). Digitalisation,

although seen as a positive tool for sustainability, has had adverse environmental effects globally due to increased use of digital products and negative consequences of ICT device extraction, manufacturing, and disposal (Lange and Santarius 2020). It is important to address these negative impacts in EU policies and consider trade-offs and the assumption that digitalisation inherently supports a green transition.

The online forum collected feedback from stakeholders on the convergence of digitalisation, sustainability, and environmental justice. Themes discussed included access to environmental information, participation in decision-making, civil society initiatives, systemic change, human rights and ICT impacts, and justice/discrimination in digital environmental technologies. A subsequent workshop focused on enhancing digitalisation's role in policy participation, examining its relationship with environmental rights and assessing environmental justice implications of online platforms and e-commerce.

The workshop highlighted the need for inclusive digital participation tools but also recognised the risks of deepening the digital divide and negative effects like surveillance and mental health impacts. It emphasised the importance of addressing human and environmental rights issues in ICT product lifecycle, such as mining violations and challenges in e-waste disposal and recycling. Recommendations were made to introduce environmental justice into policy and recognise its potential for sustainability.

Recommendations on justice and participation for EU policy makers:

- ▶ Creating a direct, participatory agenda setting process for citizens at the EU level
- ▶ Integrating the European Parliament (EP) and European Council into the European Commission's (EC) online policy consultation process and portal
- ▶ Improving and better resourcing the Better Regulation process and particularly the online 'Have your say' portal
- ▶ Optimising the European Data Act to include data relevant to the environment
- ▶ Investigating ways of implementing material use reduction targets with the ICT industry aiming for consumption footprints within planetary boundaries by 2050, as the EP has called for
- ▶ Taking a more coherent approach that integrates environmental concerns into the regulation of the digital market
- ▶ Investing into digital public infrastructure to begin to provide a real alternative to the current internet model, dominated by private interests
- ▶ Improving the transparency of interactions between industry and government at all levels

Recommendations on justice and participation for German policy makers:

- ▶ Enhancing transparency for European Council decision-making procedures, including digital tools for transparency
- ▶ Promoting of the EC's consultation procedures towards German citizens and other stakeholders
- ▶ Bridging the digital divide in Germany through targeted training, outreach for IT skill building, and ensuring that IT tools are available to all citizens

- ▶ Pursuing environmental taxation relating to electronic goods and waste
- ▶ Developing capacity building agreements with third countries, which are significant recipients of waste from electrical and electronic equipment (WEEE)
- ▶ Improving public administration's resources and training in providing information digitally
- ▶ Making more publicly available data and information machine readable and interoperable to ease access, as well as open source

For more information see section 3.5.

Key insights from the final event of the project

The insights derived from this research on the topics of digital circular economy, digital sufficiency, and environmental justice and participation have provided a valuable foundation for advancing discussions on sustainability and digitalisation within the EU. In order to move towards a twin transition that encompasses both digitalisation and sustainability, it is imperative to reorganise existing practices related to material extraction and product production and consumption that are guided by principles of circularity, sufficiency, and justice. One of the key challenges to progress in this area has been the fragmented approach to the twin transition, with professionals from diverse fields such as technology, sustainability, economics, health, and social services seldom collaborating on these interconnected transitions. Therefore, the creation of a multi-stakeholder space for dialogue is crucial to further enhance understanding and chart the path towards a successful twin transition.

To address these issues, a final event of the project was organised, bringing together experts from CSOs, academia, EU institutions, and youth organisations for an open discussion on how the twin transition could be strengthened through innovative governance approaches. The conference, titled 'Circularity, Sufficiency, and Justice: New approaches to governance of the twin transition of digitalisation and sustainability' took place on 21 March 2023, at the Brussels Press Club in a hybrid format. It aimed to tackle several key questions, including:

- ▶ What are the key challenges to move towards a twin digital and sustainable transition within the EU? How does existing work on circularity, sufficiency and/or justice point to overcoming some of these challenges?
- ▶ How can governance towards a twin digital and sustainable transition be supported if ideas derived from circularity, sufficiency, and justice would become core elements of the political narrative around digitalisation within the EU?
- ▶ How would EU policy frameworks need to be designed and look like if they would integrate ideas derived from circularity, sufficiency, and justice to move towards a twin digital and sustainable transition? What are promising policy areas where such policy work could be developed?
- ▶ What could be done to open up existing EU policy processes so that diverse groups in society can participate in shaping a twin digital and sustainable transition within the EU?

The event aimed to foster a comprehensive political-strategic approach in this field, drawing upon the insights and potentials identified in the areas of digital circular economy, digital sufficiency, and environmental justice. During the event, the importance of establishing bridges and connections between communities focused on digitalisation and sustainability was stressed. One example in this context are Recovery and Resilience Plans, which currently lack synergies

between digital transformation and the green transition. Further discussions revolved around questioning the need and direction of the digital transition, considering its environmental impacts, justice implications, and effects on people's wellbeing. The speakers emphasised the importance of shifting the mindset from the unconditional pursuit of digitalisation to fostering sustainability. They highlighted the need for reductions in material footprints of digital devices and the necessity of overarching targets to address environmental and justice issues. The governance of digitalisation is currently being driven by corporate strategies rather than public decision-making and democratic choices. It was thus argued that digitalisation is a political topic and should be addressed through democratic means. Tools, such as citizen assemblies, were mentioned as effective means of promoting sustainability and ensuring the inclusion of diverse perspectives.

The event highlighted the need to prioritise justice in the narrative surrounding digitalisation and sustainability. Corporates, governments, and civil society should invest in novel ways that bridge the gaps between digital transitions and moving towards sustainability. The event emphasised the necessity of repurposing the digital transition for sustainability and called for more societal discussions on digitalisation rather than mainly technological ones.

Steps forward to repurposing the digital transition towards sustainability in the EU

The research project 'Digitalisation and Sustainability at EU Level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level' aimed to expand the German government's efforts in the twin digital and sustainable transition. In particular, the three themes digital circular economy, digital sufficiency, and environmental justice and participation were explored. The reports on these themes highlight the potential of digitalisation for sustainability and provide policy recommendations for European and German policy makers to move towards integrating such themes into their policy work (see REPORT 2, 3, 4). While all these themes are important, towards the end of the project it became clear that justice issues are a critical lever for achieving a digital and sustainable transition. Discussions during the final event emphasised the need for justice to shape policy designs and drive European digital transitions towards sustainability.

Justice issues are essential when placing sustainability at the core of digitalisation. Currently, a small number of actors and organisations shape digital economies to serve their own interests (e.g., Bank 2023), leading to implications for market structures and sustainability dimensions like environmental justice, self-determination, inclusiveness, and digital participation. Promoting green growth, technological innovations, and efficiency gains alone may not be sufficient for leveraging digitalisation for sustainability. Emphasising justice as a tangible narrative can form the basis for inclusive policies that involve EU citizens in shaping digitalisation towards sustainability.

The joint discussion at the final event revealed untapped potentials to address social and economic inequalities and environmental injustice in the realm of digitalisation and sustainability. Yet, cross-segment guidance is needed to redesign policies and integrate the goal of just and environmentally sustainable digital societies. A justice narrative can potentially facilitate the development of new technology assessment and governance approaches. For example, ecodesign policies for ICT products can incorporate comprehensive sustainability criteria, considering social justice, wellbeing, accessibility, cultural inclusion, and participation (McGuinn et al. 2020).

A justice narrative can foster collaboration between existing digital and sustainability communities in policy, industry, and civil society circles. Exchange formats should be established to bridge the gap between these communities and prioritise social and environmental issues

alongside technical expertise. NGOs and CSOs should be included as key actors in the governance of digitalisation to address environmental changes and their distribution within society.

The idea of a twin transition, implying two parallel processes, should be questioned. Digitalisation and sustainability transitions are fundamentally different, driven by different narratives and goals. Sustainability goals should take precedence in digital transitions, with a strong recognition that social and environmental justice objectives must be fulfilled alongside environmental concerns.

In conclusion, the research project highlights the importance of justice in driving the digital and sustainable transition. It calls for policies that prioritise sustainability, foster collaboration between digital and sustainability communities, and ensure social and environmental justice in digitalisation efforts.

Zusammenfassung

Die fortschreitende Digitalisierung führt zu erheblichen Veränderungen in Gesellschaft und Wirtschaft und birgt sowohl Chancen als auch Risiken für eine sozial-ökologische Transformation (WBGU 2019). Der Digitalisierung wird eine wichtige Rolle bei der Erreichung von Nachhaltigkeitszielen zugeschrieben, aber sie erfordert eine aktive Steuerung, um sicherzustellen, dass die Produktion, die Gestaltung und der Konsum digitaler Technologien und anderer Digitalisierungsprozesse mit den Nachhaltigkeitszielen in Einklang stehen. Die doppelte Herausforderung einer digitalen und nachhaltigen Transformation ist somit eine der größten Herausforderungen des 21. Jahrhunderts. Der vorliegende Bericht fasst die Ergebnisse des Forschungsprojekts „Digitalisierung und Nachhaltigkeit auf EU-Ebene: Chancen und Risiken der Digitalisierung für die Umsetzung der Agenda 2030 auf EU-Ebene“ zusammen, das darauf abzielte, die Bemühungen der Bundesregierung um eine doppelte, digitale und nachhaltige, Transformation über ihre Ratspräsidentschaft im Jahr 2020 hinaus zu erweitern. Im Mittelpunkt des Forschungsprojekts stand das Konzept der sozialen und ökologischen Gerechtigkeit, wie es im Motto der Agenda 2030 für nachhaltige Entwicklung ‚Leave No One Behind‘ zum Ausdruck kommt. Das Forschungsprojekt wurde von Februar 2021 bis Mai 2024 vom Institut für ökologische Wirtschaftsforschung (IÖW) und dem Institute for European Environmental Policy (IEEP) im Auftrag des Umweltbundesamtes (UBA) durchgeführt. Gefördert wurde das Projekt durch das Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (BMUV). Dieser Abschlussbericht gibt einen Überblick über die wichtigsten Ergebnisse und Aktivitäten und liefert Empfehlungen für politischen Entscheidungstragende der Europäischen Union (EU) und Deutschlands.

Überblick und Struktur des Projekts

Das Projekt gliederte sich in vier Arbeitspakete, die jeweils spezifische Ziele verfolgten.

- ▶ Das erste Arbeitspaket zielte darauf ab, ein tieferes Verständnis der Bemühungen **der deutschen EU-Ratspräsidentschaft in Bezug auf eine doppelte, digitale und nachhaltige, Transformation** zu erlangen (ab jetzt deutsche Ratspräsidentschaft). Durch eine Dokumentenanalyse politischer und wissenschaftlicher Dokumente wurden spezifische Bereiche der Digitalisierung und der Nachhaltigkeit identifiziert, die auf EU-Ebene von entscheidender Bedeutung sind und in Zukunft priorisiert werden müssen. Dieses erste Arbeitspaket trug dazu bei, den Schwerpunkt der nachfolgenden Arbeitspakete festzulegen. Weitere Informationen über das erste Arbeitspaket lassen sich in Abschnitt 3.1 in diesem Bericht oder in BERICHT 1 finden.
- ▶ Das zweite Arbeitspaket umfasste die Durchführung von zwei umfassenden Studien zu den im ersten Arbeitspaket identifizierten Schlüsselthemen **digitale Kreislaufwirtschaft** und **digitale Suffizienz**. Die Auswahl der Themen erfolgte aufgrund der zentralen Rolle der Kreislaufwirtschaft innerhalb bestehender EU-Strategien und ihres noch weitgehend unausgeschöpften Potenzials sowie der effektiven, aber ungenutzten Möglichkeiten zur Stärkung des Umwelt- und Klimaschutzes, die digitale Suffizienz bieten kann. Die Studien basieren jeweils auf Online-Befragungen, Experten-Workshops und anschließenden Literaturrecherchen mit dem Ziel, diese Themen als langfristige Prioritäten auf EU-Ebene zu etablieren. Weitere Informationen zum Thema digitale Kreislaufwirtschaft lassen sich in Abschnitt 3.3 in diesem Bericht oder in BERICHT 2 finden. Weitere Informationen zum Thema digitale Suffizienz lassen sich in Abschnitt 3.4 in diesem Bericht oder in BERICHT 3 finden.

- ▶ Das dritte Arbeitspaket befasste sich mit einer eingehenden Analyse von Fragen der **Umweltgerechtigkeit und der Teilhabe im Zusammenhang mit einer doppelten Transformation**. Ziel dieses Arbeitspakets war es, die Einbindung und Vernetzung zivilgesellschaftlicher Akteure durch verschiedene Partizipationsformate zu stärken, um das Thema nachhaltige Digitalisierung langfristig in europäischen Entscheidungsgremien zu etablieren und dabei Aspekte der sozialen und ökologischen Gerechtigkeit zu integrieren. Diese Analyse beinhaltete die Einbindung von zivilgesellschaftlichen Akteuren über ein Online-Forum und Expertenworkshop, sowie eine anschließende Literaturrecherche. Weitere Informationen zum Thema Umweltgerechtigkeit und Teilhabe lassen sich in Abschnitt 3.5 in diesem Bericht oder in BERICHT 4 finden.
- ▶ Das vierte Arbeitspaket konzentrierte sich auf die Verbreitung der Forschungsergebnisse und die Vernetzung relevanter Gruppen von Interessenvertretern, um die Diskussionen in der europäischen Politikdebatte zu fördern. Dies wurde in erster Linie durch eine **Abschlussveranstaltung** in Brüssel im März 2023 erreicht. Weitere Informationen über die Abschlussveranstaltung lassen sich in Abschnitt 4, und Überlegungen zu **weiteren Schritten** in Abschnitt 5 in diesem Bericht finden.

Digitalisierung und Nachhaltigkeit im Rahmen der deutschen Ratspräsidentschaft

Am 1. Juli 2020 übernahm Deutschland für sechs Monate die EU-Ratspräsidentschaft mit dem Ziel, die Themen Digitalisierung und Nachhaltigkeit voranzutreiben. Die durchgeführte Dokumentenanalyse identifizierte drei verschiedene Nexustypen, die die Diskussionen um Digitalisierung und Nachhaltigkeit in diesem Zeitraum umfassen.

