



OVERVIEW

for a clearer picture

No. 8

**Digitalisation -
the key to
sustainability?**



diagnose:funk
Use technology wisely

Overview No. 8

Digitalisation - the key to sustainability?

As of: 5 October 2026

Summary

The diagnose:funk publication series "Overview for a clearer picture" reports on the state of research into the health effects of non-ionising radiation from mobile communications and the consequences of digitalisation.

Overview No. 8 documents why digitalisation, as industry's business model, becomes a destructive force and fails to realise its positive potential. Instead of enabling sustainable planning, it is intended to accelerate growth, causes energy and resource consumption to explode, fuels the climate catastrophe and can intensify threats to human health. Under non-capitalist conditions, digitalisation would be a new productive force for organising society better. Instead of transparency and public participation, it leads to surveillance capitalism and a new level of manipulation of opinion. Can irreversible harm to the environment, climate, people and society still be prevented?

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Publication details
Diagnose-Funk e.V.
P.O. Box 15 04 48
70076 Stuttgart
kontakt@diagnose-funk.de

Diagnose-Funk e.V.
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BIC: GENODEM1GLS
www.diagnose-funk.org/foerdern

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1 Digitalisation as industry's business model

The climate catastrophe and digitalisation are among the central political challenges of our time. The climate crisis manifests itself in advancing global warming, extreme weather events and worldwide species extinction, driven by numerous factors and itself reinforcing global warming.

For years, the German Advisory Council on Global Change (WBGU) has pointed out that digitalisation acts as an “accelerant” of the environmental crisis. Nevertheless, all governing parties regard it as indispensable progress and are pushing it forward rapidly. The Smart City is the guiding vision of this digital transformation.

The German government's Smart City strategies describe both best-case and worst-case scenarios.¹ Major risks include a comprehensively monitored city without privacy, and sharply rising energy and resource consumption.

Criticising these developments does not mean opposing digital technologies themselves, just as criticising aviation or car-based transport does not mean opposing aircraft or cars. The criticism concerns industry's business models that cause substantial ecological and social damage. As with building SUVs or domestic flights, it may be necessary to reject particular developments. This also applies to parts of digitalisation and mobile communications.

1.1 Adverse effects of digitalisation

Digitalisation as industry's business model and an instrument of power has adverse effects for four reasons:

First reason: digitalisation is the number-one driver of growth. For billions of new Internet of Things devices, autonomous cars, video streaming, energy-hungry server farms and digitally controlled mass food production, forests, rainforests and other natural areas are being turned into mines and spoil heaps even more intensively than before. This causes species extinction and accelerates environmental crises.² UN reports from 2026 show that the semiconductor and AI data-centre boom drives demand for critical minerals such as lithium and graphite up by as much as 350%, sharply intensifying extraction in ecologically sensitive regions. The global land and supply-chain footprint of AI infrastructure will

1 <https://www.smart-city-dialog.de/wissen/publikationen/smart-city-charta>

See also <https://diagnose-funk.org/2310>

2 Guillén-Gosálbez G et al. (2024): The environmental sustainability of digital content consumption, doi: 10.1038/s41467-024-47621-w; <https://www.nature.com/articles/s41467-024-47621-w>

grow to over 14,500 km² by 2030, with serious and partly irreversible ecosystem losses.³

Second reason: digital transformation rests on Big Data. Always knowing where every person is, what they think and what they do is the DNA of digital political control, with the declared aim of stabilising power and preventing social change. Smart Cities and educational institutions are also to be controlled by AI algorithms. A smart dictatorship emerges, using digital profiles to provide new mechanisms of control and manipulation of opinion, able to watch people thinking. These corporations have commercialised personal data and declared them a tradable commodity.⁴ Current technology and privacy research shows that AI profiling increasingly relies on inference data: information people never disclosed themselves, calculated unnoticed by systems in the background. In this context, the OECD officially classifies algorithmic manipulation, targeted behavioural steering and the associated risks to democratic processes as priority risks requiring immediate political countermeasures.⁵ In their landmark works "The Age of Surveillance Capitalism" (2018) and "Artificial Intelligence and the New Fascism" (2025), Shoshana Zuboff and Rainer Mühloff describe developments dominated by Google, Facebook/Meta, Amazon and Apple.⁶

Third reason: expansion of digital infrastructure itself becomes an environmental and health hazard. 5G and 6G networks require hundreds of thousands of new transmitters and a rapidly growing energy and resource base. This increases both ecological burdens and exposure to electromagnetic fields, which numerous studies associate with biological effects.⁷

Fourth reason: 5G is intended to perfect warfare. Following the motto "Those who fail to digitalise lose!", the German armed forces already use mobile 5G campus networks in the field to process sensor data and drone swarms in real time directly at command posts.⁸ To secure this technological dominance in the long term, NATO is already advancing the forthcoming 6G standard.⁹

3 <https://unctad.org/news/critical-minerals-are-reshaping-global-trade-demand-surges> and <https://news.un.org/en/story/2026/06/1167658>

4 <https://www.deutschlandfunkkultur.de/shoshana-zuboff-ueberwachungskapitalismus-steuert-das-100.html>

5 <https://www.techpolicy.press/ai-privacy-and-the-hidden-architecture-of-harm-from-inference/> and https://www.oecd.org/en/publications/artificial-intelligence-and-the-future-of-citizen-participation_a1ee2e0a-en/full-report/what-can-governments-do-the-road-to-fit-for-purpose-ai-tools-for-citizen-participation_06b838ee.html

6 Shoshana Zuboff: The Age of Surveillance Capitalism. Frankfurt am Main: Campus Verlag, 2018.

Rainer Mühloff: Artificial Intelligence and the New Fascism. How AI and Tech Billionaires Shape Our Future. Ditzingen: Reclam, 2025.

7 Our "OVERVIEW for a clearer picture" series reports on research into the health effects of non-ionising mobile phone radiation: <https://diagnose-funk.org/2090>

8 <https://soldat-und-technik.de/2025/09/sponsored-content/44157/einsatzbereites-5g-netz-fuer-die-deutsche-bundeswehr/> and <https://www.forbes.com/sites/nokia-industry-40/2025/10/07/5g-at-the-core-of-natos-digital-transformation/>

9 <https://6gworld.com/natos-2026-diana-challenge-programme/> and <https://www.6gflagship.com/news/finland-leverages-6g/>

Digitalisation also brings many benefits. Yet because it is implemented rapidly, often solely according to profit interests, its positive potential is realised only to a limited extent. Where is digitalisation taking our society? Without knowing the risks, we cannot stop harmful developments or, above all, develop alternatives.

As early as 2019, the German Advisory Council on Global Change (WBGU) warned in its groundbreaking report that digitalisation as industry's business model massively intensifies the overuse of natural resources. It endangers "even the sheer continued existence of Anthropos [humanity] on Earth. Only if digital upheavals are directed towards sustainability can the transformation towards sustainability succeed. Otherwise, digitalisation threatens to act as an accelerant of growth patterns that breach the planetary guard rails."¹⁰

This warning has lost none of its urgency in the current AI boom and its rapidly rising demand for energy and resources.

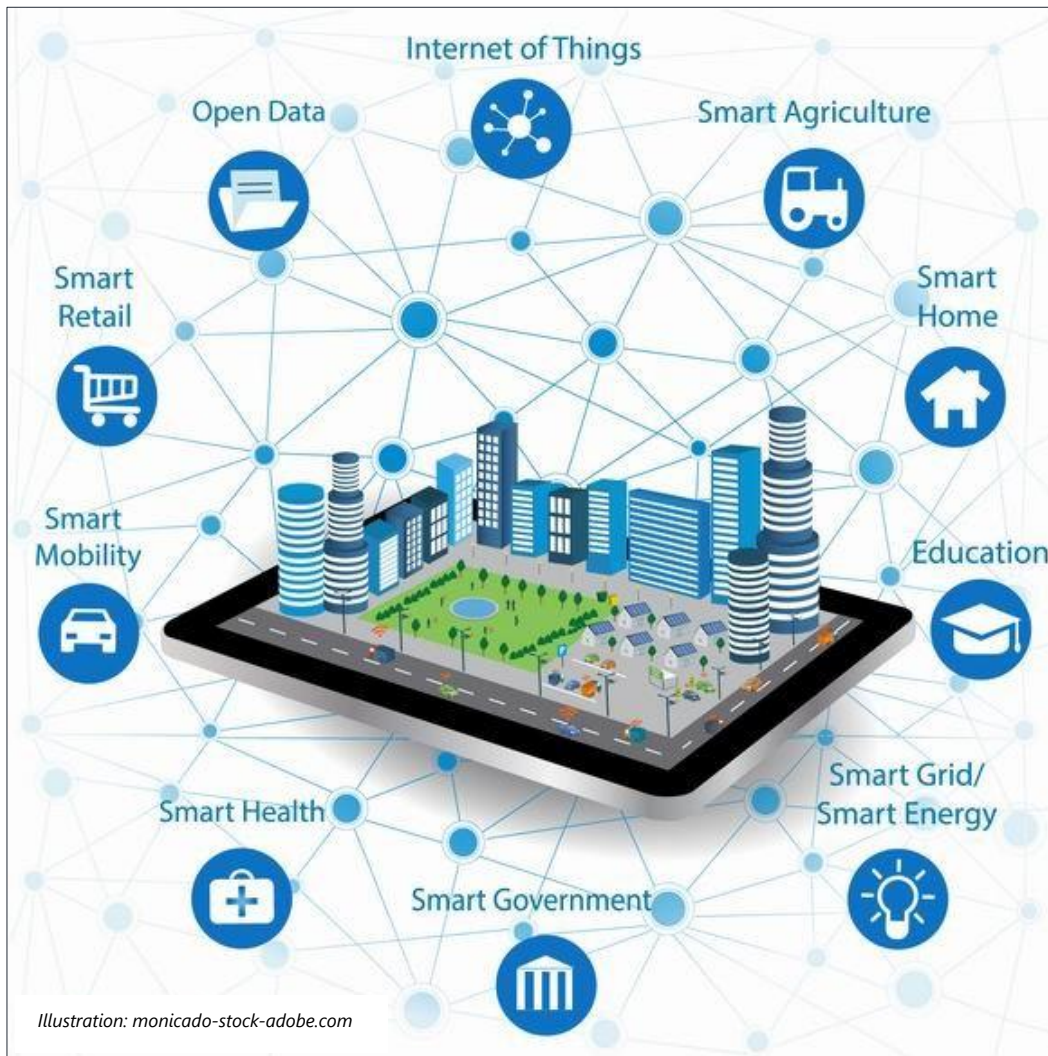
Then as now, the WBGU's statement applies: "In many respects, one must hope that the dystopia described never becomes reality. Yet precisely for this reason it must be told now, to prevent its realisation in time and make constructive use of digitalisation for a sustainable future possible."¹¹



