

Overview

Digitalisation and Resources (DigitalRessourcen)
Project No. (FKZ): 3720 31 101 0, 3724 31 703 0

Digitalisation is becoming increasingly pervasive in almost all areas of life. However, its impact on natural resources and climate change needs to be better understood. The UBA research project 'Digitalisation and resources (*DigitalRessourcen*)' investigates these interrelations with the aim of identifying strategic levers for sustainable development.

DigitalRessourcen develops and applies simulation models to estimate the resource intensity of digitalisation. For this purpose, resource requirements and greenhouse gas emissions are projected using a macroeconomic input-output model. Both the current situation and scenarios for potential future developments of digitalisation are examined. In additional steps, *DigitalRessourcen* examines life cycle data of selected digital products and services and their resource requirements. Phase II of the project also places a stronger emphasis on stakeholder engagement. With the gained insights, *DigitalRessourcen* will identify potential policies to shape digitalisation in a sustainable, environment-friendly and resource-conserving way.



Imprint

Project team (Phase 2):

- Institute of Economic Structures Research (GWS)
- Ecologic Institute
- Wuppertal Institute







Project website:

www.umweltbundesamt.de/en/digitalresources

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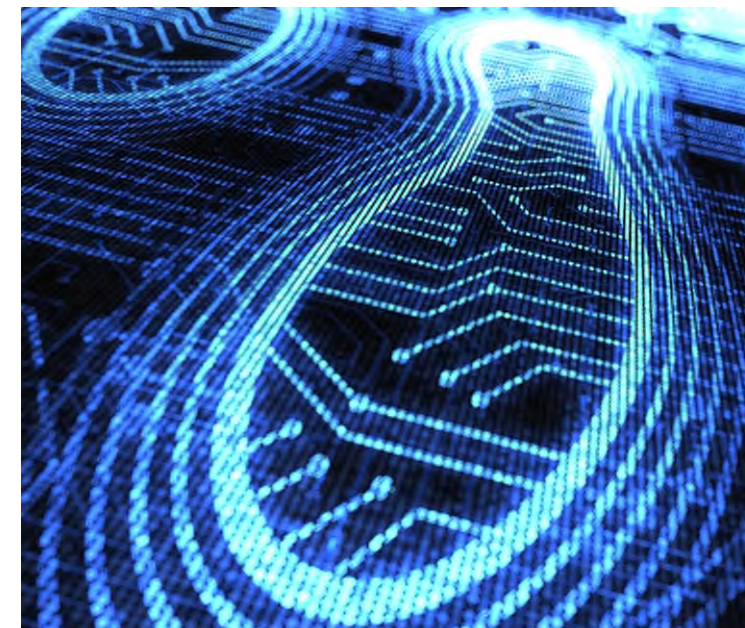
Publications as a pdf:

www.umweltbundesamt.de/publikationen

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Last updated: August 2025



Research project

Digitalisation and Resources (DigitalRessourcen)

Analysis of the resource intensity of
the digital transformation in Germany

German Environment Agency

**Umwelt
Bundesamt**

The impact of digitalisation on natural resources

Diverse aspects of our private and professional lives are increasingly shaped by digital technologies. This transformation holds significant potential for the economy, society, and the environment. Digitalisation enables the development of new products and services, enhances process efficiency, and can ultimately contribute to conserving natural resources. However, there is a pressing need to improve our understanding of how digitalisation itself influences the demand for energy and natural resources – such as copper, plastics, specialty metals, or rare earth elements – as well as its contribution to greenhouse gas emissions.

This gives rise to a range of research questions: To what extent does digitalisation increase resource demand? How does it affect consumption patterns in society? How can national policymakers ensure that globally distributed digital services operate in an environmentally responsible manner? What strategies can guide the digital transformation towards reduced resource use and lower greenhouse gas emissions?

The research project

The German Environment Agency investigates these and other questions with the research project *Digitalisation and Resources (DigitalRessourcen)* and analyses the impact of digitalisation on natural resources in Germany. The first phase of the research project started in fall of 2020 and ran until 2023. The second phase, running from 2025 to 2027, is being carried out by a team consisting of the Institute of Economic Structures Research (GWS), Ecologic Institute and Wuppertal Institute.

The approach

In **Phase I** of the project, the German Environment Agency (UBA) commissioned an assessment of the resource intensity and greenhouse gas emissions associated with the digital transformation, conducted at both micro and macro levels. Ten case studies applied life cycle assessment (LCA) methodology to quantify the resource intensity of specific digital applications and determine their ecological footprints.

At the macro level, a multi-regional input-output (MRIO) model was used to calculate raw material consumption, material inputs, and the carbon footprint of the ICT sector from the year 2000 onwards. The model also projected developments under seven scenarios through to 2050.

Findings from the simulations and case studies informed initial policy and action recommendations for promoting a resource-efficient digital transformation.

Phase II of the project, places a strong emphasis on stakeholder engagement. This phase includes a stakeholder survey, analysis, and two central workshops, aimed at refining key areas of action and developing more specific policy recommendations.

The analytical component of *DigitalRessourcen II* will comprise five additional case studies, including studies focused on artificial intelligence. It will also feature macroeconomic and mesoeconomic modelling for certain fields of demand and sectors.

The results

The results of the project are – in addition to the knowledge gained about the resource intensity of digitalisation – direct and tangible recommendations for decision makers in policy and research. Furthermore, the German Environment Agency will be provided with simulation tools to project the resource demand of digitalisation now and in the future.

Phase I (2020–2023)

1. Research on the **current state of the discussion** on resource intensity of digitalisation



2. Development of ten **case studies** on life cycle data of digitalization products and services



3. **Ex-post analysis** of the raw material and greenhouse gas intensity of digitalization



4. Carrying out **simulation calculations** up to the year 2060



5. Identification of nine **areas for action and exemplary measures**



Phase II (2025–2027)

6. **Stakeholder survey and analysis** for strategic project alignment and information gathering



7. Implementation of five additional **case studies** on life cycle data of digitalization products and services (analogous to Phase I)



8. Updating and deepening of the **macroeconomic calculations** from Phase I (Items 3 & 4)



9. **Stakeholder dialogue** to refine fields/measures for action and to discuss and reflect on the results