1. Nexustyp 1, „**nachhaltige Digitalisierung**“, konzentriert sich darauf, die Digitalisierung nachhaltiger zu gestalten.
2. Nexustyp 2, „**Digitalisierung für Nachhaltigkeit**“, legt den Schwerpunkt auf die Nutzung digitaler Werkzeuge und Lösungen zur Förderung der Nachhaltigkeit.
3. Nexustyp 3, „**Digitalisierung und Nachhaltigkeit in Silos**“, hebt hervor, dass Digitalisierung und Nachhaltigkeit oft als getrennte Themen behandelt werden, statt als miteinander verbundene Konzepte.

Es wurde festgestellt, dass sich die Debatten über diese Verknüpfungen hauptsächlich über vier Schlüsselbereiche (Umwelt, Mobilität und Verkehr, digitale Wirtschaft, wirtschaftliche Erholung) geführt werden, während andere Themen wie Lebensmittelindustrie, Verbraucherschutz, Inklusion und internationale Zusammenarbeit in diesen Diskussionen weniger Beachtung fanden:

- ▶ Die Debatten im Bereich „**Umwelt**“ betrafen in erster Linie Nexustyp 1, insbesondere die Nachhaltigkeit von Anwendungen der künstlichen Intelligenz und von Datenzentren sowie die Möglichkeiten zur Verringerung der Zahl der ausrangierten Informations- und Kommunikationstechnologien (ICT). Nexustyp 2 war hauptsächlich mit umfassenderen politischen Prozessen und Strategien der EU verknüpft, wie z.B. die EU Biodiversity Strategy for 2030 (EC 2020a) und die Farm to Fork Strategy (EC 2020b). Themen, die innerhalb der EU in Zukunft stärker angegangen werden könnten, sind die Erhöhung der Recyclingquoten, die Einführung eines Rechts auf Reparatur, die Auseinandersetzung mit der Datenintensität von Software (z.B. Datensuffizienz) und die Förderung der Langlebigkeit von Geräten.
- ▶ Die Debatten im Bereich „**Mobilität und Verkehr**“ konzentrierten sich auf Nexustyp 2, einschließlich zweier politischer Initiativen, die von der deutschen Ratspräsidentschaft angestoßen wurden: die Passauer Erklärung und der New Mobility Approach (German EU Council Presidency 2020; Schlimpert and Heinson 2020). Ziel dieser politischen Initiativen

war die Förderung von Forschung und Entwicklung im Bereich der Automatisierung mit dem Ziel, die Verfügbarkeit von Ladeinfrastruktur für alternative Kraftstoffe auszubauen und den Güterverkehr von der Straße auf die Schiene zu verlagern. In Zukunft könnte ein stärkerer Schwerpunkt auf die Verlagerung des Personenverkehrs von der Straße auf die Schiene gelegt werden, wobei digitale Werkzeuge als Hilfsmittel eingesetzt werden könnten. Diese Verlagerung sollte sich nicht nur auf den Güterverkehr konzentrieren, sondern auch den Einsatz digitaler Instrumente zur Minimierung des Personenverkehrs prüfen.

- ▶ Die Debatten im Bereich „**Digitale Wirtschaft**“ drehten sich hauptsächlich um Nexustyp 1, insbesondere um die Ermöglichung einer fairen Besteuerung und eines fairen Wettbewerbs sowie um die Sicherung der digitalen Souveränität der EU, um (ökonomische) Nachhaltigkeit in der digitalen Wirtschaft zu erreichen. Es wurde betont, wie wichtig es ist, ein offenes, transparentes und sicheres digitales Ökosystem zu entwickeln, um die digitale Souveränität über Infrastrukturen und Datenpools zu gewährleisten. Künftige Debatten in diesem Bereich sollten Überlegungen zur ökologischen Nachhaltigkeit in die Diskussionen und rechtlichen Rahmenbedingungen für die digitale Wirtschaft einbeziehen.
- ▶ In den Debatten zum Thema „**Wirtschaftliche Erholung**“ wurde betont, dass die Bemühungen der EU um den wirtschaftlichen Wiederaufbau so umgesetzt werden müssen, dass sie die Ziele der digitalen und nachhaltigen Transformation unterstützen und nicht untergraben. Die doppelte Transformation wird weithin als entscheidendes Element für die Ausrichtung der Konjunkturbelebungsmaßnahmen angesehen. Für die Zukunft besteht die Möglichkeit, die Finanzierung von Konjunkturinitiativen enger mit den Zielen der Förderung einer gleichzeitigen digitalen und nachhaltigen Transformation zu verknüpfen.

Zusammenfassend zeigt die Analyse, dass während der deutschen Ratspräsidentschaft Anstrengungen unternommen wurden, um die Bedeutung der doppelten digitalen und nachhaltigen Transformation in mehreren Diskussionen hervorzuheben. Nexustyp 1, der sich auf die nachhaltige Digitalisierung konzentriert, erhielt große Aufmerksamkeit, während Nexustyp 2, die Integration von Digitalisierung und Nachhaltigkeit, als zentrales Ziel im Rahmen der EU-Konjunkturförderung herausgestellt wurde. Die Analyse hat jedoch auch gezeigt, dass ein großer Teil der Debatten dazu neigt, Digitalisierung und Nachhaltigkeit als getrennte Einheiten zu behandeln, anstatt sie zusammen zu betrachten (wie durch den Nexustyp 3 angezeigt). Daher sind weitere Untersuchungen erforderlich, um das Zusammenspiel zwischen diesen beiden Transformationen und ihre gegenseitige Beeinflussung zu untersuchen.

Drei Kernthemen für Digitalisierung und Nachhaltigkeit: Kreislaufwirtschaft, Suffizienz und Gerechtigkeit

Auf der Grundlage dieser Analyse haben wir unsere Aufmerksamkeit auf drei unterschiedliche, aber miteinander verbundene Themen gerichtet: Kreislaufwirtschaft, Suffizienz und Gerechtigkeit. Diese Themen haben das Potenzial, eine doppelte, digitale und nachhaltige, Transformation zu unterstützen.

Digitale Kreislaufwirtschaft hat zum Ziel, von einer linearen zu einer Kreislaufwirtschaft überzugehen und Produktions- und Konsummuster zu überdenken (z. B. Hedberg und Šipka 2020), um sie nachhaltiger zu gestalten. Die Digitalisierung spielt bei dieser Transformation durch Datenerfassung und -austausch eine entscheidende Rolle. Die Steuerung der Kreislaufwirtschaft und der Informationsflüsse wird in den politischen Konzepten jedoch häufig übersehen, und die Potenziale bleiben oft noch ungenutzt.

Digitale Suffizienz zielt darauf ab, den Ressourcen- und Energiebedarf für die Produktion und Anwendung von ICT zu verringern. Das Leitprinzip der Suffizienz erkennt an, dass

technologische Innovation allein gesellschaftliche Probleme nicht lösen kann. Stattdessen betont es den sparsamen Einsatz digitaler Technologien und die Berücksichtigung von Ressourcenbeschränkungen (Santarius et al. 2022). Digitale Suffizienz trägt auch zu nachhaltiger Produktion und nachhaltigem Konsum bei, indem sie alternative Geschäftsmodelle fördert, die das soziale Wohlergehen und die Teilhabe in den Vordergrund stellen. Zu den zentralen Akteuren gehören Unternehmen, politische Entscheidungstragende, Bildungseinrichtungen und die Zivilgesellschaft. Die Einbeziehung der digitalen Suffizienz in die politischen Agenden kann eine doppelte Transformation unterstützen. Um die ökologischen und sozialen Auswirkungen und die Gerechtigkeitsfragen im Zusammenhang mit der Digitalisierung und der Nachhaltigkeit anzugehen, sind entschlossene politische Maßnahmen erforderlich.

Gerechtigkeit und Teilhabe sind im Zusammenhang mit einer doppelten Transformation mit Herausforderungen verbunden. Gerechtigkeitsaspekte müssen in die Formulierung digitaler Politiken und in die Governance eingebettet werden, um ökologische Ungerechtigkeiten während des gesamten Produktlebenszyklus zu verhindern. Digitale Instrumente können die Beteiligung von Bürger*innen an (umwelt)politischen Entscheidungen verbessern, aber es müssen Vorsichtsmaßnahmen getroffen werden, um eine Vertiefung der digitalen Kluft zu vermeiden (z.B. Perez-Morote et al. 2022). Eine wirksame Sorgfaltspflicht der Unternehmen, nachhaltige Handelsabkommen und eine verstärkte Durchsetzung von Umwelt- und Arbeitsnormen sind für die Förderung der Gerechtigkeit in der doppelten Transformation unerlässlich. Diese Maßnahmen sollten die Kluft zwischen der Rhetorik des „Leave No One Behind“ und der bestehenden Digitalisierungspolitik überbrücken.

Die drei Themen wurden eingehender untersucht und werden in den Abschnitten 3.3, 3.4 und 3.5 näher erläutert.

Digitale Kreislaufwirtschaft

Die Kreislaufwirtschaft zielt darauf ab, die Produktions- und Verbrauchsmuster auf Reparatur, Wiederverwendung, Wiederaufbereitung und Recycling umzustellen. Die EU erkennt die Notwendigkeit dieser Transformation an, um das Wirtschaftswachstum vom Ressourcenverbrauch zu entkoppeln (EC 2019). Das Potenzial bleibt jedoch weitgehend ungenutzt. Die Digitalisierung kann die Umsetzung einer Kreislaufwirtschaft unterstützen, insbesondere durch Produktverfolgung und Datenaustausch.

Der durchgeführte Expertenworkshop zur digitalen Kreislaufwirtschaft untersuchte Schlüsselfaktoren wie Produktverfolgung, Datenaustausch, zirkuläre Geschäftsmodelle und Akteursnetzwerke. Insbesondere die Bedeutung eines verbesserten digitalen Informationsflusses entlang von Kreislaufwertschöpfungsketten durch digitale Produktpässe (DPPs) und Governance für die Kreislaufwirtschaft wurden anschließend anhand einer Literaturübersicht untersucht. DPPs spielen eine wichtige Rolle, da sie es den Akteuren ermöglichen, auf Produktinformationen zuzugreifen und diese für Design- und Industrieprozesse sowie für nachhaltige Verbrauchsentscheidungen zu nutzen. Eine wirksame Governance für die digitale Kreislaufwirtschaft umfasst Datenmanagement (in Bezug auf Aspekte wie Dateneigentum, Sicherheit und Datenschutz), Standardisierung (in Bezug auf gemeinsame Datenstandards und technologische Integration verschiedener Datenmanagementsysteme) und Empowerment (in Bezug auf die Governance der Beziehungen zwischen den Akteuren) entlang der Kreislaufwertschöpfungskette. Basierend auf diesen Erkenntnissen wurden Empfehlungen für die politischen Entscheidungstragenden der EU und Deutschlands formuliert, um die Entwicklung einer systemischen und kohärenten Strategie für eine digitale Kreislaufwirtschaft in der EU zu unterstützen.

Empfehlungen zur digitalen Kreislaufwirtschaft für politische Entscheidungstragende in der EU:

- ▶ Stärkung eines partizipativen, inklusiven und gerechten Ansatzes für die Kreislaufwirtschaft durch die Befähigung der Verbraucher*innen, eine aktive Rolle in einer digitalen Kreislaufwirtschaft einzunehmen
- ▶ Erleichterung eines transparenten Datenaustauschs durch das Ausloten von Optionen für die Standardisierung und die Entwicklung des DPP als Governance-Instrument
- ▶ Ausloten von Möglichkeiten zur Ermöglichung von Daten-Altruismus unter Wahrung der Rechte an geistigem Eigentum und der Datenschutzbestimmungen für alle Beteiligten

Empfehlungen zur digitalen Kreislaufwirtschaft für politische Entscheidungstragende in Deutschland:

- ▶ Gewinnung neuer Perspektiven für die Entwicklung hin zu einer Kreislaufwirtschaft auf der Grundlage einer doppelten Transformation, indem ihre Governance in den Mittelpunkt gestellt wird
- ▶ Aufbau einer Dateninfrastruktur für die Sammlung und den Austausch digitaler Daten
- ▶ Eintreten für eine kohärente Digital- und Nachhaltigkeitspolitik für die doppelte Transformation, die die Digitalisierung als Wegbereiter für Kreislaufwirtschaft und Nachhaltigkeit sieht

Für weitere Informationen siehe Abschnitt 3.3.

Digitale Suffizienz

Digitale Suffizienz zielt darauf ab, die menschlichen Bedürfnisse zu befriedigen und gleichzeitig die ressourcenintensive ICT-Produktion, -Einführung und -Entsorgung zu minimieren. Sie ergänzt die digitale und nachhaltige Umstellung der EU, die sich auf die Verringerung des Produktions- und Verbrauchsniveaus konzentriert. Es wurden vier Dimensionen – Hardware-, Software-, Nutzungs- und wirtschaftliche Suffizienz (Santarius et al. 2022) – untersucht:

- ▶ Suffizienz der Hardware: Verringerung der Umweltauswirkungen physischer ICT-Geräte durch die Nutzung von weniger Geräten über einen längeren Zeitraum hinweg
- ▶ Software-Suffizienz: Minimierung der Daten-, Rechen- und Energieintensität durch Verwendung oder Verzicht bestimmter Softwarelösungen
- ▶ Nutzungs-Suffizienz: Verringerung des vermeidbaren ICT-Ge-/Verbrauchs bei gleichzeitiger Förderung von Anwendungen, die Suffizienz ermöglichen
- ▶ Wirtschaftliche Suffizienz: Unterstützung von Wirtschaftspraktiken, die dem Gemeinwohl Vorrang vor dem Wirtschaftswachstum einräumen

Der Expertenworkshop betonte, dass die digitale Suffizienz mehrere Aspekte der Nachhaltigkeit berücksichtigen sollte, die über reine Umweltaspekte hinausgehen, und hob die Rolle der digitalen Suffizienz für die Energiesicherheit und nachhaltige Konsummuster hervor. Basierend auf diesen Erkenntnissen wurden Empfehlungen für politische Entscheidungstragende in der EU und in Deutschland entwickelt, um das Konzept der digitalen Suffizienz in den politischen Bereich einzuführen und seine Potenziale für die Nachhaltigkeit aufzuzeigen.