¹⁰ WBGU report "Our Common Digital Future", 2019, summary, p. 1

¹¹ Ibid., p. 305

2 Smart City - the data-driven city

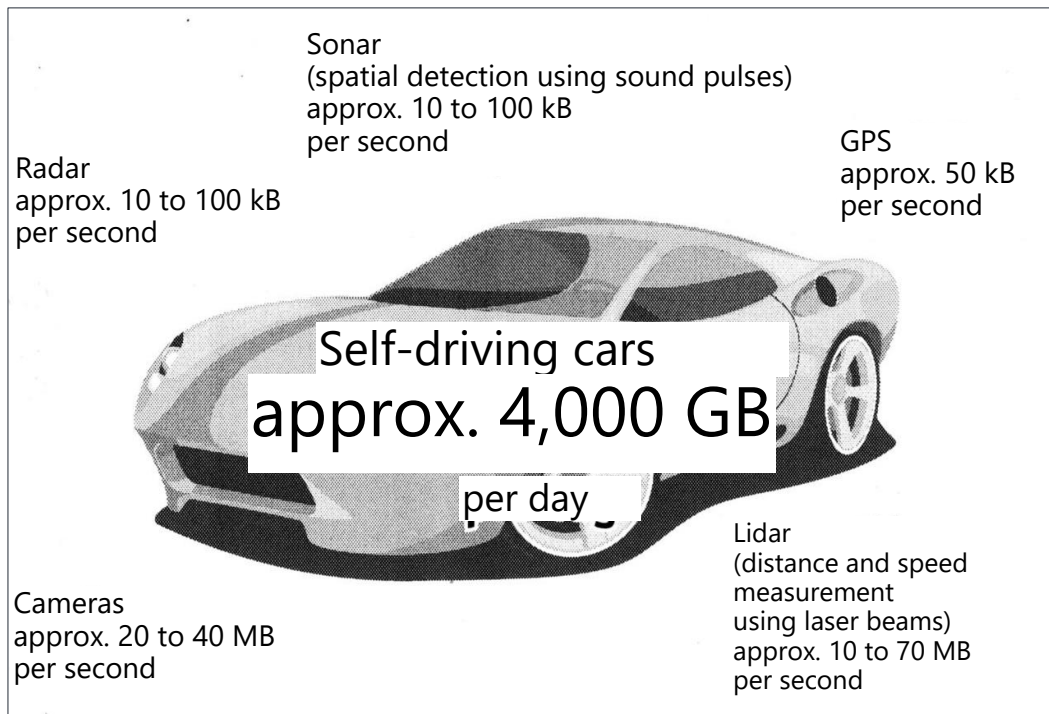


First, some of the principal areas being digitalised in municipalities.

Smart Mobility: according to the EU's sustainable mobility strategy,¹² advancing digitalisation in transport primarily aims to improve efficiency and reduce emissions through connected transport systems. Critical analyses, including those by sustainability researcher Tilman Santarius, warn of a rebound effect: autonomous driving makes private transport so convenient that traffic could grow further. Without political oversight, private robotaxis threaten to displace conventional public transport rather than usefully complement it. Such extensive networking also massively increases the digital footprint: today's connected vehicles generate around 25 gigabytes of data

¹² <https://digital-strategy.ec.europa.eu/de/policies/digitalisation-mobility>

per hour in everyday operation,¹³ while fully autonomous test vehicles running continuously process up to four terabytes (about 4,000 gigabytes) daily. Monetising these enormous data volumes is already a reality: manufacturers such as Stellantis operate specialised software and Data-as-a-Service businesses, such as Mobilisights Connect, to commercialise fleet data worldwide.¹⁴



Estimate of data generated within self-driving systems. The illustration shows the maximum unfiltered data potential of fully autonomous vehicles running continuously, reaching four terabytes a day; today's autonomous production cars process about 25 gigabytes an hour. (Illustration: Lange/Santarius, 2018.)

Internet of Things and Smart Home: millions of new Internet of Things devices are intended to stimulate consumption and growth. Talking refrigerators, Wi-Fi-connected robot vacuums and coffee machines, remotely controlled shutters, Alexa, Google Home and smartphones communicate through mobile and Wi-Fi networks, collecting extensive usage and behavioural data for advertising, profiling and security authorities.

Smart Energy (wireless meters): the real opportunities to control energy consumption through digitalisation, for example, are far outweighed by the rebound effect.¹⁵ Billions of connected Internet of Things devices will dramatically increase energy and resource consumption through their constant data traffic,

¹³ <https://www.mordorintelligence.com/industry-reports/big-data-market-in-the-automotive-industry> ¹⁴ <https://www.media.stellantis.com/em-en/mobilisights/press/mobilisights-rebrands-as-mobilisights-connect-enabling-software-solutions-powered-by-trusted-vehicle-data>

¹⁵ The rebound effect means energy savings from improved efficiency fail to materialise or are reversed. <https://www.co2online.de/klima-schuetzen/nachhaltiger-konsum/rebound-effekt/>

pushing it upwards. The German Bundestag's technology assessment committee sounds the alarm in its 2022 report: ICT energy consumption could rise by almost 300% by 2030 compared with the base year 2010 (see footnote 36).

Smart School and Digital Education: the German government has adopted Digital Pact for Schools 2.0: data-based school and teaching development using a pupil ID, with the aim of autonomous teaching through "self-adaptive, AI-supported learning systems". Pupils' learning and thinking processes are recorded by storing learning data under their ID. Teaching is to use tablets instead of books, supplying real-time data with which an algorithm can control learning. Teachers are to serve only as learning companions or coaches.

Smart Administration: no more queues for identity cards, driving licences or visas - that would be good. But administration without staff dehumanises the city. Every citizen is reduced to a dataset, from social status to health.

Mobile Data Infrastructure: this exploding mobile data exchange requires thousands of new mobile transmitters alongside broadband networks. They irradiate their surroundings and consume energy.

Transforming cities into Smart Cities is designated a major German government project in the "Smart City Charter" and "5G Strategy for Germany". The government's 2025 coalition agreement also establishes it as a core part of the digital-only society. Smart Cities and Smart Countries are connected cities and districts where data flows underpin organisational structures and political control. Residents supply data to this Big Data system through the Internet of Things (IoT) and connected Smart Home devices: smart meters, smart grids, Alexa, intelligent refrigerators, connected televisions and robot vacuums; movement profiles via mobility passes; mobile vehicle data; smartphones, tablets and smartwatches; and platforms such as Google, Facebook, Twitter, Instagram, TikTok and WhatsApp. Algorithms process data in real time and create a digital twin of every citizen as the basis for AI-controlled communal life.

Smart City dystopias once criticised have become technological reality in modern urban development. What Digitalcourage e.V. denounced as a surveillance scenario in the 2018 Smart City Big Brother Award¹⁶ is now being widely installed as mass-produced "Smart Poles".¹⁷ These multifunctional, AI-supported streetlights serve as digital infrastructure nodes, routinely combining energy-saving LEDs with 5G antennas, environmental sensors, Wi-Fi hotspots and high-resolution cameras for counting traffic and pedestrians.¹⁸ While municipalities use them for precise traffic management and demand-based light dimming, the privacy debate about the permanently transparent citizen in public

16 <https://bigbrotherawards.de/2018/konzept-smart-city>

17 <https://www.smart-city-dialog.de/wissen/smart-city-loesungen/smart-poles-intelligente-strassenbeleuchtung-als-knotenpunkte-digitaler>

18 <https://www.leappole.com/de/blog/the-future-market-trends-of-smart-lamp-poles/>

space remains highly relevant,¹⁹ especially as new regulations such as the European Data Act further promote automated processing of urban sensor data.²⁰

- The prerequisite for the Smart City, the basis of its organisation, is always knowing where every citizen is and what they are doing, in real time. The transparent citizen is the Smart City's DNA. Cities are transformed from places of local democracy into monitored zones.

China's social credit system illustrates digitalisation's surveillance potential.²¹ We must not ignore these risks to democracy. Already, use of Google, Facebook/Meta, Alexa and Amazon creates digital profiles of everyone, particularly for advertising, to commercially analyse and steer human behaviour on a large scale.



Nusantara: the world's most sustainable city? Photo: Ministry of Housing and Residential Areas of the Republic of Indonesia

Another negative example is the planned city of Nusantara, still under construction, intended to replace the overburdened Jakarta as Indonesia's capital. Nusantara is to become the world's most sustainable city, be completed by 2045, and accommodate two million people over roughly 2,561

¹⁹ <https://www.smart-city-dialog.de/wissen/publikationen/smart-cities-und-datenschutz-rechtliche-leitplanken-nach-der-dsgvo>

²⁰ <https://digital-strategy.ec.europa.eu/de/policies/data-act>

²¹ A numerical assessment and sanctions system enabling China's government to monitor and influence citizens' behaviour. Their social credit can rise or fall based on their actions, granting or restricting privileges such as air travel, access to well-paid jobs or particular schools for their children. <https://sccei.fsi.stanford.edu/china-briefs/assessing-chinas-national-model-social-credit-system>

km². In the middle of Borneo's rainforest, a "smart forest city" managed by Big Data, AI and the Internet of Things (IoT) is emerging.²² Its first construction phase alone required clearing 6,000 hectares of forest, habitat for endangered orangutans.²³

3 Digitalisation as an accelerant of the climate catastrophe

The climate catastrophe is here: hot summers, water shortages, failed harvests, famine, 48°C in India, 60°C ground temperatures, record ocean surface temperatures, worldwide forest fires, heavy rainfall, floods and uninhabitable regions ... Its severity can no longer be denied. The UN Environment Programme (UNEP) makes clear in its latest Emissions Gap Reports that the 1.5°C target is no longer achievable without temporarily exceeding it ("no overshoot"). As global warming has accelerated markedly in recent years, global climate scenarios now largely rely on risky overshoot models that assume enormous technological CO₂ removal.²⁴ According to the Global Carbon Project's current report, global fossil CO₂ emissions reached a new record of 38.1 billion tonnes in 2025 (42.2 billion tonnes including land use), as documented in the official Global Carbon Budget 2025 press release.²⁵