Empfehlungen zu Digitaler Suffizienz für politische Entscheidungstragende in der EU:

- ▶ Sensibilisierung von politischen Entscheidungstragenden auf allen Ebenen für die Bedeutung von Suffizienz-Narrativen in der Digitalisierung, um eine doppelte Transformation zu erreichen
- ▶ Unterstützung der Entwicklung digitaler Innovationen in Richtung Digitalisierung als öffentliches und gemeinsames Gut
- ▶ Stärkung der zivilgesellschaftlichen Stimmen in der Governance der doppelten Transformation, um vielfältige gesellschaftliche Bedürfnisse und Nachhaltigkeitsherausforderungen adressieren zu können

Empfehlungen zu Digitaler Suffizienz für politische Entscheidungstragende in Deutschland:

- ▶ Ausweitung der Rolle der Zivilgesellschaft im Rahmen der deutschen Digitalen Strategie und Suche nach Formaten, die eine stärkere Beteiligung der Bürger*innen an Governance-Prozessen ermöglichen
- ▶ Lehren aus der Einführung von Reparaturbonus und -index ziehen und ein nationales Reparaturbonussystem anstreben
- ▶ Beschleunigung und Stärkung der Bedeutung von Suffizienzkriterien in der europäischen Ökodesign-Kennzeichnung und -Verordnung
- ▶ Förderung offener Standards für Softwareprodukte und -plattformen, um das Potenzial engagierter Softwareingenieur*innen und -entwicklenden auszuschöpfen
- ▶ Entwicklung von Data-Governance-Modellen im Sinne des Gemeinwohls und des Klimaschutzes unter stärkerer Berücksichtigung von Datenvolumen und -verkehr
- ▶ Unterstützung und Anerkennung der Rolle von Genossenschaften für digitale Plattformen, um zu einer gemeinwohlorientierten Digitalisierung und einer wertorientierten Plattformwirtschaft zu gelangen

Für weitere Informationen siehe Abschnitt 3.4.

Gerechtigkeit und Teilhabe

Umweltgerechtigkeit konzentriert sich auf die Fairness bei der Entscheidungsfindung und die Umweltauswirkungen der Politik in Europa. Das Konzept hat sich auf Klimagerechtigkeit, Minderheitenrechte und die gerechte Verteilung von Umweltqualität und -belastungen ausgeweitet (Antal 2022). Obwohl die Digitalisierung als positives Instrument für die Nachhaltigkeit angesehen wird, hat sie aufgrund der zunehmenden Nutzung digitaler Produkte und der negativen Folgen der Gewinnung, Herstellung und Entsorgung von ICT-Geräten weltweit negative Umweltauswirkungen (Lange und Santarius 2020). Es ist wichtig, diese negativen Auswirkungen in der EU-Politik zu berücksichtigen und Kompromisse sowie die Annahme, dass die Digitalisierung von Natur aus eine grüne Transformation unterstützt, zu hinterfragen.

Das Online-Forum sammelte Feedback von Interessenvertretungen zur Konvergenz von Digitalisierung, Nachhaltigkeit und Umweltgerechtigkeit. Zu den diskutierten Themen gehörten der Zugang zu Umweltinformationen, die Beteiligung an der Entscheidungsfindung, Initiativen der Zivilgesellschaft, systemischer Wandel, Menschenrechte und ICT-Auswirkungen sowie Gerechtigkeit/Diskriminierung bei digitalen Umwelttechnologien. Ein anschließender Workshop

konzentrierte sich auf die Stärkung der Rolle der Digitalisierung bei der politischen Beteiligung, die Untersuchung ihrer Beziehung zu Umweltrechten und die Bewertung der Auswirkungen von Online-Plattformen und elektronischem Handel auf die Umweltgerechtigkeit.

Der Workshop hob die Notwendigkeit inklusiver digitaler Partizipationsinstrumente hervor, erkannte aber auch die Risiken einer Vertiefung der digitalen Kluft und negativer Auswirkungen wie Überwachung und psychische Gesundheit. Es wurde betont, wie wichtig es ist, sich mit Menschen- und Umweltrechtsfragen im Lebenszyklus von ICT-Produkten zu befassen, z.B. mit Verstößen gegen den Bergbau und den Herausforderungen bei der Entsorgung und dem Recycling von Elektroschrott. Es wurden Empfehlungen ausgesprochen, um Umweltgerechtigkeit in die Politik einzubringen und ihr Potenzial für Nachhaltigkeit zu erkennen.

Empfehlungen zu Gerechtigkeit und Teilhabe für politische Entscheidungstragende in der EU:

- ▶ Schaffung eines direkten, partizipativen Agenda-Setting-Prozesses für die Bürger*innen auf EU-Ebene
- ▶ Einbindung des Europäischen Parlaments (EP) und des Europäischen Rates in den Online-Konsultationsprozess und das Online-Portal der Europäischen Kommission
- ▶ Ausbau und bessere Ausstattung des Prozesses zur besseren Rechtsetzung und insbesondere des Online-Portals „Have your say“.
- ▶ Optimierung des Europäischen Datenschutzgesetzes zur Einbeziehung umweltrelevanter Daten
- ▶ Untersuchung von Möglichkeiten zur Umsetzung von Zielen für die Verringerung des Materialverbrauchs in der ICT-Industrie mit dem Ziel, den Verbrauchsfußabdruck bis 2050 innerhalb der planetaren Grenzen zu halten, wie vom EP gefordert
- ▶ Verfolgung eines kohärenteren Ansatzes, der Umweltbelange in die Regulierung des digitalen Marktes einbezieht
- ▶ Investitionen in die digitale öffentliche Infrastruktur, um eine echte Alternative zum derzeitigen, von privaten Interessen dominierten Internetmodell zu schaffen
- ▶ Verbesserung der Transparenz der Interaktionen zwischen Industrie und Regierung auf allen Ebenen

Empfehlungen zu Gerechtigkeit und Teilhabe für politische Entscheidungstragende in Deutschland:

- ▶ Verbesserung der Transparenz der Entscheidungsverfahren des Europäischen Rates, einschließlich digitaler Instrumente für die Transparenz
- ▶ Förderung der Konsultationsverfahren der Europäischen Kommission gegenüber deutschen Bürger*innen und anderen Interessengruppen
- ▶ Überwindung der digitalen Kluft in Deutschland durch gezielte Schulungen, Vermittlung von IT-Kenntnissen und Gewährleistung, dass IT-Werkzeuge allen Menschen zur Verfügung stehen
- ▶ Verfolgung der Umweltbesteuerung von elektronischen Waren und Abfällen

- ▶ Entwicklung von Vereinbarungen zum Kapazitätsaufbau mit Drittländern, die wichtige Empfänger von Elektro- und Elektronik-Altgeräten sind
- ▶ Verbesserung der Ressourcen und der Ausbildung der öffentlichen Verwaltung im Hinblick auf die Bereitstellung digitaler Informationen
- ▶ Mehr öffentlich zugängliche Daten und Informationen maschinenlesbar und interoperabel gestalten, um den Zugang zu erleichtern, sowie Open Source

Für weitere Informationen siehe Abschnitt 3.5.

Zentrale Erkenntnisse aus der Abschlussveranstaltung des Projekts

Die Ergebnisse der vertiefenden Studien zu den Themen digitale Kreislaufwirtschaft, digitale Suffizienz sowie Umweltgerechtigkeit und Teilhabe haben eine wertvolle Grundlage geschaffen, um die Diskussionen über Nachhaltigkeit und Digitalisierung innerhalb der EU voranzutreiben. Um zu einer doppelten Transformation zu gelangen, die sowohl die Digitalisierung als auch die Nachhaltigkeit umfasst, ist es zwingend erforderlich, die bestehenden Praktiken im Zusammenhang mit der Materialgewinnung, der Produktproduktion und dem Konsum neu zu organisieren und sich dabei an den Prinzipien der Kreislaufwirtschaft, der Suffizienz und der Gerechtigkeit zu orientieren. Eine der größten Herausforderungen für den Fortschritt in diesem Bereich ist die fragmentierte Herangehensweise an die doppelte Transformation, bei der Fachleute aus verschiedenen Bereichen wie Technologie, Nachhaltigkeit, Wirtschaft, Gesundheit und Sozialwesen nur selten bei diesen miteinander verbundenen Themen zusammenarbeiten. Daher ist die Schaffung von Dialogräumen zwischen den verschiedenen Interessengruppen von entscheidender Bedeutung, um das Verständnis zu verbessern und den Weg für eine erfolgreiche doppelte Transformation zu ebnen.

Um diese Fragen zu adressieren, wurde eine Abschlussveranstaltung des Projekts organisiert, bei der Expert*innen aus Organisationen der Zivilgesellschaft, der Wissenschaft, EU-Institutionen und Jugendorganisationen zu einer offenen Diskussion darüber zusammenkamen, wie die doppelte Transformation durch innovative Governance-Ansätze gestärkt werden könnte. Die Konferenz mit dem Titel „Circularity, Sufficiency, and Justice: New approaches to governance of the twin transition of digitalisation and sustainability“ fand am 21. März 2023 im Press Club in Brüssel als hybrides Format statt. Ziel der Veranstaltung war es, mehrere Schlüsselfragen zu erörtern, darunter:

- ▶ Welches sind die wichtigsten Herausforderungen auf dem Weg zu einer doppelten, digitalen und nachhaltigen, Transformation in der EU? Wie können die bestehenden Arbeiten zu Kreislaufwirtschaft, Suffizienz und/oder Gerechtigkeit dazu beitragen, einige dieser Herausforderungen zu bewältigen?
- ▶ Wie kann die Governance in Richtung einer doppelten, digitalen und nachhaltigen, Transformation unterstützt werden, wenn Ideen aus den Bereichen Kreislaufwirtschaft, Suffizienz und Gerechtigkeit zu Kernelementen der politischen Erzählung über die Digitalisierung in der EU werden?
- ▶ Wie müssten die politischen Rahmenbedingungen der EU gestaltet sein, wenn sie die Ideen der Kreislaufwirtschaft, der Suffizienz und der Gerechtigkeit integrieren würden, um einer doppelten, digitalen und nachhaltigen, Transformation zu erreichen? Was sind vielversprechende politische Bereiche, in denen eine solche politische Arbeit entwickelt werden könnte?

- Was könnte getan werden, um die bestehenden politischen Prozesse in der EU zu öffnen, damit verschiedene gesellschaftliche Gruppen an der Gestaltung einer doppelten, digitalen und nachhaltigen, Transformation in der EU teilnehmen können?

Ziel der Veranstaltung war es, einen umfassenden politisch-strategischen Ansatz in diesem Bereich zu fördern, der sich auf die Erkenntnisse und Potenziale in den Bereichen digitale Kreislaufwirtschaft, digitale Suffizienz und Umweltgerechtigkeit stützt. Es wurde betont, wie wichtig es sei, Brücken und Verbindungen zwischen Gruppen zu schaffen, die sich auf Digitalisierung und Nachhaltigkeit konzentrieren. Ein Beispiel in diesem Kontext sind „Recovery and Resilience Plans“, denen es derzeit an Synergien zwischen digitaler Transformation und grünem Wandel fehle.

Die Diskussionen während der Veranstaltung drehten sich darum, die Notwendigkeit und die Richtung des digitalen Wandels zu hinterfragen und seine Auswirkungen auf die Umwelt, die Gerechtigkeit und das Wohlergehen der Menschen zu berücksichtigen. Die Gastredner*innen betonten, wie wichtig es sei, die Denkweisen vom bedingungslosen Streben nach Digitalisierung hin zur Förderung der Nachhaltigkeit zu erreichen. Sie betonten außerdem die Notwendigkeit, den materiellen Fußabdruck digitaler Geräte zu verringern und übergreifende Ziele zu setzen, um Umwelt- und Gerechtigkeitsfragen anzugehen. Die Steuerung der Digitalisierung wird derzeit eher durch Unternehmensstrategien als durch öffentliche Entscheidungsfindung und demokratische Entscheidungen bestimmt. Es wurde daher argumentiert, dass die Digitalisierung ein politisches Thema ist und mit demokratischen Mitteln angegangen werden sollte. Instrumente, wie z.B. Bürger*innenversammlungen, wurden als wirksame Mittel zur Förderung der Nachhaltigkeit und zur Gewährleistung der Einbeziehung unterschiedlicher Perspektiven genannt.

Die Veranstaltung unterstrich die Notwendigkeit, dem Thema Gerechtigkeit in der Diskussion um Digitalisierung und Nachhaltigkeit Priorität einzuräumen. Unternehmen, Regierungen und die Zivilgesellschaft sollten in neue Wege investieren, um die Kluft zwischen dem digitalen Wandel und dem Weg zur Nachhaltigkeit zu überbrücken. Die Veranstaltung betonte, dass der digitale Wandel in den Dienst der Nachhaltigkeit gestellt werden muss, und forderte mehr gesellschaftliche Diskussionen über die Digitalisierung anstelle von hauptsächlich technologischen Debatten.

Schritte zur Neuausrichtung einer digitalen Transformation in Richtung Nachhaltigkeit in der EU

Das Forschungsprojekt „Digitalisierung und Nachhaltigkeit auf EU-Ebene: Chancen und Risiken der Digitalisierung für die Umsetzung der Agenda 2030 auf EU-Ebene“ zielte darauf ab, die Bemühungen der Bundesregierung um die doppelte, digitale und nachhaltige, Transformation zu erweitern. Dabei wurden insbesondere die drei Themen digitale Kreislaufwirtschaft, digitale Suffizienz sowie Gerechtigkeit und Teilhabe untersucht. Die Berichte zu diesen Themen zeigen das Potenzial der Digitalisierung für die Nachhaltigkeit auf und geben politische Empfehlungen für europäische und deutsche Entscheidungstragende, um diese Themen in ihre politische Arbeit zu integrieren (siehe BERICHT 2, 3, 4). Obwohl alle diese Themen wichtig sind, wurde gegen Ende des Projekts deutlich, dass Gerechtigkeitsfragen ein entscheidender Hebel sind, um eine digitale und nachhaltige Transformation zu erreichen. Die Diskussionen während der Abschlussveranstaltung betonten die Notwendigkeit, dass Gerechtigkeit die Politikgestaltung prägt und den digitalen Wandel in Europa in Richtung Nachhaltigkeit vorantreibt.

Gerechtigkeitsfragen sind wesentlich, wenn es darum geht, Nachhaltigkeit in den Mittelpunkt der Digitalisierung zu stellen. Derzeit gestalten einige wenige Akteure die digitale Wirtschaft nach ihren eigenen Interessen (z.B. Bank 2023), was Auswirkungen auf Marktstrukturen und Nachhaltigkeitsdimensionen wie Umweltgerechtigkeit, Selbstbestimmung, Inklusion und

digitale Teilhabe hat. Die Förderung von grünem Wachstum, technologischen Innovationen und Effizienzgewinnen allein reicht nicht aus, um die Digitalisierung für die Nachhaltigkeit zu nutzen. Die Betonung der Gerechtigkeit als greifbares Narrativ kann die Grundlage für eine integrative Politik bilden, die die EU-Bürger*innen in die Gestaltung der Digitalisierung in Richtung Nachhaltigkeit einbezieht.

Die gemeinsame Diskussion auf der Abschlussveranstaltung zeigte ungenutzte Potenziale auf, um soziale und wirtschaftliche Ungleichheiten und ökologische Ungerechtigkeiten im Bereich der Digitalisierung und Nachhaltigkeit zu bekämpfen. Es bedarf jedoch einer bereichsübergreifenden Leitlinie, um die Politik neu zu gestalten und das Ziel einer gerechten und ökologisch nachhaltigen digitalen Gesellschaft zu integrieren. Ein Gerechtigkeitskonzept kann die Entwicklung neuer Technologiebewertungs- und Governance-Ansätze potenziell erleichtern. So können beispielsweise Ökodesign-Richtlinien für ICT-Produkte umfassende Nachhaltigkeitskriterien enthalten, die soziale Gerechtigkeit, Wohlbefinden, Zugänglichkeit, kulturelle Integration und Partizipation berücksichtigen (McGuinn et al. 2020).

Ein Gerechtigkeitsnarrativ kann die Zusammenarbeit zwischen den bestehenden digitalen und nachhaltigen Gruppen in Politik, Industrie und Zivilgesellschaft fördern. Es sollten Austauschformate eingerichtet werden, um die diese Gruppen zu vernetzen und neben technischem Fachwissen auch sozialen und ökologischen Fragen Priorität einzuräumen. Zivilgesellschaftliche Organisationen sollten als Schlüsselakteure in die Steuerung der Digitalisierung einbezogen werden, um Umweltveränderungen und deren Verteilung in der Gesellschaft anzugehen.

Die Idee einer doppelten Transformation, die zwei parallele Prozesse impliziert, sollte in Frage gestellt werden. Die Digitalisierung und die Transformation zur Nachhaltigkeit sind grundverschieden und werden von unterschiedlichen Narrativen und Zielen angetrieben. Nachhaltigkeitsziele sollten bei digitalen Transformationen Vorrang haben, wobei deutlich anerkannt werden sollte, dass neben Umweltbelangen auch soziale und ökologische Gerechtigkeitsziele erfüllt werden müssen.

Zusammenfassend unterstreicht das Forschungsprojekt die Bedeutung von Gerechtigkeit für den digitalen und nachhaltigen Wandel. Es fordert eine Politik, die der Nachhaltigkeit Priorität einräumt, die Zusammenarbeit zwischen Digital- und Nachhaltigkeitsgemeinschaften fördert und für soziale und ökologische Gerechtigkeit bei Digitalisierungsbemühungen sorgt.

1 Introduction

Digitalisation is bringing profound societal and economic changes that offer both opportunities and risks for socio-ecological transformations (WBGU 2019; Nakicenovic et al. 2019; Lange et al. 2023). The twin digital and sustainable transition is a key challenge of the 21st century. Digitalisation involves various technology clusters that have already been shaping economies and societies for decades, but recently at an increasing pace. Sustainability is a normative objective. There are different concepts and pathways associated with steps towards a sustainable society. At the international level, the achievement of the Sustainable Development Goals is at the centre of these discussions. Furthermore, the concept of environmental justice plays a major role, especially in civil society debates. In Germany, many related discussions are taking place under the heading of socio-ecological transformations. Some have considered digitalisation to be an important aspect for achieving the sustainability goals (Sachs et al. 2016; WBGU 2019; EC 2020c; BMU 2020). To do so, however, it must be actively governed whilst shaping the production, design and consumption of digital technologies towards sustainability.

This report is based on the findings derived from the research project ‘Digitalisation and Sustainability at EU level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level’. The overarching goal of this project was to strengthen the German government’s work on the twin digital and sustainable transition beyond its Council Presidency in 2020. A key element for the research work was the concept of social and environmental justice, which is reflected in the motto of the 2030 Agenda for Sustainable Development “Leave No-One Behind”. The research was carried out by IÖW and IEEP between February 2021 and May 2024. The work was accomplished on behalf of UBA and financed by BMUV.

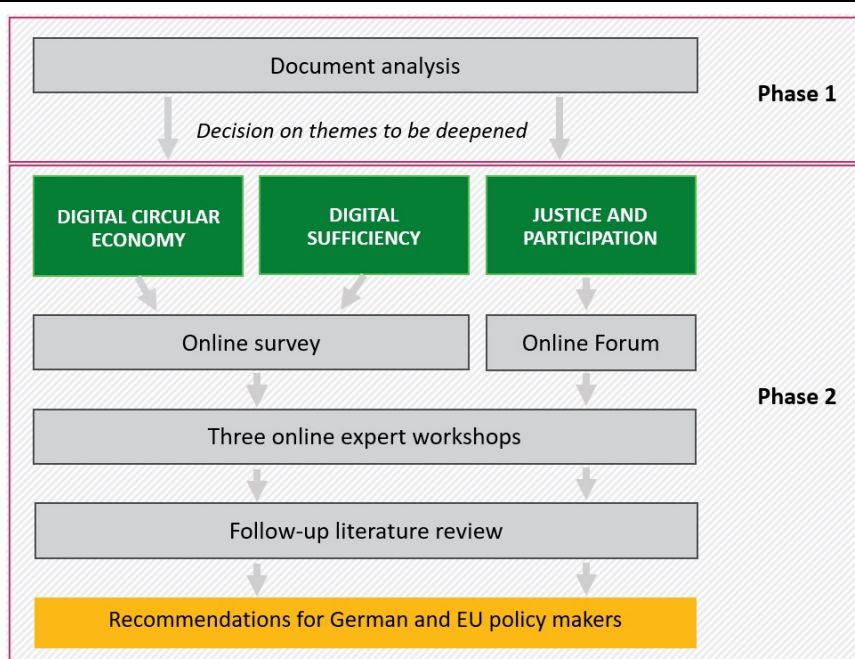
The project was structured into four work packages that pursued the following goals: The first work package aimed at better understanding the work of the German Council Presidency on the twin digital and sustainable transition through carrying out a document analysis. This work packages also helped to define the focus of the subsequent work packages (see section 3.1). The second work package was based on carrying out two in-depth studies into two key topics identified as part of the analysis in work package 1. The work was based on expert workshops and follow up literature reviews. The work package aimed at positioning these two topics at the EU level for the long term. These topics are digital circular economy and digital sufficiency (see section 3.3 and 3.4). The aim of the third work package was to carry out an in-depth analysis of environmental justice issues linked to the twin transition, in particular involving civil society actors into the debate through an online forum, expert workshop and follow-up literature review (see section 3.5). As part of the second and third work packages several recommendations for EU and German policy makers were developed to support the twin transition (see section 3.3, 3.4, 3.5). The fourth work package was concerned with communicating the results and networking relevant groups of actors to establish the topic in European policy debates. This was mainly achieved through a final event that was carried out in March 2023 in Brussels (see section 4). In addition, this report outlines the methodological approach (see section 2) and provides some reflections on steps forward (see section 5).

This final report gives an overview of the main findings and activities and outlines the recommendations for EU and German policy makers. More in-depth discussions based on the findings of the work packages can be found in the following reports: REPORT 1 analyses digitalisation and sustainability in the context of Germany’s Presidency of the Council of the European Union 2020; REPORT 2 provides an in-depth study on digital circular economy; REPORT 3 focuses on digital sufficiency; and REPORT 4 provides insights on digitalisation, sustainability and environmental justice and participation.

2 Methodology

The project ‘Digitalisation and Sustainability in the EU: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level’ aimed to strengthen the position of the German government’s work on a twin digital and sustainable transition at the EU level beyond the course set by the German EU Council Presidency in 2020. In the following, we outline the methodology of the project (see Figure 1). **Two project phases** can be identified: phase 1) analysed debates surrounding sustainability and digitalisation during the German Council Presidency and phase 2) examined three topics in more depth – circularity, sufficiency, and justice – that were considered to be promising avenues to strengthen the interlinkages between digitalisation and sustainability to move towards a twin transition in Europe.

Figure 1: Schematic illustration of the research process



Source: own illustration, Institute for Ecological Economy Research

2.1 Phase 1: Digitalisation and sustainability in the context of the German Council Presidency

Phase 1 was aimed at building a better understanding of the debates and priority areas linked to digitalisation and sustainability during Germany’s Presidency of the Council of the EU, which took place from 1 July 2020 until 31 December 2020. A **document analysis** making use of quantitative and qualitative approaches was carried out in 2021, analysing press releases, articles and speeches linked to digitalisation and sustainability derived from the German Federal Government and German Council Presidency published during July and December 2020. Overall, 47 documents were selected and analysed. Several key themes were identified that were regularly mentioned within the documents linked to digitalisation and sustainability. These included recovery, consumer protection, digital economy, industry, food industry, transport and mobility, environment, inclusion, and international cooperation. To deepen the analysis of these themes, additional nine EU policy documents were selected for the analysis. As a result of the document analysis, three thematic nexuses linked to digitalisation and sustainability were identified: 1) sustainable digitalisation, 2) digitalisation for sustainability and 3) digitalisation

and sustainability in silos. In addition, future priority areas were pointed out to strengthen the interlinkages between digitalisation and sustainability. These included CE, energy systems, housing, and biodiversity. A full list of analysed documents and more detailed outline of the methodology can be found in the REPORT 1.

2.2 Phase 2: Circularity, sufficiency and justice: Approaches for the twin transition

Based on the results of phase 1, the project team in collaboration with UBA and BMUV decided to deepen the work on the digital circular economy, digital sufficiency, and justice and participation. These themes were considered to show the greatest potentials to strengthen the interlinkages of digitalisation and sustainability to move towards a twin transition.

For two of the themes (digital circular economy and digital sufficiency), an online survey, a half-day **expert workshop** and a follow-up literature review were carried out. In preparation of the online survey and expert workshop, a short background paper was produced on each theme and sent out to the invited workshop participants. The invitation to the expert workshop was widely distributed through the project partners' social media and newsletter channels. Some of the participants were directly contacted due to their expertise on the themes. The responses to the online surveys was rather low. Due to the COVID-19 pandemic, the workshops took place online in March and April 2022. Policy makers, NGOs, think tanks and academic researchers from seven different EU countries participated in the workshops. To deepen the understanding of the two topics and some of the points raised during the expert workshop, a **follow-up literature review** was carried out.

In parallel to the two themes on digital circular economy and digital sufficiency, the theme of justice and participation linked to digitalisation and sustainability was examined. First, an **online discussion forum** was set up from November 2021 to January 2022 and was designed to solicit inputs from a wide range of CSOs. The forum gathered feedback, discussion points and questions from 22 CSOs and individuals. Second, an online expert workshop was held in May 2022 to discuss some of the questions in more depth with a group of experts including policy makers, NGOs, think tanks and academic researchers. Participants from the original online forum were invited as well as new participants. The results of the workshop were synthesised and some of the discussions were deepened through carrying out a **follow-up literature review**.

A **final event** was held in Brussels in March 2023 to deepen the project's team work on the three themes and connect relevant groups of stakeholders to foster discussions on circularity, sufficiency, and justice in European twin transition policy debates.

Based on the analysis of the three themes, a comprehensive overview of the key potentials of a digital circular economy, digital sufficiency, and justice and participation has been outlined in three reports, including recommendations for priorities for action that the German government can work on or pursue in greater depth at the EU level in the coming years. A more detailed outline of the methodology for each theme can be found in REPORT 1, 2, 3, 4.

3 Digitalisation and sustainability in the EU

3.1 Digitalisation and sustainability in the context of the German Council Presidency

Germany assumed the Presidency of the Council of the EU on the 1 July 2020 with the ambition to move forward the topics of digitalisation and sustainability. Our document analysis identified three nexus types around which the debates about digitalisation and sustainability can be grouped during this period. The first type **sustainable digitalisation** links to debates about making digitalisation more sustainable whereas the second type **digitalisation for sustainability** focuses on the use of digital tools and solutions to move towards sustainability. Finally, the third type **digitalisation and sustainability in silos** problematises that digitalisation and sustainability are often treated as separate topics rather than considering them as interlinked. We found that the debates on these nexus types were primarily linked to **four areas**: 1) environment, 2) transport and mobility, 3) digital economy, and 4) recovery (some topics received less attention such as food industry, consumer protection, inclusion, and international cooperation).

Debates that can be grouped under **'environment'** were primarily concerned with how to make digitalisation more environmentally sustainable (nexus type 1) and how digitalisation can be used for ecological sustainability (nexus type 2). Topics under nexus type 1 mainly involved discussions about the sustainability of AI applications and data centres and opportunities of reducing the number of discarded ICT products. With regards to nexus type 2, the German Council Presidency mainly discussed 'digitalisation for sustainability' linked to broader EU policy processes and strategies such as the EU Biodiversity Strategy for 2030 (EC 2020a) and the Farm to Fork Strategy (EC 2020b). Within these strategies, great potentials were considered to derive from digitalisation for sustainability. Based on our analysis, linked to the area of 'environment', several topics could be addressed more strongly within the EU in the future. These are increasing recycling rates, incorporating the right to repair, addressing the data intensity of software (e.g., data sufficiency) and encouraging the longevity of devices.