Yet policymakers act hesitantly, and many people refuse to acknowledge the climate catastrophe's severity because it unfolds gradually here. In August 2026, the European climate service Copernicus recorded the world's hottest summer since records began.²⁶ In the four largest EU countries alone, over 25,000 people had already died from extreme heat in summer 2026, including around 14,000 in Germany, a new high since 2016.²⁷

And animals? Würzburg researchers found that high temperatures severely disrupt insects' sense of smell, making food-seeking harder, impairing pollination and potentially affecting agriculture and biodiversity.²⁸ Jena University notes that increasingly frequent heatwaves force insects either to reduce activity or seek shelter in more suitable microhabitats. Yet changing land use reduces microhabitat diversity. This harms not only insects but also their vital ecosystem services, such as pollination, humus formation and general improvement of soil quality.²⁹

22 <https://govinsider.asia/intl-en/article/indonesias-new-capital-nusantara-to-become-tech-enabled-smart-city>

23 <https://magazin.schindler.de/architektur/nusantara-indonesiens-neue-hauptstadt>

24 <https://wedocs.unep.org/items/156d074c-ab1d-4833-acf8-6343589ede9b>

25 <https://globalcarbonbudget.org/fossil-fuel-co2-emissions-hit-record-high-in-2025/>

26 <https://climate.copernicus.eu/copernicus-august-was-worlds-joint-hottest-month-record-pushing-global-temperatures-back-above>

27 <https://www.euractiv.com/news/heat-deaths-in-germany-france-italy-and-spain-soar/>

28 <https://royalsocietypublishing.org/doi/10.1098/rspb.2024.0352>

29 <https://idw-online.de/de/news813299>

We must stop land sealing and pesticide use, save energy and switch to renewables - immediately! Many appropriate measures are proposed in municipalities too. Yet one thing stands out: digitalisation's role as a climate killer has so far received only marginal attention in local councils, Fridays for Future and BUND.

The government claims digital networking serves climate protection. In reality, digitalisation is a growth strategy rather than a sustainability strategy! Digital solutions allow businesses to improve efficiency, reduce costs and identify new commercial opportunities.³⁰ New digital services stimulate consumption.³¹ Connected transport - Smart Mobility - is intended to organise more cars on the roads.³² Smart Homes promise a sales boom in millions of new household appliances, and Smart Schools open a market for millions of tablets and laptops to the IT industry.

An algorithm-controlled society is justified on the grounds that it could optimise consumption and solve environmental problems. This is now used, for example, to justify installing wireless electricity and water meters that often transmit consumption data every 20 seconds. Big Data is said to be necessary for connected, energy-efficient supply. This is sales-promoting propaganda serving a purpose: reports by the German Environment Agency document the opposite.³³

Actual opportunities to manage energy consumption are far outweighed by the rebound effect.³⁴ Billions of connected Internet of Things devices will increase consumption and dramatically raise energy and resource use. Here are some figures from three authoritative studies, some commissioned by government.

3.1 Bundestag technology assessment: a tripling of energy consumption

The German Bundestag technology assessment report "Energy Consumption of ICT³⁵ Infrastructure" (2022) shows that digital infrastructure's energy and resource demands have already reached enormous levels and threaten to rise sharply. One key statement:

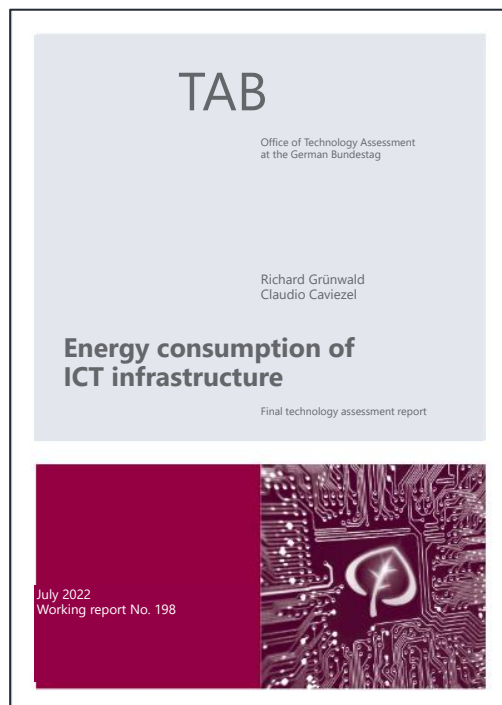
30 <https://www.hagel-it.de/it-insights/digitale-transformation-als-wachstumstreiber-tipps-fuer-geschaeftsfuehrer-zur-erfolgreichen-umsetzung.html> 31 <https://www.umweltbundesamt.de/themen/digitalisierung/digitale-nachhaltigkeit>

32 Lange S, Santarius T (2018): Smart Green World? Digitalisation Between Surveillance, Consumption and Sustainability, Munich, p. 65: "Digital optimisation of transport is intended ... to create the conditions for further growth rather than reduce traffic volumes."

33 Article on the UBA report: <https://www.diagnose-funk.org/1642>

34 Lange, Steffen; Pohl, Johanna; Santarius, Tilman (2020): Digitalization and energy consumption. Does ICT reduce energy demand? Ecological Economics Vol. 176, Elsevier, <https://doi.org/10.1016/j.ecolecon.2020.106760>; study: Does digitalisation mean climate protection? Not so far, <https://www.nachhaltige-digitalisierung.de/index.php?id=1746>

"The assumptions for the worst-case scenario still appear plausible, so an increase in energy demand to a maximum of 58.5 TWh/year [from 22 TWh/year in 2022, author's note] by 2030 seems conceivable" (p. 27).³⁶



This means an increase to almost 300% of the 2010 baseline. To put its scale in perspective: Germany's total net electricity consumption in 2025 was around 495 terawatt-hours,³⁷ while Hamburg consumed 10.7 TWh that year.³⁸

The technology assessment report states:

"Private internet and digital media use is considered a major driver of rising ICT-related energy demand. This comprises energy consumption by the enormous number of devices in German households (including televisions, gaming consoles and digital audio receivers), together with the energy consumption their use induces in data centres and transmission networks.

Yet not only use but also the highly energy-intensive manufacture of electronic devices contributes substantially to energy consumption" (p. 16).

This confirms that, as industry's business model, digitalisation is a climate killer. Public debate does not problematise this. On the contrary, the state promotes digitalisation and equates it with sustainability and environmental compatibility. Federal specialist agencies themselves now provide evidence that this state-prescribed optimism ignores ecological reality.

3.2 Report by the World Future Council think tank

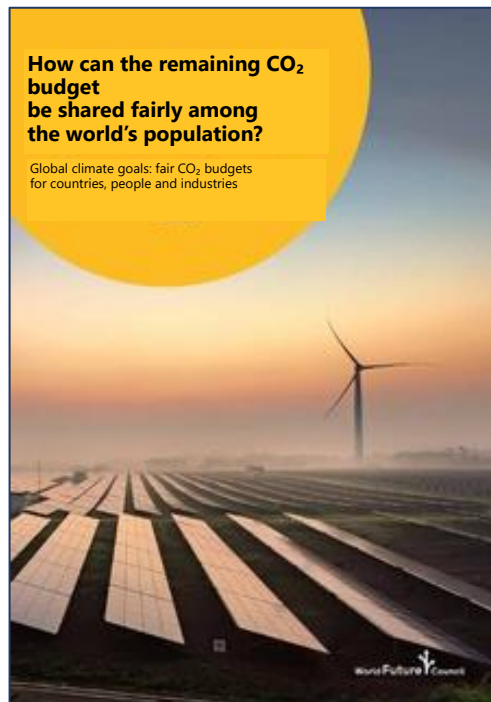
The independent green think tank World Future Council (WFC) confirms the technology assessment office's analysis. Its study "How Can the Remaining CO₂ Budget Be Distributed Fairly Across the World's Population?" states:

36 Grünwald R, Caviezel C (2022): Energy Consumption of ICT Infrastructure. Final technology assessment project report, 2022. Office of Technology Assessment at the German Bundestag (TAB). DOI: 10.5445/IR/1000151164, <https://publikationen.bibliothek.kit.edu/1000151164>; <https://publikationen.bibliothek.kit.edu/1000151164/149393331>

37 See <https://www.ise.fraunhofer.de/de/presse-und-medien/presseinformationen/2026/oeffentliche-stromerzeugung-2025-wind-und-solar-erstmal-als-doppelspitze.html>

38 See <https://www.energieportal-hamburg.de/>

"If current trends continue, data centres' worldwide energy demand will rise by over 60% in the next ten years. Ever more electricity for data centres means we cannot achieve energy transition goals so easily," warns the WFC (p. 20). An estimated 80% of this rise comes from video streaming - entertainment. With artificial intelligence also advancing, the International Energy Agency already estimated in 2022 that worldwide data-centre electricity consumption would rise by as much as 80% by 2026, from 350 terawatt-hours (TWh) to at least 640 TWh.



*"AI's enormous energy consumption could torpedo the energy transition, meaning climate protection, so severely that renewable electricity generation will be unable to match growing demand."*³⁹

The WFC sees "digitalisation and its many applications, such as 5G, video streaming and AI" as amplifying environmental crises, for example through autonomous driving plans. The proposed digital mobility structure entrenches old patterns: "An autonomous car would generate well over 4,000 GB of data daily and require corresponding amounts of extra energy. If even a fraction of the more than 40 million cars on German roads were self-driving, it would be a catastrophe for climate and resource protection. Not only would enormous data transfers require more electricity; digital infrastructure such as server farms, data centres and, of course, new 5G networks would consume substantial resources" (ibid., p. 21).

Further facts: the global internet ecosystem already uses the equivalent of well over 100 large power stations running at full load. Germany alone has around 2,000 larger data centres with IT connected loads exceeding 100 kW, remaining Europe's largest and most important data-centre location.⁴⁰ Servers, storage and, above all, complex cooling systems drive this enormous appetite for energy.⁴¹

³⁹ https://www.rnz.de/kultur/magazin_artikel,-Klimaziele-in-Gefahr-Frisst-die-KI-zu-viel-Energie-arid,1383180.html

⁴⁰ <https://bmfs.bund.de/service/publikationen/nationale-rechenzentrumsstrategie>

⁴¹ <https://www.ndr.de/studio16/rechenzentren-boom-im-norden-reicht-grundwasser-im-norden,rechenzentren-110.html>

According to the latest Fraunhofer IZM data, German data centres recently required around 25.9 terawatt-hours (TWh) of electricity annually.⁴² This already amounts to almost 4% of Germany's total gross electricity consumption. For comparison, it could supply Berlin and Hamburg with all their electricity for an entire year.

Experts forecast German data-centre electricity consumption exceeding 30 TWh by 2030 and 41.3 TWh by 2035.⁴³ Digital infrastructure's energy demand will therefore soon exceed electricity consumption in major key industries, such as Germany's entire automotive production.

Massive expansion of cloud services, 5G and particularly computationally intensive artificial intelligence (AI) applications accelerates growth rapidly. AI applications now occupy about 15% of Germany's total data-centre capacity; this share is expected to almost triple to 40% by 2030.⁴⁴

Global projections also show that although historical extreme scenarios, such as TU Dresden's 2011 estimate, are mathematically outdated, the global ICT sector is still heading towards a huge share of up to 20% of global electricity demand, or around 945 TWh, by 2030.⁴⁵ A current Allianz Trade study puts worldwide data-centre emissions in 2025 at 286 million tonnes of CO₂, 57% above earlier International Energy Agency studies.⁴⁶

Artificial intelligence's devastating appetite for resources

 Massive AI expansion increased Google's worldwide electricity consumption in 2025 by 37% to 43.6 terawatt-hours (TWh).⁴⁷ Its absolute CO₂ emissions rose to 14.5 million tonnes, an 81% increase in greenhouse gases compared with 2019.⁴⁸ Freshwater consumption for intensive server cooling simultaneously soared to 9.9 billion gallons (about 37.4 billion litres).⁴⁹

 Despite fierce public protests and federal court lawsuits, the US government is providing a billion-dollar loan (\$1,000,000,000) for the notorious Three Mile Island nuclear power plant to supply electricity exclusively to Microsoft's AI data centres.⁵⁰

42 https://www.izm.fraunhofer.de/de/abteilungen/environmental_reliabilityengineering/projekte/green-ict/studie-zum-strombedarf-und-carbon-footprint-der-ikt-in-deutschland.html

43 See footnote 46

44 <https://bmds.bund.de/aktuelles/pressemitteilungen/detail/halbjahresbilanz-rechenzentrumsstrategie-wir-setzen-den-fahrplan-zuegig-um>

45 <https://www.marktundmittelstand.de/technologie/ki-frisst-strom>

46 <https://www.allianz-trade.de/presse/pressemitteilungen/studie-rechenzentren-klimaschaedlicher-als-gedacht.html> 47 <https://valueaddvc.com/pulse/google-ai-buildout-37-percent-electricity-increase-2026>

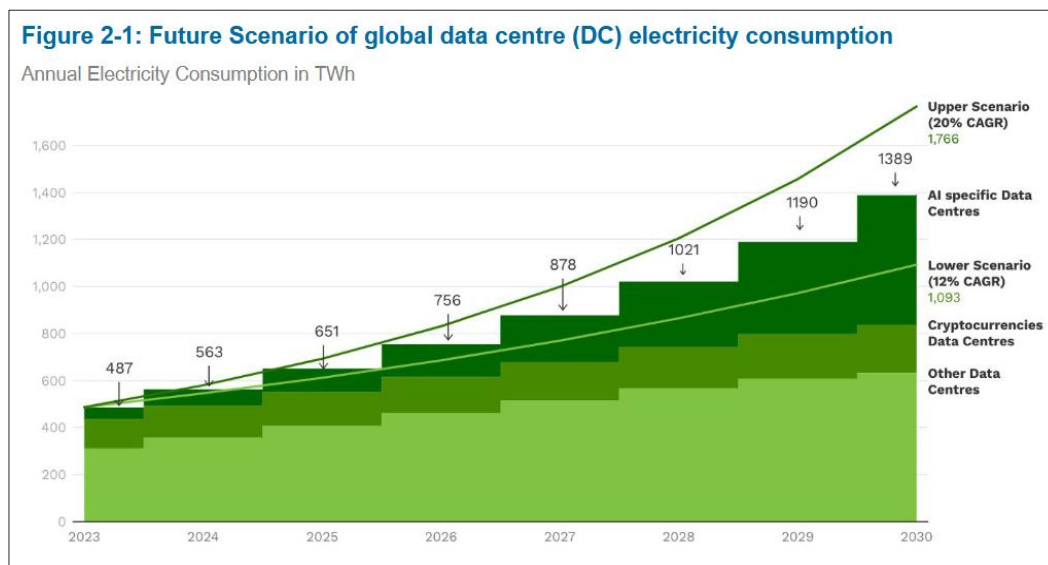
48 <https://carboncredits.com/google-ai-emissions-net-zero-environmental-report-2026/>

49 <https://trellis.net/article/behind-amazons-industry-leading-water-efficiency-score/>

50 <https://www.theguardian.com/us-news/2025/nov/19/three-mile-island-nuclear-loan-microsoft-datacenter>

3.3 Greenpeace study “Environmental Impacts of Artificial Intelligence”⁵¹

The Greenpeace study “Environmental Impacts of Artificial Intelligence” (2025), by the Öko-Institut in Berlin, demonstrates that the current AI boom substantially drives rapidly increasing energy, water and resource consumption by digital infrastructure, sharply worsening IT’s known environmental effects. Without immediate technology assessment, AI infrastructure threatens to completely undermine municipal and federal climate targets.



Future scenario for worldwide data-centre electricity consumption. Source: Greenpeace 2025

The mass introduction of AI applications leads to an explosive overshooting of planetary boundaries:

- **Elevenfold electricity demand:** electricity consumption by purely AI-specific data centres leaps from 50 terawatt-hours in 2023 to around 554 TWh in 2030. Total electricity demand from all data centres almost triples to 1,389 TWh - doubling every five years!
- **CO₂ explosion:** while conventional cloud storage emissions decline slightly thanks to green electricity, AI data centres see an almost sixfold increase in greenhouse gases by 2030, from 29 to 166 million tonnes of CO₂ equivalent.
- **Water and electronic waste:** water consumption for server cooling will triple to over 500 billion litres by 2030. Rapid replacement of specialist chips also threatens up to five million extra tonnes of electronic waste.

⁵¹ Gröger J, Behrens F, Gailhofer P, Hilbert I (2025): Environmental Impacts of Artificial Intelligence, Öko-Institut, Berlin, published by Greenpeace Germany. The study is in English; its summary is also in German. <https://www.greenpeace.de/publikationen/20250514-greenpeace-studie-umweltauswirkungen-ki.pdf>

*"Efficiency improvements reduce costs, increasing AI use and cancelling out the savings."
(Rebound effect)⁵²*

Smart Cities & AI: what projected increases mean for municipalities

Source: Greenpeace Germany, Environmental impacts of artificial intelligence, 2025

Area	Study projections	Consequences for municipalities / Smart Cities
AI electricity consumption	AI data centres: 50 TWh (2023) → 554 TWh (2030) (×11)	Smart City AI permanently increases external electricity demand, mostly outside municipal generation.
AI share of data centres	AI share of all data-centre electricity: 14% → 47%	Municipal AI becomes part of a rapidly growing global base-load system.
All data-centre electricity	Worldwide: 487 TWh → 1,389 TWh (almost tripling)	Cities increasingly compete with data centres for electricity capacity.
Local grid load	Already >20% in Ireland, ~80% in Dublin, 30–40% in Frankfurt, Amsterdam and London	Smart Cities put more pressure on urban power grids, permits and prices.
Total CO₂ emissions	Data centres: 212 million t CO ₂ e → 355 million t CO ₂ e	Emissions occur outside the city but affect municipal climate targets.
AI CO₂ emissions	AI data centres: 29 million t → 166 million t CO ₂ e (almost ×6)	"Smart" applications can worsen the climate balance instead of improving it.
Total water consumption	Data centres: 175 → 664 billion litres of water (>×3)	Municipalities indirectly bear growing water demand, often unaccounted for.
AI water consumption	AI data centres: 30 → 338 billion litres (>×11)	Critical for Smart Cities in water-scarce regions.
Electronic waste	Up to 5 million additional tonnes of e-waste by 2030	Rapid hardware cycles conflict with municipal circular-economy goals.
Rebound effect	Greater use more than offsets efficiency gains.	Smart control often leads to more AI, more data and more infrastructure.
Energy sources	Additional demand prolongs fossil power-plant operation; some replacement by nuclear power.	Municipalities gain no benefit but bear environmental and acceptance risks.
Main study finding	Technical progress alone does not reduce environmental pressures.	Smart Cities need political guardrails, not just technology.
Greenpeace demand	Use AI only where ecological benefit exceeds environmental cost.	Municipalities should limit, prioritise and make AI transparent.

Diagram: *diagnose:funk*. Data source: Greenpeace study 2025

Greenwashing by the "Smart City" and technology corporations

The promise of making cities more sustainable through round-the-clock digitalisation and AI-supported traffic or energy monitoring proves illusory.

- Permanent base load: continual Smart City data collection and algorithmic analysis create a huge additional base load in data centres. The global IT appetite for resources consumes local savings.
- Accounted for and concealed: major IT companies embellish their accounts with certificates while their absolute emissions actually rise. To meet immense electricity demand, technology giants increasingly turn to nuclear power, a highly risky technology that is neither sustainable nor climate-neutral. Federal and municipal administrations also barely record the actual energy consumption of their flood of AI applications.