The German Council Presidency seemed to be keen to move the EU towards an important position within the area of **'mobility and transport'**. Nexus type 2 of 'digitalisation for sustainability' played a key role in this area, including two policy initiatives that were started by the German Council Presidency in 2020: the Passau Declaration and the New Mobility Approach (German EU Council Presidency 2020; Schlimpert and Heinson 2020). These policy initiatives were aimed at advancing research in automation to allow for the expansion of charging infrastructure for alternative fuels and shift freight transport from road to rail. In addition, the expansion of area-wide electricity grids and high-performance data networks were meant to facilitate digital communication and working from home thus avoiding emissions in passenger transport. Our analysis has shown that in the future, a greater focus could be placed on the shift of passenger transport from road to rail with the help of digital tools (rather than mainly a focus on freight) and the use of digital tools to reduce passenger transport.

The focus within the debates under the area of the **'digital economy'** mainly was on making digitalisation more sustainable (nexus type 1). Some interlinked issues were highlighted during the German Council Presidency: enabling fair taxation and fair competition as well as securing the EU's digital sovereignty to be able to reach (economic) sustainability within the digital economy. The need to advance the creation of an open, transparent and secure digital ecosystem was stressed to enable digital sovereignty of infrastructures and data pools. Companies and citizens should be able to share data but also decide what happens to it and how it is stored. Our

analysis has found that future directions in this area should address the integration of environmental sustainability issues into debates on and regulatory approaches for the digital economy.

Debates surrounding the COVID-19 pandemic **'recovery'** repeatedly emphasised that while EU recovery measures are a key priority, they must be implemented in a way that supports and does not undermine the goals of the digital and sustainable transition. The twin transition is considered to be a key element in shaping recovery activities. In the future, funding for recovery activities could be interlinked more closely with objectives of advancing a twin digital and sustainable transition.

Investigating more deeply political, academic, and civil society debates on the twin transition, several topics emerged that have gained increasing interest over the past years but were not picked up by the German Council Presidency. These were: energy systems, housing, biodiversity, and circular economy. While the concept of the CE was mentioned during the German Council Presidency, the role of digitalisation in achieving a CE stayed general and vague. A future priority for the German Federal Government could be to identify the role of digitalisation in collecting data and providing information for circular production methods and circular business models. The main policy approach at the EU level in this area is the Ecodesign Directive. Other areas that should have received more attention are the role of digitalisation for transforming energy systems towards low carbon targets, the ambivalent environmental impacts of smart homes and the role of digitalisation in safeguarding biodiversity.

To sum up, our document analysis has shown that the German Council Presidency has tried to draw more attention to the twin digital and sustainable transition in **several debates**. In particular, nexus type 1 (sustainable digitalisation) has gained much work and reflection, whilst digitalisation and sustainability has become a central ambition within the EU recovery funding. Still, the analysis has also found that much of the debates do not consider digitalisation and sustainability alongside each other (but rather as separate issues – see nexus type 3). Hence, more work needs to be done to reflect upon these two transitions in combination: how do they shape and influence each other. For more information on the document analysis linked to the German Council Presidency (see REPORT 1).

Based on the document analysis, three issues were selected by the project team in cooperation with the UBA and BMUV to be able to deepen the work on the twin transition and develop recommendations on how to strengthen sustainability in digitalisation processes within the German government and EU policy. These were **digital circular economy, digital sufficiency, and justice and participation**, seeing that they are widely debated within academia and civil society but were not picked up by the German Council Presidency. The relevance and relations between these three issues will be discussed in more detail in the next section.

3.2 Three core issues for digitalisation and sustainability: Circularity, sufficiency, and justice

The EU is aiming to take the lead in tackling climate change and at the same time enabling Europe to become more digitally aware and skilled for the future (EC 2019). The EC has recognised the importance of enabling the twin digital and sustainable transition as having potential synergies to advance the EU towards its carbon neutrality goal. The role of these transitions can be witnessed throughout current EU policies. Still, our analysis has shown that although issues of sustainability and digitalisation have gained substantial attention, they are still often treated as separate processes (see description of nexus type 1 and 2 in section 3.1 and how nexus type 3 needs to be overcome). Hence, thinking about intertwining the digital and

sustainable transitions needs to be further developed across different policy fields. Our analysis has indicated that there are many promising topics and themes that could be addressed within policy and research in the future (see section 3.1). Rather than focusing on discrete policy steps linked to current policy developments, we have focused our attention on three separate and interlinked themes: circularity, sufficiency, and justice. With regard to these three topics, the project team could see potentials to derive at approaches to strengthen a twin transition.

Circularity means a paradigm shift from a linear to a CE by rethinking and redirecting current production and consumption patterns (e.g., Ellen MacArthur Foundation 2012). Digitalisation is supposed to play a key role in this shift through digital data collection and exchange infrastructures. Such infrastructures heavily rely on (all) stakeholders to be willing and able to collaborate and share information in a transparent, accessible, and comprehensible way. The governance of circularity, especially information flows and actors' relationships that empower stakeholders to move towards a CE, is crucial but so far often neglected in policy approaches. Only if all relevant actors (including policy makers and CSOs) are willing and able to share and use relevant data through digitally enhanced data sharing and exchange infrastructures, production and consumption processes can be changed from linearity to circularity. Such change also requires active and reflexive governance. Our recommendations aim to support the twin transition towards a circular economy by presenting opportunities to integrate new ways of governing for circularity into policy.

Digital **sufficiency** has been defined as “any strategy aimed at directly or indirectly decreasing the absolute level of resource and energy demand from the production or application of ICT” (Santarius et al. 2022, p. 4). It has been divided into four interrelated dimensions: hardware sufficiency, software sufficiency, user sufficiency, and economic sufficiency (ibid.). Hardware sufficiency is aimed at reducing negative environmental effects of physical devices. Software sufficiency covers strategies that make software less data and energy intensive. User sufficiency is strengthened if fewer or more environmentally beneficial ICT consumption takes place. Economic sufficiency revolves around digital businesses and economic incentives, for instance, to foster the common good. A premise of sufficiency as a guiding principle for the twin transition is that technological innovations alone cannot solve societal problems. Digital sufficiency points to and takes these issues into account by drawing attention to the frugal use of resources – see user and software sufficiency – and the reparability of products and expanding their useful lifetime – see hardware sufficiency.

Moreover, digital sufficiency provides a basis to build an understanding of how digitalisation can become part of social and environmental transformations through changing business practices towards sustainable production and consumption, for instance, alternative business models, which focus on social wellbeing and participation rather than on growing market shares and profits – see economic sufficiency. Central actors in this endeavour include businesses, policy makers, educators, and civil society (Sandberg 2021). Business models based on economic sufficiency can make use of cooperative and commons-based approaches, pursuing alternative goals to profit maximisation as they are aimed at designing economic activities in ways that deliberately prioritise sustainability goals towards the public and common good (Lange and Santarius 2020; Santarius et al. 2022). Our recommendations aim to provide ideas on how to introduce digital sufficiency into policy agendas of the twin transition.

Stringent policy action for digitalisation and sustainability is necessary to not only address environmental issues but also to govern social implications and possibilities, drawing attention to several **justice** issues linked to the twin transition. Digitalisation and sustainability shape the ways in which (1) people can participate in and govern environmental change processes and (2) the burden of environmental and social impacts and potentials of digitalisation processes are

distributed within society. Several justice issues therefore need to be considered in the twin transition. The differential environmental consequences that result from ICT product life cycles through resource extraction, manufacturing, and disposal are a classic example of environmental injustice (Benqassem et al. 2021). Human rights abuses are significant throughout the product life cycle. Despite efforts to combat these problems through domestic EU legislation and international agreements there are still significant problems (Basel Action Network 2018). With adequate governance and policy measures, the internalisation of these ‘costs’ in a just way should help to make digital tools more efficient, encouraging sufficiency and circularity because the environmental and social costs of the tools is passed on, or made apparent to the producers and users, and preventing areas outside of Europe from bearing their brunt as they do now.

Moreover, using digital tools to enhance EU citizen participation in environmental decision-making is an area with significant promise that could be acted on immediately, but care needs to be taken to make sure that this does not deepen the digital divide (Botrić and Božić 2021). If well designed, this should help to promote just and effective environmental policy. In addition to enhanced citizen engagement in policy making and implementation, effective corporate due diligence legislation and other corporate governance measures, as well as effective sustainable trade agreements and significantly enhanced enforcement of existing environmental and labour standards and regulations are needed to bring the justice elements into a twin transition (e.g., the effective enforcement of illegal waste dumping and shipping). Measures to enhance environmental justice within the digital policy sphere can build additional sustainability into the system on top of a sufficiency approach, which on its own is not enough to ensure that there will be a just approach to digital policy. It should help to support an approach to digital sufficiency by helping to ensure a just allocation of environmental costs and benefits. Our recommendations aim to address the ‘ambition gap’ between the rhetoric of ‘leaving no one behind’ and existing digitalisation policies.

The next three sections will outline in more depth the three themes, including recommendations for EU and German policy makers.

3.3 Digital circular economy

The concept of CE aids the process of rethinking and redirecting current production and consumption patterns. It is based on the principles of repairing, reusing, remanufacturing, and recycling materials and products in order to maintain their use and material value to the maximum extent (Ellen MacArthur Foundation 2012, 2016; Hedberg and Šipka 2020). Several EU strategies call for a transition from a linear to a CE (e.g., the European Green Deal (EGD) or the Circular Economy Action Plan) in order to decouple economic growth and resource consumption. While this potential still remains largely unrealised (Circle Economy 2022), digitalisation may support the implementation of a CE in the EU, especially through the use of digital technologies for product tracking and monitoring as well as for a transparent digital data exchange.

In order to discuss key factors of a digital circular economy, an expert workshop took place in April 2022 with 18 experts from politics, NGOs, think tanks and scientific communities (including the project team). The discussion focussed on the topics of ‘product tracking and data exchange’ and ‘circular business models, networks and roles’ and provided insightful ideas that were deepened in the subsequent analysis. In particular, the importance of improved digital information flows along circular value chains through DPPs and governance for circularity were subsequently examined through a literature review.

DPPs make product information digitally available to stakeholders and are seen as a key technology for a digital circular economy. The shared information can be used to improve product design and industry processes, such as reuse and recycling (EC 2020c; Kadner et al. 2021). Furthermore, DPPs can support market surveillance and more sustainable consumer decisions. To ensure that policy developments for DPPs will consider economic, environmental, and social interests, a democratic, participatory and inclusive multi-stakeholder process should discuss the type and depth of information to be included.

A transparent flow of information along circular value chains, however, also depends on whether (all) stakeholders are willing and able to cooperate and exchange information in an accessible and understandable way. Therefore, a governance for a digital circular economy, especially the governance of information flows and actor's relationships for circularity that empowers stakeholders to move towards a CE is needed. Three dimensions of governance were perceived as central in this context:

- ▶ data management (relating to aspects like data ownership, security, and privacy),
- ▶ standardisation (relating to common data standards and technological integration of different data management systems), and
- ▶ empowerment (relating to the governance of relationships between actors along the circular value chain).

Overall, the efforts of collecting and sharing information within a digital circular economy should always be grounded in the aim to advance towards sustainability. For this, rebound effects need to be considered and costs need to be balanced with benefits for the economy, environment, and society. Instead of gathering all data possible, it should be evaluated, which information is needed by whom and solutions should build on already existing hardware and established systems, if possible.

Based on these findings, recommendations for EU and German policy makers were outlined to support the development of a systemic and coherent strategy for a digital circular economy within the EU. A more detailed elaboration on this analysis can be found in the in-depth study in REPORT 2.

3.3.1 Recommendations on a digital circular economy for EU policy makers

- ▶ **Strengthening a participatory, inclusive and equitable approach to circularity by empowering consumers to take an active role within a digital circular economy**

Within a digital circular economy, the empowerment of consumers so that they can take an active role in 'prosuming' products and services as well as sharing and processing data is an essential foundation. On the EU level, enabling consumer empowerment within a digital circular economy can build on previous policy efforts, especially the new initiative on Empowering Consumers for the Green Transition that was presented as part of the new CE Action Package on 30 March 2022. The initiative aims at ensuring that consumers have access to relevant information about the environmental performance, durability, and reparability of products to make conscious consumption decisions. Still, to be able to implement this request, the EC in collaboration with other stakeholders needs to determine more concretely, which information needs to be made available by whom and how consumers can access it. One starting point is to require businesses to make transparent statements about their products, as it is called for in the EU Proposal for a directive on green claims from 2023 (EC 2023). In order to use governance for circularity as an empowering mechanism, the EC can explore different options how digital data

collection and exchange needs to be formulated. Multi-stakeholder dialogues that include consumers as well as other stakeholders in a transparent, inclusive, and equal manner can help to gain an integrated perspective on the different needs and concerns regarding these matters.

► **Facilitating transparent data exchange by exploring options for standardisation and developing the DPP as a governance instrument**

EU policy makers should make it a priority to facilitate the coordination and exchange of data between different stakeholders by establishing common standards that guarantee the compatibility and quality of data and material flows. Due to differences between industries, the use of multiple, more specific standards may be more conceivable than referring to one standardisation. In general, an important aspect is the interoperability of different data management systems to avoid missing linkages between (already) stored information. The concept of DPP as a standardised method to exchange data is already referred to in several initiatives and strategies, such as the overarching Sustainable Products Initiative, the European Battery Regulation, the EU Strategy for Sustainable and Circular Textiles and the revision of the Construction Products Regulation. While these initiatives describe the use of DPPs in broad terms, a specific strategy for its implementation still needs to be developed. Therefore, the EC should explore options for more detailed standards and guidelines on the type and depth of information to be covered by DPPs, possible ways of storing the data and its availability as well as the accessibility of certain information. Together with cross-sectoral industry representatives and other stakeholder within a CE, the EC could explore the understanding of DPP not only as an informative instrument towards circularity, but also as a governance instrument regarding data that actively shapes, which information is shared between whom and how and why.