52 See footnote 15

3.4 Smartphones, Netflix and Google are major CO₂ emitters

Digitalisation is not invisible: it consumes enormous energy. A current study in FAIA puts all information and communication technology (ICT) at 4-10% of worldwide electricity consumption.⁵³ Energy demand from video platforms, gaming and cloud computing grows steadily and increasingly shifts into the network. International Energy Agency (IEA) forecasts put worldwide electricity demand from data centres and AI infrastructure above 1,000 terawatt-hours by the end of 2026, equivalent to entire industrialised nations' electricity consumption.⁵⁴

A German Environment Agency study shows how deeply this digital lifestyle affects our carbon footprint. One hour of gaming and streaming League of Legends generates 2.54 kg of CO₂ equivalent, taking the full life cycle of hardware, networks and servers into account.⁵⁵ Everyday clicks also add up: searches, streaming services, posts and emails now typically generate 200-300 kg of CO₂ equivalent per person annually.⁵⁶ A seemingly harmless normal email without attachments produces about 0.03-0.1 g of CO₂. A lengthy email with attachments generates 1-10 g of CO₂ equivalent, exceptionally up to 20-30 g.⁵⁷ A single Google search now emits around 0.02-0.05 g of CO₂.⁵⁸ Searches using Google's AI, such as AI Overviews or Gemini, typically generate around 0.38 to over 1.5 g of CO₂ per request.⁵⁹

Besides operating networks, the largest item is devices' "ecological rucksack" from manufacturing. Producing a modern notebook now creates an average 150-250 kg of CO₂ equivalent.⁶⁰ An average smartphone is assigned about 80.2 kg over its entire life cycle. Crucially, 79.3 kg comes solely from manufacture and distribution, while home use and disposal together contribute only about 0.9 kg (over 2.5 years' use, this corresponds to around 32 kg of CO₂ equivalent annually).⁶¹ Thus 70-90% of digital devices' total environmental burden still arises before they are first switched on.⁶²

53 <https://journals.sagepub.com/doi/10.3233/FAIA251716>

54 <https://www.iea.org/reports/energy-and-ai/energy-demand-from-ai>

55 UBA (2024): Digitalisation and Natural Resources. Analysis of the resource intensity of digital transformation in Germany. <https://www.umweltbundesamt.de/publikationen/digitalisierung-natuerliche-ressourcen>

56 <https://www.iea.org/reports/electricity-2026>

57 <https://www.hutton.ac.uk/blog/the-hidden-carbon-footprint-of-emails-why-our-everyday-digital-habits-matter/>

58 <https://sustainability.google/reports/google-2025-environmental-report/>

59 <https://www.climeet.net/%F0%9F%8C%8D%F0%9F%A4%96-kuenstliche-intelligenz-klima-gamechanger-oder-klimakiller/> 60 https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2026.pdf <https://www.lenovo.com/us/en/compliance/eco-declaration/>

61 <https://impactco2.fr/outils/numerique>

62 <https://tcocertified.com/news/using-a-notebook-computer-for-three-more-years-can-cut-emissions-in-half/>

Even smaller digital applications matter: intensive 3D-printer use over 77 hours produces 148 kg of CO₂ equivalent. Cryptocurrencies also add substantially to the burden. The German Environment Agency shows that Bitcoin's electricity demand compares with that of entire countries. A single Bitcoin transaction therefore generates as much CO₂ as over 1.5 million Visa transactions.⁶³

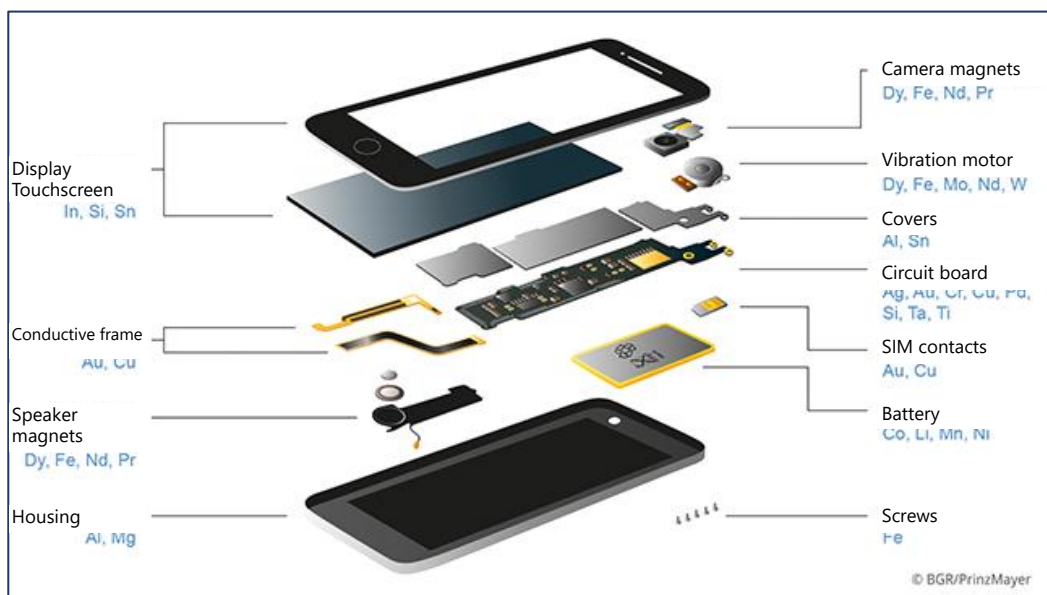
A Canadian study forecasts, in a worst-case scenario, that by 2040 digital technology could generate about half as much greenhouse gas as all global transport, and smartphone production could emit 125 megatonnes of CO₂ annually.⁶⁴

Martin Wimmer, the Federal Environment Ministry's IT officer, once aptly stated:

*"Digitalisation's smokestacks smoke just like those in Gelsenkirchen used to."*⁶⁵

3.5 Enormous resource consumption and electronic waste!

Producing our devices alone consumes ten times more energy than their use. The diagram of a phone's composition and the table of elements illustrate this.



Main smartphone components and the metals they contain. © Source: BGR⁶⁶

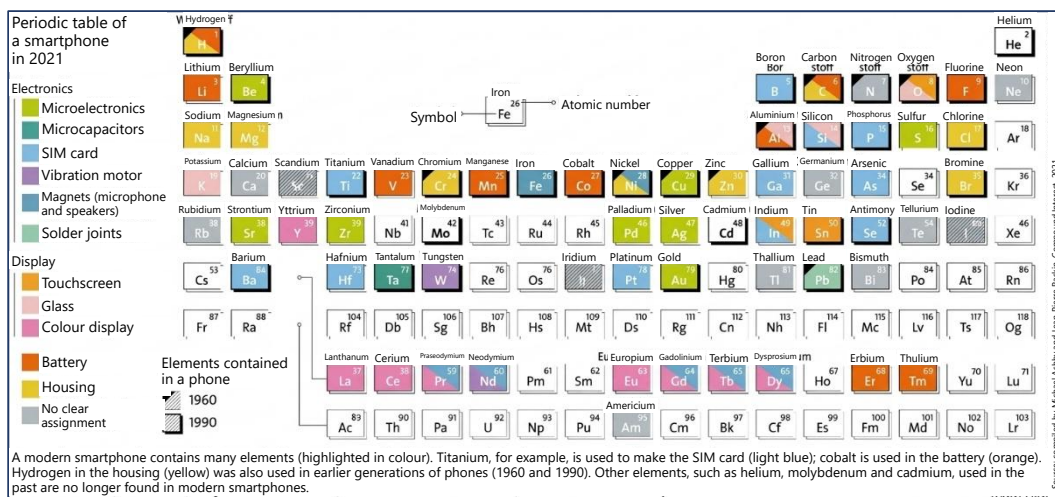
63 See footnote 55

64 Precht RD (2021): Artificial Intelligence and the Meaning of Life, p. 19

65 <https://www.heise.de/newsticker/meldung/Klimaverschmutzung-Die-Schlote-der-Digitalisierung-rauchen-kraeftig-4568933.html>, 25 October 2019

66 https://www.bgr.bund.de/SharedDocs/Meldungen/DE/Allgemeines/2026/2026-07-01_studie-smartphone-recycling.html

Metals and rare earths mined for billions of devices cause catastrophic environmental destruction in the producing countries - consider lithium mining in Latin America. They are also mostly extracted through slave and child labour. Our convenience rests on this. Annual device production remains at an enormous level. A typical smartphone now contains around 60 different elements and chemical compounds, including over 30 distinct metals.⁶⁷



The diagram shows a smartphone's material mix as of 2021. Graphic: Le Monde diplomatique

The smartphone is the digital world's "SUV". A mobile phone's ecological rucksack weighs around 70-75 kg, almost 400 times the device itself.⁶⁸ Smartphones sold annually in Germany alone consume natural resources equivalent to around 66,000 truckloads.⁶⁹ Joseph Steinbeiss writes in his analysis: "Obtaining the rare metals and earths needed to manufacture a two-kilogram computer requires 240 kg of fossil fuels, 22 kg of partly highly toxic chemicals and no less than 1.5 tonnes of water."⁷⁰

Today's efficient microprocessors, displays and vibration motors contain 16 of the world's 17 rare earths, including neodymium, cerium and lanthanum.⁷¹

Modern flagship devices upgraded for complex on-device AI applications, such as the Apple iPhone 17 or Google Pixel 10, require even more resources. The highly complex manufacture of their integrated

67 <https://www.clevertronic.de/blog/was-steckt-eigentlich-in-einem-smartphone>

68 <https://mlp-financify.de/lebenssituationen/freizeit/oekologischer-rucksack/>

69 http://www.reuse-computer.org/fileadmin/user_upload/documents/Artikel/Elektroschrott-IKT2013.pdf

Lange S, Santarius T (2018): Smart Green World? Munich

70 Joseph Steinbeiss (2020): Beautiful Dark Data World. The ecological consequences of digitalisation, <https://www.untergrund-blättele.ch/digital/die-oekologischen-folgen-der-digitalisierung-6019.html>

71 <https://www.n-tv.de/mediathek/videos/wissen/Diese-seltenen-Erden-sind-fuer-Handys-unerlaesslich-article25725082.html>

circuits and memory chips alone now accounts for 72-77% of a smartphone's entire production footprint. The silicon inside is the true CO₂ heavyweight.⁷²

Worldwide, 62 million tonnes of electronic waste were generated in 2022.⁷³ Distributed among trucks carrying 40 tonnes each, this would form a queue encircling the Earth. The mountain continues growing: the current Global E-waste Monitor projects 82 million tonnes annually by 2030.⁷⁴ Waste ends up in developing countries, contaminating entire regions. Kenya's open Dandora dump is considered one of the world's most toxic places. Workers burn illegally imported electronic waste daily without protective clothing, causing devastating environmental and health damage.⁷⁵



*Europe's largest rubbish dump - in the middle of Africa.
After the closure of Agbogbloshie in Ghana, the drama now unfolds in Nairobi, Kenya: illegally imported electronic waste lies at the vast open Dandora dump, often disguised as used goods from Europe. Photo: Duncan Moore/UN Environment*

A joint report by Boston Consulting Group (BCG) and environmental organisation Cradle to Cradle NGO reveals the enormous wealth wasted: unused critical raw materials worth over €65 billion lie in Europe's household and consumer electronics, lost through inadequate

⁷² <https://www.techinsights.com/blog/hidden-cost-pro-your-smartphones-carbon-footprint-bigger-you-think> ⁷³ <https://thesustainableagency.com/blog/impact-of-e-waste-stats-and-facts/>

⁷⁴ <https://ewastemonitor.info/the-global-e-waste-monitor-2024/>

⁷⁵ Article and film: <https://www.backmarket.de/de-de/c/technology/inside-one-of-the-biggest-ewaste-dumps-kenya-dandora>

returns and poor recycling. Old smartphones alone contain around 50,000 tonnes of valuable materials, while discarded washing machines could theoretically provide up to 70% of the raw materials needed for new ones.⁷⁶

A new, invisible dimension now joins this consumer waste: UN research institute UNU-INWEH urgently warns that the AI boom requires replacement of servers and data centres in extremely short cycles. Worldwide AI infrastructure alone will thus generate up to 2.5 million additional tonnes of electronic waste annually by 2030.⁷⁷

Note: mathematically, the world's population currently needs about 1.73 planets to meet resource demand sustainably. If every country used resources like Germany, 2.8 Earths would be needed.⁷⁸

4 4G, 5G and 6G - energy and environmental costs of digital networks

It is claimed that 5G infrastructure for mobile data transmission is substantially more energy-efficient than previous frequencies. This is wrong for several reasons. 5G is primarily intended to handle the Internet of Things: billions of new devices worldwide for Smart Homes and autonomous transport. The first reason 5G requires more electricity:

"One disadvantage affecting operators' transition from 4G to 5G will be cost. The electricity needed to power 5G networks is expected to exceed 4G by more than three and a half times ... ABI Research informs us that a normal LTE (4G) mobile site consumes about six kilowatts (kW), rising to 8-9 kW at peak times. Implementing a massive MIMO system with four transmitters and receivers (4T4R), however, may require 14 kW, rising to 19 kW at peak times. A separate Huawei analysis based on operator data shows similar results: the power consumption of 3.5 GHz 5G equipment with 64T64R and massive MIMO will be 300-350% of a 4G base station's."⁷⁹

⁷⁶ <https://www.fr.de/wirtschaft/elektroschrott-schatz-rohstoffe-fuer-65-milliarden-in-europas-geraeten-94482668.html>

⁷⁷ <https://unu.edu/inweh/collection/environmental-cost-of-AIs-Enrgy-Use-Carbon-water-and-land-footprints> ⁷⁸ <https://overshoot.footprintnetwork.org/newsroom/eod-2026-de/> <https://www.wwf.de/themen-projekte/klimaschutz/klimaschutz-deutschland/german-overshoot-day>

⁷⁹ 5G energy efficiency; are operators doing what they can?, 2020, <https://insidetelecom.com/5g-energy-efficiency-are-operators-doing-what-they-can/>, translation: diagnose:funk

Further reasons: 5G needs more antennas, every 100 metres in cities for each operator, and is intended to encourage purchases of more devices. It is to connect a million devices per km² - a classic rebound effect.⁸⁰

"While devices' energy consumption tends to decline, ICT infrastructure energy demand caused by private internet and digital media use shows the opposite trend. Energy demand in transmission networks and data centres rose from 8.5 to 10.7 TWh/year between 2010 and 2018. The increase accelerated markedly from 2015: annual growth was 1.2% during 2010-2015, but ICT infrastructure consumed 6% more energy annually during 2015-2018" (technology assessment report, see footnote 36).

Business association Bitkom tries to refute these facts with a study, claiming digitalisation contributes to climate protection. Yet its conclusion states: "Given the complexity and breadth of the range described, this study does not calculate rebound effects" (p. 92).⁸¹

4.1 German Environment Agency criticises mobile network rollout practices⁸²

An ecological footprint must encompass the entire chain of production, use and recovery. Switching from 4G to 5G more than triples electricity demand from all transmitters.⁸³ The German Environment Agency (UBA)'s 2020 report sharply criticises IT industry's business practices. Its main criticisms:

1. Mobile networks are redundant because each operator has its own network. The report therefore calls for one network for all providers:

"When mobile operators share sites and equipment, this saves energy and resources because technology need not be duplicated and operated twice. It also improves network access for all users" (p. 7).

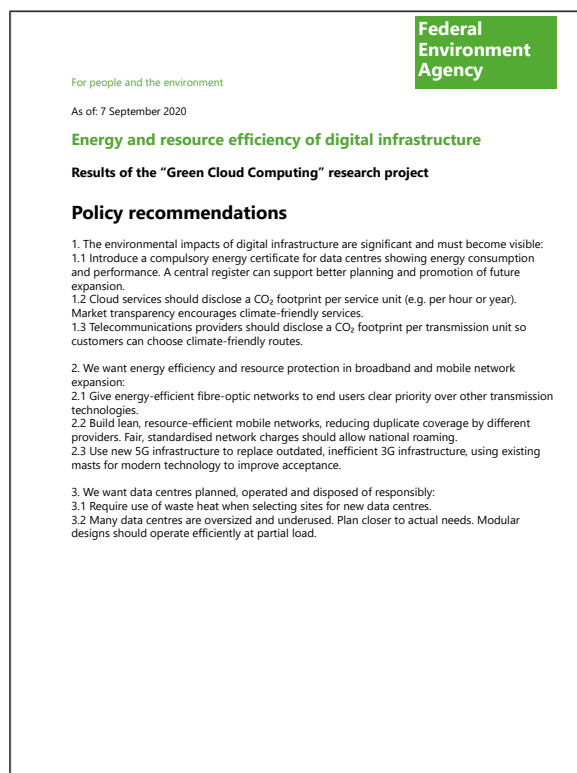
"Mobile network expansion should be lean and resource-efficient, with reduced overlapping coverage of the same regions by different providers. Uniform, fair network access charges enabling national roaming should therefore be introduced" (p. 1).

80 European Commission (2016): COMMUNICATION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS: 5G for Europe: An Action Plan, {SWD(2016) 306 final}: "Planned 5G networks are expected to support up to one million connected devices per square kilometre, a thousandfold increase over today's capacity. This massive increase in device numbers will also raise traffic per network access point. Achieving the planned connectivity will therefore require smaller cells and greater antenna density" (p. 7), Brussels, 14 September 2016, COM(2016) 588 final.

81 Bitkom (2024): Climate Effects of Digitalisation 2.0, <https://www.bitkom.org/Bitkom/Publikationen/Studie-Klimaeffekte-der-Digitalisierung>

82 <https://www.umweltbundesamt.de/publikationen/energie-ressourceneffizienz-digitaler>
<https://diagnose-funk.org/1642>

83 See footnote 79



2. Data centres consume enormous energy. A Blue Angel ecolabel for data centres is therefore needed, alongside monitoring and recycling systems to curb electronic waste.

3. Video streaming consumes 80% of data traffic (p. 11). Countermeasures should adjust default resolutions to display size (p. 2), stop offering flat rates for large data volumes, and financially reward data restraint (p. 2).

4. Consumer frenzy fuelled by advertising and bargain prices - "a new smartphone every year" - must stop: "Manufacturing new devices consumes resources and causes greenhouse gas emissions,

around 100 kg of CO₂ equivalent for a smartphone" (pp. 8, 13).

5. The UBA report rejects wireless indoor service and calls for separate indoor and outdoor provision: "Mobile communications are unsuitable for household connections and unsustainable from an environmental and climate protection perspective" (p. 8). Because: "Data transmission in mobile networks has a markedly larger ecological footprint than in wired broadband networks" (p. 12).

The UBA report's crucial conclusion: expansion of fibre-optic networks must take priority:

"In broadband expansion, energy-efficient fibre-optic networks extending to the end user should clearly be preferred to other transmission technologies."

4.2 Effects of radiation from mobile networks

4G and 5G networks not only consume energy: they produce radiation to transmit data. This energy transfer - generating electromagnetic fields - also has effects.

The non-ionising radiation used by mobile masts to transmit and receive harms health; research on this is now conclusive. EU documents confirm the risks, including the European Parliament's technology assessment report "Health Impact of 5G" (STOA study, 2021), which calls for a halt to 5G expansion

because research on 5G is insufficient and cancer and fertility risks from existing mobile communications have been demonstrated.⁸⁴

In March 2022, the European Economic and Social Committee (EESC) published an opinion in the EU's Official Journal, drawing conclusions from the evidence: protection against electromagnetic pollution, especially 5G; recognition of independent research and NGO criticism; recognition of electromagnetic hypersensitivity as an illness; and application of the precautionary principle. It also calls for new exposure limits.

Since 14 February 2023, the Bundestag Committee on Education, Research and Technology Assessment's report "Possible Health Effects of Different Frequency Ranges of Electromagnetic Fields (RF-EMF)" has been online. It identifies risks and alternatives and documents over 60 scientific studies showing significant results on mobile phone radiation's health risks.

4.2.1 Geopolitical uses and security policy

Despite these demonstrated risks, policymakers massively accelerated network expansion under digitalisation strategies and largely exempted smaller transmitters from approval and procedural requirements in state building regulations. Rearmament and the acute wartime situation are also reasons. Military website esut.de writes: "Private individuals are not 5G's principal target group, because the technology is simply unnecessary for most of their uses."⁸⁵ NATO recently founded its own multinational 5G initiative. SpaceX/Starlink intends to launch up to 42,000 satellites for 5G transmission, with a military mandate.⁸⁶ This satellite communication is used in the Ukraine war,⁸⁷ a testing ground for new digitally controlled weapons. These developments led the USA to establish its own EMF Operations Center.⁸⁸

Building digital combat infrastructure has significant ecological consequences. Under the Telecommunications Amendment Act (TKÄG), the seamless 5G infrastructure needed for "digital warfare" is declared an "overriding public interest" even in nature reserves. This opens sensitive habitats to military wireless networks, adds masts and legitimises extensive interference with landscapes and biodiversity.