► **Exploring possibilities to allow for data altruism while respecting intellectual property rights and privacy regulations for all stakeholders**

While a transparent flow of information is crucial for a digital circular economy, policies need to balance the incentive to share data with data protection. While the EC already refers to the concept of data altruism in order to increase data collection and exchange, its adoption remains uncommon. Altruistic behaviour is more likely to be shown when people and organisations trust that their data is protected and not misused. Consequentially, the EC can assign an expert group to explore two starting points to promote data altruism: (1) Passing clear guidelines and regulations on the use rights for data for circularity. In line with the idea of sharing information on a 'need-to-know' basis, the possibility of creating different DPPs for different stakeholder groups can be evaluated further to determine what information should be accessible for which stakeholder group. (2) Evaluating under which circumstances data protection obligations for altruistic behaviour, as they are currently defined by the General Data Protection Regulation and the Data Governance Act (DGA), can be loosened in order to lower bureaucratic obstacles for data exchange and processing. Still, data sovereignty should be a corner stone of new/revised policies to ensure that the data is subject to EU laws and best practices.

3.3.2 Recommendations on a digital circular economy for German policy makers

► **Gaining new perspectives on developments towards a CE based on a twin transition by putting its governance at the centre**

The political discussion about implementing a CE often focusses on ecodesign regulations and the promotion of technological innovation. However, this focus neglects the governance of data and actors' relationships within a digital circular economy. The BMUV can therefore explore how the policy discourse and institutional innovation can be refocussed from technology to

governance for circularity and integrate this new perspective into (existing) national regulation, such as the German Digital Strategy (German Federal Government 2022), and discussions on the EU level, e.g., regarding a further development of the Sustainable Product Initiative or the DGA. The question to be explored is, how (existing) policies could be enriched by incorporating a focus on governance for circularity, including goals like consumer empowerment, democratic participation, and data-oriented innovation for the common good. Such an integrated systems approach still needs to be configured, but it could be crucial for implementing a digital circular economy towards sustainability as it truly breaks with the linear, efficiency-driven logic and replaces it with a perspective that puts data governance for circularity into the centre. In order to gain new and diverse perspectives on how the focus on governance can establish a new approach towards circularity, the BMUV could conduct workshops on ‘Governance for Circularity’ with different stakeholders from science, business, civil society and politics.

► **Working towards the establishment of data infrastructure for digital data collection and exchange**

Building on the new understanding of governance for circularity, the BMUV could support the development of the systemic and integrated data infrastructure that is needed for digital data collection and exchange. A cross-sectoral and open data infrastructure connecting different cloud services via open-source applications could enable data sovereignty. Discussions on such a data infrastructure have so far not included aspects of a digital circular economy. The BMUV could fill this gap by bringing in the perspective of how such a system could be used for governance for circularity. More precisely, the BMUV can set up an expert working group to develop a position on how public and private data for circularity can be governed and how a data cloud can create easy access to relevant information for different stakeholders along the circular value chain.

► **Advocating for coherent digital and sustainability policies for the twin transition that frame digitalisation as an enabler for circularity and sustainability**

Digitalisation should not be framed as an end in itself, but as an enabler to make circular products and processes more efficient. The push towards a digital circular economy needs to come from systemic governance and regulation by giving a reliable and strategic long-term perspective for companies and other stakeholders. To support the twin transition, the BMUV can help to build an understanding of how policies for a digital circular economy should address digital, sustainability, and circularity aspects together in a coherent policy approach. Policies should not be classified as ‘sustainable’ or ‘digital’ but as ‘sustainable and digital’. This means, addressing the opportunities and challenges of digital technologies in policies related to sustainability and circularity, as well as addressing sustainable and circular objectives in digital policies. In order to leave no one behind, the BMUV could advocate for policies to be based on the current digitalisation and circularity levels of industries and to develop future pathways that allow stakeholders to build up their capacities and competences to implement a digital circular economy. In this way, policies for a digital circular economy can represent a win-win-win solution that can have positive economic, social, and environmental impacts.

3.4 Digital sufficiency

The concept of digital sufficiency holds promising advancements towards sustainability, although, it is still in its infancies (Sandberg 2021; Lange et al. 2019; Colaço 2021). Its aim is to point to the fulfilment of human needs for decent lives whilst avoiding unnecessary production, deployment, and disposal of resource-intensive ICT (Lange and Santarius 2020). A digital

sufficiency approach could complement the EU's current plans for a digital and sustainable twin transition. Such plans are currently largely based on efficiency strategies to push for green growth (EC 2019). In contrast, sufficiency strategies are focused on the goal of reducing absolute production and consumption levels (Santarius et al. 2022). Building on previous work, four dimensions of digital sufficiency were considered and advanced (ibid.):

- ▶ hardware sufficiency (to reduce the absolute environmental impact of physical ICT devices by using fewer devices and for an extended period of time),
- ▶ software sufficiency (to minimise data, computation, and energy intensity by using or omitting respective software solutions),
- ▶ user sufficiency (to reduce avoidable ICT consumption while boosting sufficiency-enabling applications), and
- ▶ economic sufficiency (to support economic practices that focus on the common good instead of economic growth).

Digital sufficiency holds notable complexities as the four dimensions can affect each other in various ways. Hardware sufficiency, for example, is substantially influenced by software, which can significantly influence devices' lifespans through choices derived from users, developers, and providers (Gröger and Herterich 2019; Bachér et al. 2020). User sufficiency can influence both economic sufficiency and software sufficiency through decisions on which and how certain digital applications are used. For example, personal programme settings can have a substantial influence on volumes of processed data or overall energy consumption (Obringer et al. 2021).

To pave the way for digital sufficiency as a guiding principle in the twin transition, respective policies should aim to support its implementation on different levels. During a half-day expert workshop in April 2022, possible starting points for the development of policy recommendations were discussed with 18 participants. Experts on digitalisation, sustainability, and sufficiency from business and research as well as civil society groups and policy analysts attended the workshop. Discussions focused on 1) the four dimensions of digital sufficiency and 2) possible entry points for making digital sufficiency more relevant for policy makers. It was pointed out that digital sufficiency should take several aspects of sustainability into account (i.e. not only environmental ones). The concept goes beyond approaches of green ICT, which often merely build on efficiency strategies. Points discussed during the workshop were examined in more depth as part of a follow-up literature review.

Linking the notion of sufficiency with other policy discussions, workshop participants pointed to the role of digital sufficiency linked to energy security issues and patterns of sustainable consumption. Digital sufficiency can effectively contribute to overall energy security by lowering absolute energy demand, which is an exceedingly relevant topic in European energy policy not only since 2022. As 9 % of annual increases in total energy demand are attributable to digitalisation (The Shift Project 2020), digital sufficiency may be a lever to lower future dependencies from energy imports. Another key discussion during the workshop related to digital sufficiency as enabling more sustainable everyday consumption patterns. Implementing digital (user) sufficiency includes promoting the use of digital applications for, e.g., sharing, repairing or enabling social and digital innovation for sustainability. Digital tools can assist in, for example, shifting transport modes, increasing product lifespans or enabling sharing practices (Sandberg 2021). Platforms and initiatives for sustainability-oriented social innovation can combine value creation and environmental impact reduction whilst strengthening the role of civil society in the twin transition.

The concept of digital sufficiency is only to a limited extent tangible for policy makers, citizens, and businesses. There is a need to raise awareness of digital sufficiency issues and develop options for actions towards sustainability. In contrast to the sustainability transition, the digital transition lacks a clear societal goal. However, if digitalisation is seen as a public and common good, it can become more inclusive and equitable. In a twin transition, digital sufficiency could shape digitalisation in a way that supports sustainability.

Based on these findings, recommendations for EU and German policy makers were developed to introduce the concept of digital sufficiency into the policy realm and point to its potentials for sustainability. A more detailed analysis on digital sufficiency can be found in REPORT 3.

3.4.1 Recommendations on digital sufficiency for EU policy makers

► Raising awareness among policy makers at all levels about the significance of sufficiency-induced narratives in digitalisation to move towards a twin transition

As part of the EGD, the EC considers digital technologies as a key enabler for achieving the sustainability goals, for example, through improving energy efficiency. However, much research has found that technology is only one factor in moving towards a twin transition. Digital sufficiency highlights that technologies alone cannot overcome sustainability challenges and directly addresses the need to decrease absolute levels of resource and energy demand from production and consumption. EU policy makers therefore benefit from engaging with existing literature on digital sufficiency and raising awareness of the concept in policy circles and beyond. A first step towards integrating these narratives could be the realisation of workshops at responsible Directorates-General (DG) such as 'Environment' and 'Communications Networks, Content and Technology'.

► Supporting the development of digital innovations towards digitalisation as a public and common good

Digital sufficiency draws attention to digital innovations that aim to nurture a public and common good beyond business models that first and foremost strive for growing market shares and capital accumulation. An example of such innovations are digital social innovations that seek to address sustainability issues, orient technology towards social ends and focus on improving wellbeing. They can change the speed and scale of overcoming barriers to accessing resources, information, and support, and improve networking between initiatives. In addition, digital social innovations can change the impact and perception of citizen participation by making ways to participate easier and less time consuming. Although the EC has recognised the key role of social innovation in sustainability transformations and has supported research on digital social innovation through its Horizon programmes, more could be done to design policies, that support the diffusion and acceleration of digital social innovations.

► Strengthening voices from civil society in the governance of the twin transition to be able to address diverse societal needs and sustainability challenges

Diverse civil society groups and organisations can help make voices heard and promote more inclusive digital policies whilst working on issues linked to the twin transition. Moreover, they can advance the ethical use of digital technologies that often are still poorly understood. Such groups and organisations often point to and experiment with ideas derived from digital sufficiency (such as repairing platforms and networks to lengthen product lifetimes). The important role of civil society within digitalisation has been recognised by a wide range of actors, e.g., in the German 2021 coalition agreement (German Federal Government 2021).

Although extensive EU digital policies have been developed recently, e.g., the Digital Markets Act (DMA), civil society involvement beyond policy consultation processes is rare. Future legislative procedures and implementation processes can be enhanced by creating more meaningful formats to take up and strengthen the voices of civil society in digital policy developments. As an initial step such formats could be discussed with civil society groups and organisations as part of a wider consultation process and focus groups (potentially carried out by the EC's Joint Research Centre (JRC)).

3.4.2 Recommendations on digital sufficiency for German policy makers

The concept of digital sufficiency and its dimensions point to a set of key topics and issues that need to be further strengthened with policies for digitalisation. These are the role of civil society, reparability of products, data governance towards data volume reductions, new ways of organising and governing, and open standards for digital ecosystems. The following recommendations address some of these themes and show how German policy makers could advance them nationally with a view to influence European developments.

► Widening the role of civil society within the German Digital Strategy, whilst finding formats to enable more citizen participation in governance processes

The German Digital Strategy and coalition agreement have stressed the important role of civil society in shaping a digital society (German Federal Government 2022). Initiatives such as the Civic Coding or KI-Ideenwerkstatt für Umweltschutz (i.e. AI workshop for environmental protection), where citizens can come together to develop ICT applications and other types of innovations for the public and common good are a good starting point to strengthen the voice of civil society within digitalisation. Such initiatives could be widened beyond AI whilst including important issues of justice, solidarity, and access. In addition to creating additional research programmes and projects, UBA could pioneer initiatives such as workshops with diverse civil society groups to discuss and identify current challenges that prevent an increasing role of civil society in existing governance process surrounding digitalisation. This could also help to improve the recognition of issues of justice, solidarity, and access in German and EU policy making around the twin transition.

► Learning from the introduction of the repair bonus and index, whilst aiming to implement a national repair bonus system

Repair bonuses and indexes have been introduced in the German region of Thuringia in 2021 and nationally in Austria and France in 2022. Initial enquiries about the scheme have been high, with the potential result that broken products are being repaired rather than discarded, extending their life. To be able to learn from current experiences, the BMUV could launch research calls, aiming to better understand the potential impacts of such schemes and their governance. Such learning can then contribute to the national implementation of repair bonuses and indexes in Germany, while also incorporating considerations of obsolescence prevention, reparability, and re-use options for ICT products into the German Waste Prevention Programme. Such efforts could create a role for German policy makers to advocate for similar schemes in Europe, alongside existing right-to-repair initiatives and directive developments.

► Accelerating and strengthening the significance of sufficiency criteria in European ecodesign labelling and regulation

To expand environmental and climate protection by the existing EU Ecodesign Directive, the 2022 proposal for a new Ecodesign for Sustainable Products Regulation aims to provide a new

framework for ecodesign requirements for most physical products in the EU single market. Next to energy and resource efficiency, it incorporates sufficiency-oriented product properties such as durability, reusability, repairability, maintainability, and possibilities of remanufacturing and recycling. In this context, the EC's Ecodesign and Energy Labelling Working Plan 2022-2024 aims to revise energy labels, introduce rules for smartphones and tablets, and explore options for a European Repair Score for these products. These initiatives in ICT product design and transparency are positive developments to hardware sufficiency and user empowerment that recognise more sustainability aspects than energy and resource efficiency. The BMUV could advise and accompany this process wherever possible in order to encourage these efforts. With UBA's experience from the Blue Angel labelling of smartphones and tablets (e.g., disassembly, repair, component durability, and recycling requirements), active knowledge sharing and exchange with the JRC and relevant DGs could significantly advance the EC's existing developments on these issues.

► **Promoting open standards for software products and platforms to unlock the full potential of engaged software engineers and developers**

Software impacts on the sustainability of ICT must be deliberately governed towards social and environmental goals. This can include socially inclusive digital applications that enable sufficient practices or the use of software development principles that lower energy consumption and increase hardware obsolescence. However, software engineers often face technical and legal barriers to the implementation of innovative solutions into digital ecosystems that are dominated by restrictive competitors. With the DMA, the EU has recently granted users a right to remove pre-installed applications from their systems to strengthen the individual's freedom of choice. As a next step, requirements of open standards (i.e. agreed technical specifications) could enable the provision of alternative applications. The 2022 German Digital Strategy pursues an obligation to use open standards within public administration, which can increase interoperability among digital applications and fair competition for their development. To improve market access for actors that prioritise sufficiency aspects, a broader range of applications than public administration needs to be developed. In order to achieve this, the BMUV, the Federal Ministry for Digital and Transport, and the Federal Ministry for Economic Affairs and Climate Action, BMWK, could first seek a common understanding and agreement on additional areas of application (e.g., government-funded development projects).

► **Setting up development of data governance models towards public and common good and climate protection whilst considering data volumes and traffic demands**

The European DGA is concerned with the governance of, for instance, data processing infrastructures, data sharing tools, and cloud infrastructures. Among other things, it aims to enable the idea of data altruism i.e. voluntary provision of data for the purpose of public good (see also the EU GreenData4All initiative). Such an idea should be supported, but currently has been criticised to be too vaguely defined and too highly regulated. Setting up real life laboratories led by civil society groups in Germany and financed by the German ministries that experiment with data governance business models might be a first step to better understand potentials of data altruism and its governance and create definitions for its implementation. Findings derived from these labs could then be able to enhance future developments of the DGA within the EU. Currently, issues of the reduction of data volumes and traffic demands are not part of the DGA. Experiments could therefore additionally look at ways to incorporate such reduction potentials in the future governance of data.

► **Supporting and recognising the role of digital platform cooperatives to move towards commons-based digitalisation and value-based platform economies**

Although platform cooperatives (e.g., Supercoop and SMart) have gained some national financial support, they are currently not recognised by the EU Observatory on the Online Platform Economy, the EU Digital Services Act (DSA), and the German Digital Strategy. Still, considering that platform cooperatives are employee-owned, democratically governed, and often pursue commons-based digitalisation goals, a recognition of these activities can support the German government's ambitions to create inclusive digital spaces for a more democratic and just society. Still, several barriers exist for platform cooperatives, including, for instance, creating financially sustainable business models and scaling up existing activities. Several European countries have created incubation and funding programmes specifically for platform cooperatives. German ministries could set up a similar programme to provide initial support for platform cooperatives that help to address existing sustainability challenges.

3.5 Justice and participation

Environmental justice encompasses fairness both in terms of participation in the decision-making process and the varying environmental impacts of different policies. The dialogue on environmental justice in the EU has primarily focused on procedural and corrective aspects within the framework of the Aarhus Convention, which established environmental democracy and rights (Antal 2022; Halleux 2022). However, in recent years, there has been a broadening of the concept to address various issues, such as climate justice, minority rights, and equitable distribution of environmental quality and burdens (Antal 2022). It is crucial to examine environmental justice in relation to the fair treatment of individuals in the EU and beyond, particularly regarding the environmental impacts of digitalisation, while also considering the environmental rights established by the Aarhus Convention.

In EU policy documents, digitalisation and sustainability are generally depicted in a positive light. There is a strong belief in the potential of digital tools to drive sustainability. However, recent research has revealed that this potential remains largely untapped (Piétron et al. 2022), and in fact, digitalisation has had mostly adverse environmental effects globally until now (Lange and Santarius 2020). These effects can be attributed to the widespread increase in the use of digital products, as well as the significant negative environmental and social consequences associated with the extraction, manufacturing, and disposal of ICT devices, which affect specific communities and individuals.

It is crucial to recognise and address these negative and unequal impacts in EU policy prioritisation and discussions. Moreover, it is necessary to carefully consider the trade-offs involved in technological and political choices, and challenge the underlying assumption that digitalisation inherently supports a green transition. While the concept of a twin transition presents digitalisation and sustainability as parallel goals, it is important to firmly establish digitalisation as a supporting tool for other objectives, rather than an independent goal in itself.

An online discussion forum was organised by the IEEP with the aim of collecting feedback from CSOs regarding the convergence of digitalisation, sustainability, and environmental justice. The forum took place for a duration of 8 weeks, commencing on 22 November 2021, and concluding on 28 January 2022. The forum's structure revolved around six key themes, namely:

1. Access to environmental information
2. Participation in environmental decision-making
3. Civil society environmental initiatives
4. Systemic change

5. Human rights and environmental impacts of ICT manufacturing and life cycle
6. Justice/discrimination in digital environmental technologies

Throughout the online forum, feedback was received from 22 CSOs and 24 individuals.

In May 2022, an online expert workshop took place aiming to delve deeper into specific questions linked to justice and participation issues and to encourage interactive discussions. Both participants from the original online forum and new participants were invited, resulting in a total of 29 attendees, including 16 individuals who had not been part of the initial forum. The workshop focused on the following topics:

- ▶ Enhancing digitalisation's role allowing for greater participation within environmental policy making
- ▶ Examining the relationship between digitalisation and environmental rights, encompassing issues such as pollution, human rights, and the different environmental impacts of the production and disposal of ICT products
- ▶ Assessing the environmental justice implications associated with online platforms and e-commerce

The workshop participants decided to particularly focus on the issues of participation in environmental decision-making, as well as environmental justice and human rights in the ICT lifecycle. It was discussed that digital participation tools offer opportunities to engage more people, especially young individuals and enhance democratic processes through inclusivity, effective structuring, and transparency. However, the risk of deepening the digital divide exists, excluding certain groups from participating. Digital tools also pose risks such as surveillance, hacking, polarisation, and mental health effects, highlighting the need for careful design and consideration of offline engagement. Transparent feedback and responsiveness to input are crucial for successful consultations and prevent cynicism and disillusionment with the process.

In particular, CSOs have drawn attention during the workshop to human and environmental rights issues in third countries arising from the lifecycle of ICT products. Activities such as mining outside the EU result in violations such as forced relocation, limited access to clean resources, and harassment. E-waste disposal and recycling is also a challenge, with informal workers, including migrants and children, exposed to hazardous conditions and toxic substances. Despite the negative impacts, recycling rates in the EU remain low, and the expected growth in electronic consumption will increase the demand for metals, potentially leading to resource scarcity. E-waste generation is rapidly increasing, and inadequate disposal practices contribute to environmental and health risks.

In addition, the participants of the workshop also explored access to environmental information, environmental justice implications of digital technologies (including AI, e-commerce and online platforms) and the need for systemic change.

Based on these findings, recommendations for EU and German policy makers were developed to introduce the concept of environmental justice into the policy realm and point to its potentials for sustainability. A more detailed analysis on environmental justice and participation can be found in REPORT 4.

3.5.1 Recommendations on justice and participation for EU policy makers

Selected recommendations on justice and participation for EU policy makers can be found below:

► **Creating a direct, participatory agenda setting process for citizens at EU level**

At the moment, direct citizen participation in the legislative process at EU level is mainly reactive to the proposals as adopted by the EC and is mostly limited to the framing of issues led by the EC on specific initiatives. In addition, a high level of technical expertise is usually needed to engage effectively. A digital tool, in combination with in-person formats, could be used to engage citizens into a higher-level agenda setting process, which could define policy priorities at an earlier stage, for example, in line with the recommendations of High-Level Advisory Group (HLAG 2022). This could be an effective way of injecting more democratic engagement into the EU policy process, using a balance of digital and offline tools.

► **Integrating the EP and European Council into the EC's online policy consultation process and portal**

Although each institution has its own important prerogatives and role to play in the policy making process, these distinctions are not of primary relevance to citizens engaging on particular elements of policy making. At the moment, consultation of citizens on the actions of the different institutions is not connected with the 'Have your say portal', and decision-making derived from these processes is not transparent for citizens. Therefore, the engagements of these institutions should as much as possible be integrated into the online public consultation platform of the EC, with meaningful feedback to citizens to enhance accountability, transparency, and understanding.

► **Improving and better resourcing of the Better Regulation process, in particular the online 'Have your say' portal**

For the Better Regulation process to be successful, EC staff needs to be adequately trained and resourced, both technically to put in place the necessary IT infrastructure and in terms of experience in running successful consultations. The ICT infrastructure needs to be simple, modern and robust in order to make it easy and intuitive to participate. There needs to be resources to ensure that the language used is accessible and understandable, including for people with disabilities, and translations need to be of a high quality. The EC needs to be able to conduct targeted outreach to get a more representative pool of respondents to overcome the digital divide. This may have to involve physical consultations, focus groups, and similar fora to reach certain groups. A first step could be to agree on an enhanced budget and human resources for the relevant units.

► **Optimising the Data Act to include data relevant to the environment**

The data that companies will be required to transparently share with governments about their products should be linked to climate and environmental targets in a way that can influence the sustainability of those products. These standards ought to be overseen with sufficient public scrutiny to ensure that the public interest is being served in their development. Companies' exclusive corporate access rights to non-personal data can be a major impediment to developing circular ecosystems. A key element in achieving a digital circular economy is a clear legal framework for data exchange between companies that carefully balances the producers' (intellectual property) rights to societal and environmental concerns (Piétron et al. 2022) to ensure that environmental justice is addressed.

► **Investigating ways of implementing 2030 material use reduction targets with the ICT industry, aiming for consumption footprints within planetary boundaries by 2050**

Absolute material use reduction targets are the next step to ensuring a genuine reduction in environmental footprint in the sector. This is a concept that has been explored in the Netherlands and can provide an example for other economies (Langsdorf and Duin 2021).

► **Taking a more coherent approach that integrates environmental concerns into the regulation of the digital market**

Environmental concerns are still mostly treated separately. The DSA and DMA have established a framework, and some real disclosure obligations for the largest market actors. However, the next step is to use these disclosures to take further action to address the environmental impacts of these companies by setting explicit environmental targets for them to achieve, in cooperation with the relevant DG. Regulation of digital markets and tools must include meaningful access to justice provisions for citizens and CSOs. This aspect is still largely neglected in EU digital market regulations. An evaluation of the effectiveness of current disclosure requirements will need to be carried out within a brief period of time. At the same time, impact assessments should acknowledge more uncertainty around digital solutions and their rebound effects as well as their opportunity costs in terms of systemic changes.

► **Investing into digital public infrastructure to begin to provide a real alternative to the current internet model, dominated by private interests**

Contrary to what is implied by the terminology infrastructure, a public digital infrastructure is not a (cyber-)physical assemblage, nor is it build on just one single tech fix or regulatory intervention. Rather, it describes a logic consisting of different technical, governance and funding components that, when combined, provide a shared set of rules and protocols based on which a new ecosystem of alternative solutions can be built. The key components of this approach focus on opening up access to data and identity management in a fair and reciprocal way, devising new governance models and institutions that ensure underlying infrastructures remain open and secure, and creating the conditions for a vibrant alternative ecosystem of solutions to emerge on top of this model by strengthening interoperability (Bego 2022). This will give public authorities more leverage to act in the public interest in areas of digital policy, and provide a practical governance framework to advance issues of justice and sustainability in the digital space.

► **Improving the transparency of interactions between industry and government at all levels**

This will ensure that input of special interest groups is transparent and well understood. The immense economic power and concentration of digital industries make this a particularly important point with regard to digital solutions and policy. Such industries will have a vested interest in obstructing a range of potential improvements for environmental justice. The European Council is particularly poor at disclosing such links, but it is important to improve this across all institutions.

3.5.2 Recommendations on justice and participation for German policy makers

Selected recommendations on justice and participation for German policy makers can be found below:

► **Enhancing transparency for European Council decision-making procedures, including digital tools for transparency**

German policy makers could push the European Council, which represents Member States, to adopt more digital transparency tools to fill the gaps in giving citizens a better overview of EU decision-making processes. In this context, it should be insisted on higher adherence to the Inter-Institutional Agreement on Better Law Making through, for example, a more systematic implementation of impact assessments of substantial amendments to legislative proposals. Proper communication of these assessments to members of the public who have expressed an interest in the legislation through the ‘Have your say’ portal would be a good first step. These could be better linked to the EC’s consultation procedure, both to provide feedback to citizens who have engaged, as well as to justify decisions. In this way the online consultation process can be more transparent for those who have participated and help to circumvent last-minute changes by lobbyists and special interest groups.

► **Promoting of the EC’s consultation procedures towards German citizens**

Despite an already reasonably good system of consultation at EU level, one of the continuing problems is a lack of awareness. Member States could help to publicise and amplify the existing system through their own national publicity channels, also ensuring that a broad range of citizens and groups are targeted and made aware of the initiatives.

► **Bridging the digital divide in Germany through targeted training, outreach for IT skill building, and ensuring that IT tools are available to all citizens**

The digital divide remains a very real phenomenon, and efforts are needed at national level to overcome it through targeted skills training, outreach, and ensuring that effective access to the internet is available everywhere. This is a particular problem in rural areas, for the elderly, and for the socio-economically disadvantaged.

► **Pursuing environmental taxation relating to electronic goods and waste**

The application of the Polluter Pays Principle is still underutilised in the EU and the share of environmental taxes has decreased over the last decade, despite political commitments to increase their use. In particular, the promotion of repair and refurbishment is an under-exploited opportunity, for example, by lowering taxes on such services compared to new products. Additionally, lower extended producer responsibility fees for highly repairable or sustainable electrical and electronic equipment could be a significant incentive, similar to initiatives already tried under packaging extended producer responsibility (EPR) schemes.

► **Developing capacity building agreements with third countries, which are significant recipients of WEEE**

This will help third countries to process the waste according to good environmental and human rights standards. The Trade and Sustainable Development provisions of EU’s Free Trade Agreement (FTA) provide a useful basis for the development of e-waste related Aid for Trade strategies, which could be a concrete way to develop such provisions. It has been suggested that the Vietnam-EU FTA could be a useful test case for such a mechanism (Kettunen et al. 2019).

► **Improving public administration’s resources and training in providing information digitally**

This is particularly important at Member State and sub-national levels. Public environmental data needs to be more proactively published within a reasonable time frame across all EU Member States, even where legal requirements do not exist. This is still not consistently done across all areas but could make a big difference to timely environmental monitoring.

► **Making more publicly available data and information machine-readable and interoperable to ease access, as well as open source**

Help to build the capacities of civil society to access and use this data. The power imbalance between CSOs and some private interests in this area is an area of concern for environmental justice.