84 EU scientific bodies' reports: <https://www.diagnose-funk.org/1388> and <https://www.diagnose-funk.org/1530>

85 <https://esut.de/2019/08/fachbeitraege/industrie-fachbeitraege/14824/5g-neuer-mobilfunkstandard-verspricht-der-bundeswehr-grossen-nutzen-it-news-trends-september-2019/>

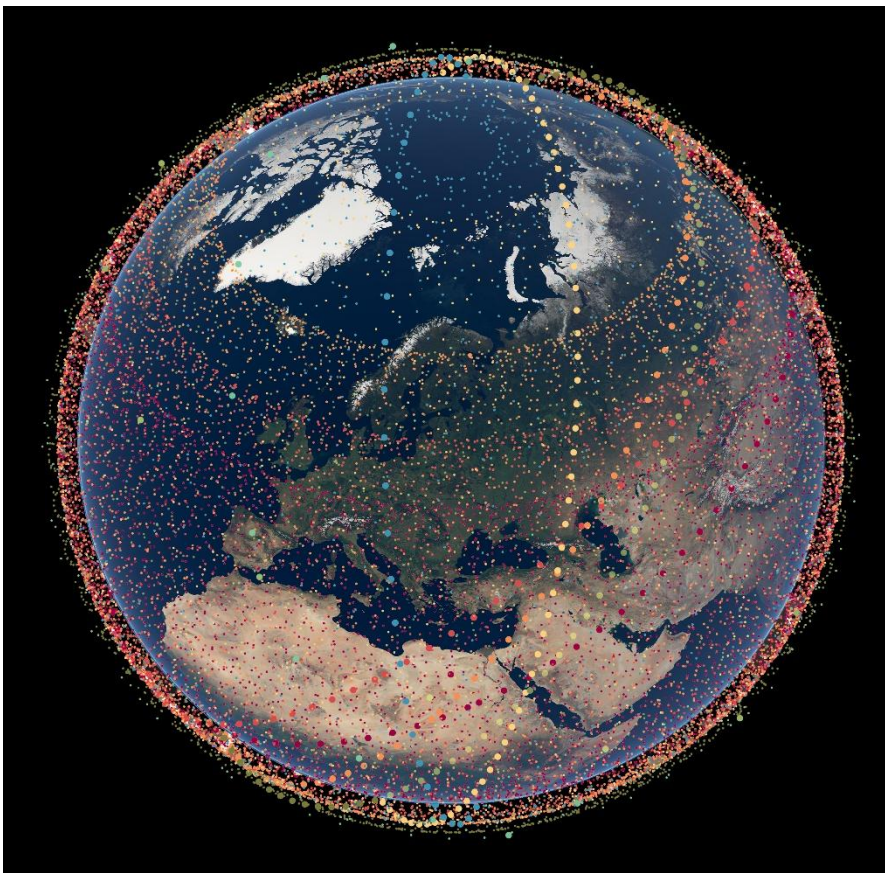
86 <https://de.wikipedia.org/wiki/Starlink> <https://www.defensenews.com/battlefield-tech/it-networks/5g/2022/03/22/nato-wants-a-say-in-5g-standardization-talks/> <https://www.heise.de/-6647797>

87 <https://www.deutschlandfunk.de/starlink-satelliten-ukraine-musk-100.html>

88 <https://www.diagnose-funk.org/1996>

4.2.2 Ecological effects of megaconstellations (Starlink & Starship)

Planned military satellite constellations also create new burdens: thousands of communications satellites increase energy consumption, light pollution and space-debris risks. Military use of digitally controlled weapons, such as drone swarms and autonomous weapons systems, increases resources needed to manufacture, operate and dispose of them. Digitalising warfare thus perfects destructive potential and expands ecological harm through wireless infrastructure, energy demand, raw-material consumption and interference in protected areas.⁸⁹



Visualisation of planned satellite megaconstellations in low Earth orbit. The sheer mass of artificial objects threatens sustainable use of space, causes uncontrolled material inputs into the stratosphere and fundamentally impairs astronomical measurements. Photo: ESO/F. Kamphues/M. Kornmesser (CC BY 4.0).

The continual cycle of production, launches and deliberate disposal of expired satellites by burning them up shifts environmental problems from Earth and orbit into the upper atmosphere. To lower immediate collision risks in low Earth orbit, thousands of satellites are deliberately re-entered after a few years. According to Barker et al.'s 2026 modelling study, radiative forcing from rocket soot at high

⁸⁹ See <https://diagnose-funk.org/2261>, <https://diagnose-funk.org/2210>, <https://diagnose-funk.org/1996>; on the TKÄG: <https://diagnose-funk.org/2138>

altitudes is over 540 times more effective than near-ground soot; satellite megaconstellations will cause around 56% of all spaceflight's immediate radiative forcing by 2029. The new Starship launcher reduces soot but requires nine times the fuel and ten times the dry mass of a Falcon 9 rocket, causing massive nitrogen oxide emissions. This form of "waste disposal" also produces a dangerous particle shower: researchers have already detected aluminium and other metals from vaporised spacecraft in 10% of stratospheric aerosols. Beyond stratospheric pollution, harm to astronomy is already real: second-generation Starlink satellites produce unintended electromagnetic interference up to 32 times stronger than the first generation.⁹⁰

4.2.3 6G and ISAC: the leap to comprehensive mass surveillance

The next stage is already emerging: government-funded research networks, such as Germany's "6G Transfer Hubs" launched in 2026, are intensively developing 5G's successor, 6G, for commercial introduction around 2030. 6G is intended to embed AI directly in the network ("AI-native networks") and transmit data at extremely high sub-terahertz frequencies. Its most far-reaching innovation, however, is Integrated Sensing and Communication (ISAC): 6G antennas will simultaneously serve as permanent radar sensors.⁹¹ For consumer protection, this represents a consequential systemic change: mobile networks gain the technical potential to become comprehensive surveillance infrastructure, recording the positions and movements of people and objects continuously in real time. The German Conference of Independent Federal and State Data Protection Authorities (DSK) warns of precisely these extensive privacy risks and impending mass surveillance in its official ISAC and 6G position paper. Seamless wireless sensing could capture people's behavioural profiles and movement patterns without their knowledge or consent, regardless of whether they carry a mobile device.⁹²

4.3 Insect decline and digitalisation

Finally, another connection seldom considered: species extinction feeds back into the climate catastrophe. The consequences of insect decline are particularly serious. Insect researchers regard it as an "ecological catastrophe of geological proportions, with a significantly greater

⁹⁰ https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2025EF007229?utm_source=chatgpt.com

See Murphy et al. (2023): Metals from spacecraft reentry in stratospheric aerosol particles, PNAS 120, e2313374120. Di Vruno et al. (2023) / Bassa et al. (2024): Unintended electromagnetic radiation from Starlink satellites, Astronomy & Astrophysics.

⁹¹ <https://www.forschung-it-sicherheit-kommunikationssysteme.de/foerderung/bekanntmachungen/6g-a>

⁹² https://www.datenschutz-berlin.de/fileadmin/user_upload/pdf/publikationen/DSK/2026/20260617-DSK_Positionspapier-ISAC-Standardisierung-in-WiFi-und-6G.pdf; summary of the position paper: <https://www.heise.de/news/ISAC-und-6G-Datenschuetzer-warren-vor-Masseneueberwachung-und-fordern-Regeln-11338678.html>

potential threat than global warming”, according to Munich entomologist Segerer (Segerer, The Great Insect Die-off, 2019, thesis 3). Insects are a link in the biodiversity chain.

In his book “Silent Earth”, entomologist Dave Goulson writes about electromagnetic fields: “It seems plausible that such fields could trigger major behavioural changes [in insects] ... What concerns me most is how little research is done in this area. We have introduced a succession of global telecommunications networks in a vast, unreplicated experiment in which virtually every living thing on this planet is exposed to a rapidly rising dose of radiofrequency radiation, although the consequences are not yet entirely clear” (pp. 221, 223).

An increasing body of research demonstrates damage to insects from electromagnetic fields.⁹³ Here are seven recent studies:

Treder et al. (2023, University of Hohenheim): “Defined exposure of honeybee colonies to simulated radiofrequency electromagnetic fields (RF-EMF): Negative effects on the homing ability, but not on brood development or longevity”. Long-term RF-EMF exposure had a markedly adverse effect on honeybees' orientation during foraging. www.emfdata.org/en/studies/detail?id=806

Molina-Montenegro et al. (2023): “Electromagnetic fields disrupt the pollination service by honeybees”. The authors showed that EMF under field conditions, especially from high-voltage lines, significantly impaired honeybee pollination. www.emfdata.org/en/studies/detail?id=805

Nyirenda et al. (2022): “Effects of phone mast-generated electromagnetic radiation gradient on the distribution of terrestrial birds and insects in a savanna protected area”. Wildlife diversity declined significantly with increasing EMF strength. The area nearest the mast contained the fewest species. www.emfdata.org/en/studies/detail?id=688

Adelaja et al. (2022): “Distribution, diversity and abundance of some insects around a telecommunication mast in Ilorin, Kwara State, Nigeria”. Seven species were particularly common, including migratory locusts, honeybees and house mosquitoes. All except honeybees showed markedly lower abundance as sampling approached the mast. www.emfdata.org/de/studien/detail&id=757

Mulot M. et al. (2022). “Effects of non-ionising radiation (NIR) on arthropods”, report commissioned by the Swiss Federal Office for the Environment (FOEN). NIR effects at frequencies up to 6 GHz were found with acceptable reliability (at least moderate) for locomotion, reproduction, foraging and food storage, orientation, DNA damage, cellular stress,

93 Studies on EMF and insects: <https://www.diagnose-funk.org/1606>; <https://www.diagnose-funk.org/1607>; <https://www.diagnose-funk.org/1668>

Studies on EMF and forests: <https://www.diagnose-funk.org/publikationen/publikationen-zum-mobilfunk/magazin-kompakt>

behaviour and various bodily functions. Mulot et al.'s 2022 review for the Swiss government states:

"Anthropogenic NIR [non-ionising radiation] poses a potential threat to arthropod populations by impairing individuals' fitness, reproduction and behaviour." "NIR clearly has sublethal effects on arthropods, at both cellular and organism level."

Source: www.emfdata.org/en/studies/detail?id=784

The BEEFI study appeared in November 2023: Thill A, Cammaerts M-C, Balmori A (2023), Biological Effects of Electromagnetic Fields on Insects: a Systematic Review and Metaanalysis, Reviews on Environmental Health, www.doi.org/10.1515/reveh-2023-0072, www.emf-portal.org/de/article/52384, with a clear statement:



"Non-thermal biological effects of EMF on insects are clearly demonstrated in the laboratory." "Assessing the overall body of insect studies warrants a warning against careless expansion of further mobile infrastructure, as harmful effects on insect populations are expected, particularly considering interactions with other hazards, including high-voltage lines and artificial lighting. This could further reduce already dwindling pollinator populations and thus impose costs on humanity."