4 Key insights from the final event of the project

The insights from this research on digital circular economy, digital sufficiency and environmental justice provide an important basis for advancements on debates linked to sustainability and digitalisation at the EU level. To move towards a twin transition, more work needs to be done to reorganise existing extraction, production and consumption practices based on governance principles of circularity, sufficiency, and justice. A central challenge to progress has been the siloed approach to the twin transition, with policy professionals in technology, sustainability, economics, health, and social services rarely collaborating on these transitions. Creating a multi-stakeholder space for discussion is therefore crucial to advance the understanding of moving towards a twin transition.

The **final event** of the project gathered experts from CSOs, academia, the EU institutions, and youth organisations for an open discussion on the ways that the twin transition could be enhanced through new governance approaches. The event entitled ‘Circularity, Sufficiency, and Justice: New approaches to governance of the twin transition of digitalisation and sustainability’ took place on 21 March 2023 from 10:30 to 14:00 at the Brussels Press Club in a hybrid format.

Questions covered included:

- ▶ What are the key challenges to move towards a twin digital and sustainable transition within the EU? How does existing work on circularity, sufficiency and/or justice point to overcoming some of these challenges?
- ▶ How can governance towards a twin digital and sustainable transition be supported if ideas derived from circularity, sufficiency, and justice would become core elements of the political narrative around digitalisation within the EU?
- ▶ How would EU policy frameworks need to be designed and look like if they would integrate ideas derived from circularity, sufficiency, and justice to move towards a twin digital and sustainable transition? What are promising policy areas where such policy work could be developed?
- ▶ What could be done to open up existing EU policy processes so that diverse groups in society can participate in shaping a twin digital and sustainable transition within the EU?

The aim of the event was to move towards an overall political-strategic approach in this field based on issues and potentials raised by the three areas: digital circular economy, digital sufficiency, and environmental justice. The event opened with an **introductory keynote** speech by Almut Nagel, the Head of the Environment Department at the Permanent Representation of the Federal Republic of Germany to the EU, who highlighted the importance of building bridges and interlinkages between the communities focused on digitalisation and sustainability. She also provided an example: the Recovery and Resilience Plans, which show a lack of synergies between the digital transformation and the green transition. Dr. Barbara Beckert, Scientific Policy Advisor at UBA, then gave introductory remarks explaining the context of the project and the importance of the topic for EU debates.

The event then continued with **presentations of project outcomes** on digital circular economy, digital sufficiency, and environmental justice, delivered by Dr. Sabine Hielscher, Christina Klusch, Frieder Schmelzle from IÖW and Agata Meysner from IEEP. The **central discussion** gathered speakers with an expertise across the spectrum of the project themes: Chris Adams from the Green Web Foundation, Meadhbh Bolger from Friends of the Earth Europe and Hugues Ferreboeuf from The Shift Project.

Discussions arose on the question of the need for a digital transition or its current direct direction, considering that digitalisation has implications for the environment (e.g., rebound effects), for justice (e.g., the digital divide) and people's well-being. The global north has become more and more digital but less sustainable as stated by Meadhbh Bolger. All three speakers agreed that a shift in mindset therefore needs to happen. Hugues Ferreboeuf argued that digital innovations have so far been considered to be for the common good, but this might no longer be the case. It is therefore key to reflect upon digitalisation and its current direction. The aim needs to be to move away from living in a digital world to live in a sustainable one. For him, it often feels like that discourses on digitalisation are based on arguments that it should happen whatever it takes. He questioned whether policy makers and academics should talk about a twin transition and put each transition on the same level or rather stress more the importance of a sustainable transition?

Meadhbh Bolger talked about the need for the reductions in material footprints linked to digital devices and the need for an overarching target to address environmental and justice issues that could have an impact on different policy areas. Hugues Ferreboeuf built on these points by illustrating that the material intensity of digital devices is very high, for example, when looking at the number of raw materials needed to produce 1kg of a smartphone. It amounts to a ratio of 80 to 1. In other words, you need to 80 times more material to produce 1kg of a smartphone. At the moment, 1.3 billion smartphones are being produced each year. Hugues Ferreboeuf also emphasised what needs to change. Efficiency improvements are good, but they are not enough (see rebound effects), and new ways of governing the digital transition are needed. Currently, the way in which digitalisation is governed is not through public decision-making and democratic choices but rather through corporate strategies and commercial targets. This needs to change. Digitalisation is a political topic, not a purely technical one, and it should be addressed and governed through democratic means.

Chris Adams added to Hugues Ferreboeuf's points by stating that the climate crisis is a crisis of democracy. Currently, there are only some decision-making tools and processes (e.g., deliberation and citizens' assemblies) that address the climate crisis, but these tools and processes are not being used to move towards a twin transition. For him, the Aarhus Convention also plays an important role because it allows for a freedom of information request to take place, but it is also currently underused. He argued that society needs to be prioritised in the twin transition, which is currently not the case and that the tools of democracy need to be used more. Meadhbh Bolger pointed to the success of democratic tools such as citizen assemblies, which have led to solutions and positive prospects for sustainability. Such tools could open debates on possible alternative directions of digital transitions and issues of people being left behind. She also drew attention to current potential barriers of not utilising such tools, such as the corporate and industry tech lobby. Hugues Ferreboeuf also argued that most of the agendas around digitalisation are set by big tech companies and this needs to change. Big tech needs to become less powerful, and this could happen through regulation. The dynamic exchange showed the importance of justice and participation at the centre of the digital and sustainable transition. It also challenged the role of digitalisation and its impacts on sustainability.

The event was closed with **summary remarks** from Christian Löwe from UBA, who concluded with a few key takeaways. Firstly, he focused on the importance of justice and participation moving to the centre of the narrative around the digitalisation and sustainability, which for him was the main takeaway from the discussion at the event. He highlighted that justice is not an add-on for future policy making, but a prerequisite. Secondly, Mr. Löwe wondered how different communities linked to digitalisation and sustainability could come together to create a new culture in the digital world, given that sustainability issues are currently not taken seriously.

Thirdly, building on the previous point, he contemplated how digital literacy could be better aligned with sustainability literacy. Corporates, governments, and civil society should invest in a new form of literacy, that brings the digital transition closer to the sustainability transition. He asked whether we need to start thinking about how to repurpose the digital transition for the sustainable transition and move beyond the narrative of a twin transition. Finally, Mr. Löwe wondered how we can repurpose the digital transition for sustainability. For him, we need to have more societal rather than technological discussions around the digital transition in Europe and its Member States. This could also strengthen the role of civil society in this area.

The event not only provided a platform to discuss the research findings from the three thematic reports focusing on digital circular economy, digital sufficiency and environmental justice, but also highlighted the importance of justice as a central accelerator for redirecting the digital transitions towards sustainability.

5 Steps forward to repurposing the digital transition towards sustainability in the EU

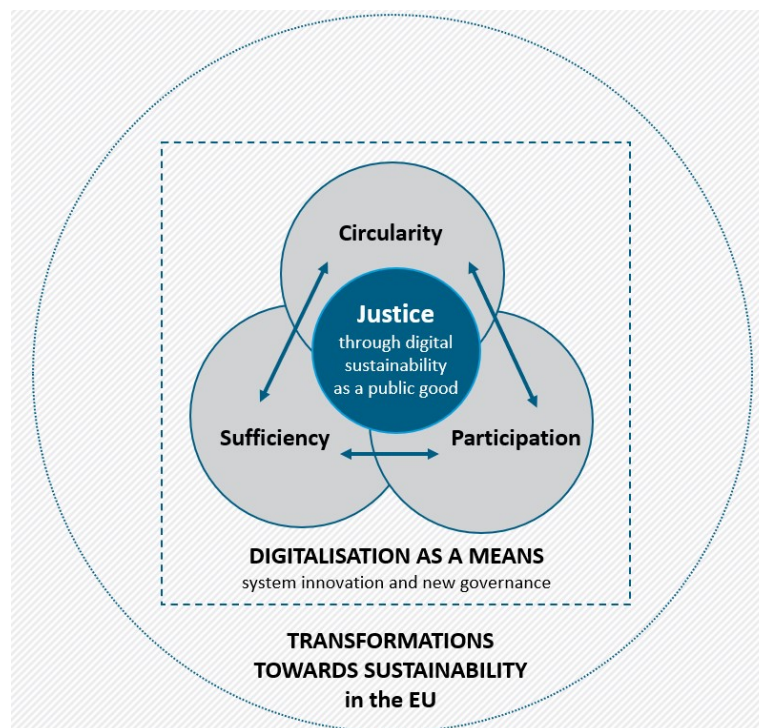
The research project ‘Digitalisation and Sustainability at EU Level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level’ aimed to extend the German government’s efforts towards the twin digital and sustainable transition beyond its Council Presidency in 2020. Three themes have been selected to explore ways in which these two transitions can be more deeply intertwined. These were digital circular economy, digital sufficiency, and justice and participation. As shown in the respective reports (REPORT 2, 3, 4), all themes hold opportunities to make use of digitalisation for sustainability and include policy recommendations for European and German policy makers to move towards integrating such themes into their policy work. Towards the end of the project, however, an important lever for environmental and social policies in the digital world became apparent. **In order to achieve a digital and sustainable transition, it is essential to put environmental and social justice at the centre.** Discussions during the final project event in Brussels underlined this argument. Several inputs and discussions drew attention to the key role of justice issues in moving towards a twin transition. Discussions led to the conclusion that an overarching narrative based on justice needs to shape and stimulate new policy designs and advance steps towards European digital transitions that move towards sustainability.

Justice issues appear to be nothing less than a prerequisite when putting sustainability issues at the centre of digitalisation. Today, many areas in digital economies are shaped by a small number of actors, who are shaping digitalisation towards their own needs i.e. a big tech model (Satariano and Stevis-Gridneff 2020; Clarke et al. 2021; Bank 2023). This model has consequences not only for market structures but also for externalities on different dimensions of sustainability such as environmental justice, (informational) self-determination, social inclusiveness, and digital participation. **Increasing and widening the possibilities for participation in digitalisation processes** to make them more just and equitable bears the potential to better integrate the diversely shaped intersections between sustainability and digitalisation, such as issues of global justice and usage within planetary boundaries. It also puts into question the distribution of economic and technological power. Narrow focuses on the promotion of green growth strategies, technological innovations, or maximum efficiency gains risk to be insufficient for making use of digitalisation for sustainability (Spengler 2016; Lange et al. 2020). Upholding justice as a strong and tangible narrative could form a basis for adequate policies for digitalisation towards sustainability designed by many and for all EU citizens.

As the joint discussion of the three reports at the project’s final event highlighted, there is an untapped potential to address current social and economic inequalities and issues of environmental justice. Currently, the European twin transition calls for cross-segment guidance to redesign respective policy. The common goal of a just and environmentally sustainable digital society may be an integrative element to overcome current siloed developments. Taking up a justice narrative can be a starting point for developing **new forms of technology assessment and governance approaches**. For example, EU policy on ecodesign for ICT products could be extended to more comprehensive sustainability criteria. This means that besides narrow ecological efficiency indicators, carbon footprint values, etc., sustainable product design takes greater account of fundamental sustainability principles to govern effects on aspects such as social justice and equity, well-being, accessibility, cultural inclusion, and participation (McGuinn et al. 2020). To complement proposals stemming from the EC’s Right of initiative, also Member States should consequently advocate for such principles in supra- and international bodies and forums relating to digitalisation, for instance, at the EU or United Nations level.

To develop and implement concrete measures, it seems extremely helpful to foster a culture that acknowledges sustainability as being at the core of digitalisation in both policy developments and in the private digital sector, as well as in technology research and development. **A justice narrative could help to bring existing digital and sustainability communities from policy, industry and civil society closer together.** Efforts should be aimed at creating exchange formats between these communities who are currently often not interlinked. The inclusion of NGOs and CSOs should play a key role, as they are currently underrepresented in the governance of digitalisation. However, they are key actors in highlighting processes of environmental change associated with digitalisation and the distribution of resulting burdens within society. The reports from this research project provide insights in how this can be addressed with principles derived from digital sufficiency, circularity and participation: finally promoting a narrative of justice. Figure 2 illustrates how these aspects interact and support justice for a purposeful digitalisation that supports sustainability transformations in the EU.

Figure 2: Interactions between circularity, sufficiency, and participation in a just digitalisation to support sustainability transformations



Source: own illustration, Institute for Ecological Economy Research

The findings of this project call into **question the idea of a twin transition**, which implies two parallel and intertwined processes. From an environmental policy perspective, the envisaged transition to sustainability follows a politically legitimated purpose, justified in treaties such as the 2015 Paris Agreement (UNFCCC 2015). Digitalisation can be seen as a fundamentally different process as it reflects developments that are significantly driven by technological narratives and geared towards diverse goals. Assigning sustainability goals as a purpose for digital transitions can facilitate strategic governance, based on just sustainability transitions whilst pursuing digital futures. This begs the question: should we still refer to the twin transition at all? After all, digitalisation and sustainability transitions should not be placed on an equal footing. Rather, there needs to be clear recognition that **any digital transition is only justified if its development meets social and environmental justice objectives alongside environmental concerns.**

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A Appendix

More in-depth discussions based on the findings of the project can be found in four reports on 1) analysing the Germany's Presidency of the Council of the European Union 2020, 2) digital circular economy, 3) digital sufficiency, and 4) environmental justice and participation. The reports are available as separate publications in the database of the UBA.

A.1 Report 1: Digitalisation and sustainability in the context of Germany's Presidency of the Council of the European Union 2020. Analysis report of the project "Digitalisation and Sustainability at EU level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level"

This report is available as a separate publication in the database of the UBA.

A.2 Report 2: Digital circular economy: A new perspective on digitalisation as a driver for sustainability? Analysis report of the project "Digitalisation and Sustainability at EU level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level"

This report is available as a separate publication in the database of the UBA.

A.3 Report 3: Digital sufficiency: A new perspective on digitalisation as a driver for sustainability? Analysis report of the project "Digitalisation and sustainability at EU level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level"

This report is available as a separate publication in the database of the UBA

A.4 Report 4: Digitalisation, sustainability and environmental justice: Leaving no one behind in the twin transition. Analysis report of the project "Digitalisation and sustainability at EU level: Opportunities and risks of digitalisation for the implementation of the 2030 Agenda at EU level"

This report is available as a separate publication in the database of the UBA.