In a comprehensive review in Ornithologischer Beobachter 122/2025, biologist Erich Bächler of the Swiss Ornithological Institute shows that non-ionising radiation can cause thermal and non-thermal stress in bird embryos and nestlings, disrupt the magnetic sense and cause oxidative stress in adults. The Institute therefore explicitly recommends applying the precautionary principle at breeding sites and extending existing protection rules to birds.⁹⁴ <https://www.emfdata.org/de/studien/detail?id=928>

This means wireless-free protected areas for insects must be preserved and even designated: areas where mobile masts may not be built. In other populated areas, exposure must be reduced sufficiently to stop harming insects. More information: insekten-schuetzen.info.

5 Loss of control



These are some facts about social development shaped by digitalisation. How should we place what we are witnessing historically? The industrial

⁹⁴ Bächler E (2025): Effects of non-ionising radiation (NIR) on birds: legal situation, scientific knowledge and recommendations for bird conservation. Ornithologischer Beobachter, 122. <https://diagnose-funk.org/2373>

revolution of the nineteenth century brought progress and destruction. Modern capitalism, which emerged from it, brought us the climate catastrophe and species extinction through its compulsion for growth and mass consumption, undermining the foundations of human existence. Over the past century, cities and landscapes were concreted over for cars, air was polluted and wars for oil have continued to this day. Digital transformation for hyperconsumption continues the destruction of the first industrial revolution. Sociologist Harald Welzer sums it up:

*"Looking at all this reveals a cascade of problems, not one of which can be solved through digitalisation. Add environmental destruction, climate change, land grabbing and all the other consequences of hyperconsumption with its unrestrained logic of expansion, and the opposite becomes clear: directly intertwined with the consumption of goods and services, digitalisation is simply a radical continuation of the growth-based economic programme, interested neither in the rational organisation of society nor in a future-compatible relationship with nature. Only the present counts, and how its circumstances can be exploited. In this respect too, the digital is fossil. It burns the future. Radically."*⁹⁵

In 2026, generative AI's rapid arrival takes this loss of control to a new, threatening level. The term gains a double meaning: we no longer merely lose control of our data to surveillance capitalism, but increasingly lose control of reality itself as a society. In a digital world that can be flooded within seconds by convincing AI fakes (deepfakes) and automated algorithms, the basis for informed democratic debate disappears. Radicalising the growth-based economic programme thus burns ecological resources and gradually undermines our autonomous freedom of decision.

Conclusion: under capitalism, digitalisation becomes a destructive force, above all because it is permeated by the ideology of growth. Its positive potential is not realised. We can now look back on well over 20 years of digitalisation. Have energy and resource consumption and CO₂ emissions declined since then?

6 Is there a solution?

What must we prevent, and what positive demands must we make?

What can we do now? Here again is the WBGU's warning: "In many respects, one must hope that the dystopia described never becomes reality. Yet precisely for this reason it must be told now, to prevent its realisation in time and make constructive use of digitalisation for a sustainable future possible."⁹⁶

⁹⁵ Harald Welzer (2016): The Smart Dictatorship, Fischer Verlag, p. 287

⁹⁶ WBGU: report "Our Digital Future", 2019, p. 305

How can we prevent this dystopia becoming reality? Digitalisation overturns every area of life and must therefore be regulated. The WBGU, German Environment Agency and think-tank documents cited in this brochure recommend ways to limit energy and resource consumption in particular. Pointless applications should not be permitted at all. Considering that about 80% of device use is entertainment, giving Neil Postman's "Amusing Ourselves to Death" new meaning, this should be the first area strictly regulated. Do we need self-driving SUVs? Do we need Wi-Fi and tablets in nurseries and primary schools?

Consumer protection ministers call for national roaming

To minimise radiation exposure and save energy in building mobile infrastructure, diagnose:funk proposes immediately feasible measures, such as national roaming - one network for everyone.⁹⁷ The state consumer protection ministers' conference in Konstanz endorsed this in June 2023. It could substantially reduce radiation and energy consumption. First, every municipality and rural area must have comprehensive fibre-optic coverage. diagnose:funk has long urged the responsible Bundestag members to support

- Requiring every operator to provide national roaming: one network for everyone
- Comprehensive expansion of fibre-optic networks
- Promoting energy-efficient projects separating indoor and outdoor provision, without irradiating homes
- Promoting new technologies such as OWC/VLC communication using light/infrared.

NO to turning the city into industry's business sector and a monitored zone.

What can each of us do locally? Give up smartphones? This is almost impossible, as people are increasingly excluded from public life without one. That is unacceptable. Heribert Prantl comments in "Snooping Apps. Freedom Includes Choosing Between Digital and Analogue Life" (Süddeutsche Zeitung, 8 December 2023). He calls for Article 3(3) of Germany's Basic Law to include the right to analogue life: "Basic services and public provision for a person must not depend on using digital offerings." He warns against surveillance capitalism: "Access to fundamental rights must be possible without a surveillance apparatus called a smartphone."

The Smart City is intended to turn municipalities into an ICT business and consumption sector and a vast surveillance zone. Urban planners Bauriedl/Strüver write in "Smart City. Urban Studies": "The Smart City's supposed citizen orientation can therefore be exposed merely as camouflage for 'buy more' strategies."

⁹⁷ How can the German government make our mobile communications healthier? diagnose:funk presents proposals to members of parliament and the government: <https://diagnose-funk.org/2183>

⁹⁸ In the Smart City, nobody can participate in public life without a smartphone and surrendering their data. China and Orwell send their regards. "If people need digital prostheses to become Smart City citizens, what happens to those without them?" the planners ask.

Support political solutions that can and must begin locally. Everything changes, but nothing changes by itself. There is no shortage of visions or feasible alternatives. Councils and environmental associations must seriously address the consequences of digital transformation. The mistakes of the 1960s car boom and urban motorways must not be repeated as a digitalisation boom for data highways.

We must therefore ask locally:

- Is there public participation in the work of digitalisation departments?
- How will our data and privacy be protected?
- Will a report be prepared on the energy and resource consumption of the proposed Smart City?
- Will mobile infrastructure expansion use radiation-minimising indoor and outdoor technologies?
- Will the right to analogue life without a smartphone, and analogue public services, continue to be guaranteed for all citizens?

Alternatives exist! We must and can stop developments that will cause irreversible harm to people and nature. Help us do so!

Note

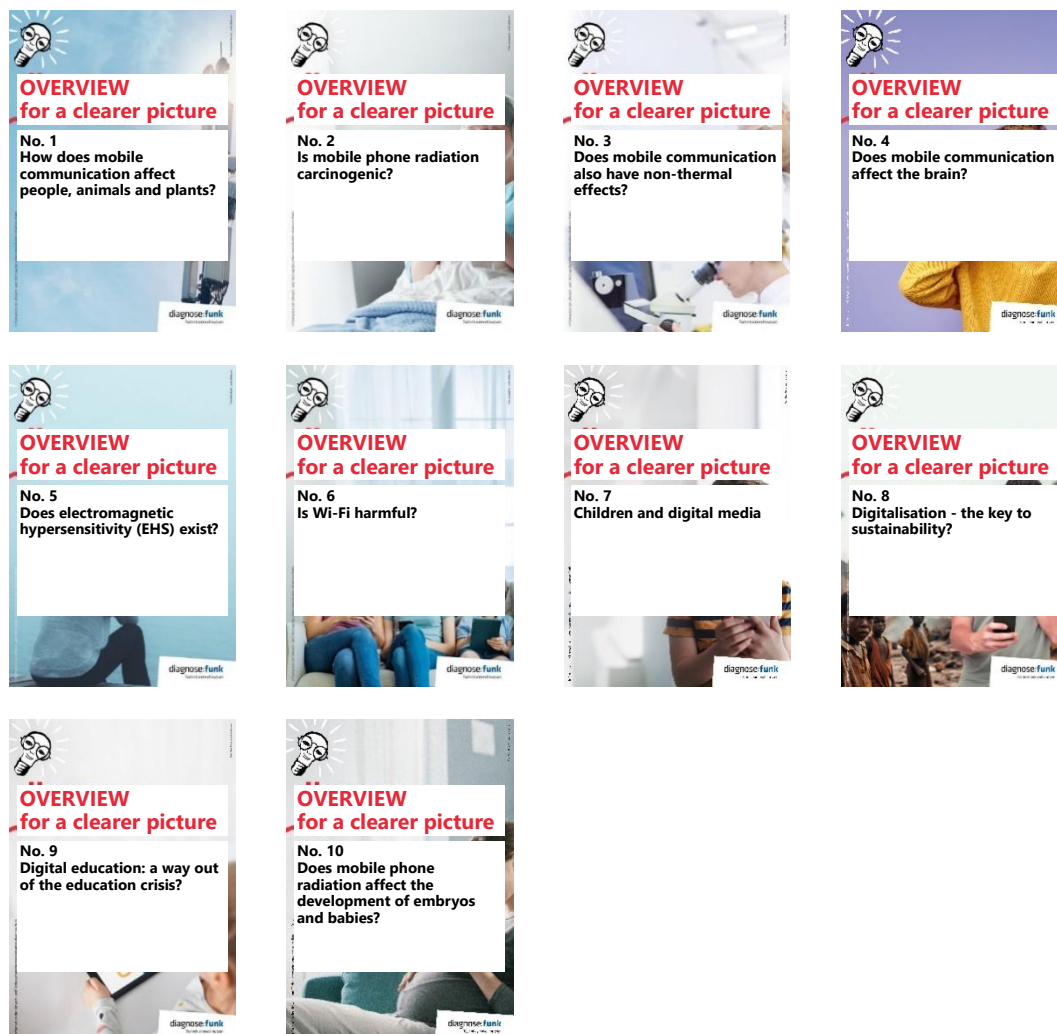
This Overview is based on a lecture Peter Hensinger gave in 2024 to BUND Ditzingen near Stuttgart.

Overview No. 7 discusses the effects of digitalising nurseries and schools.

Please also see our article series "Digitalisation, Mobile Communications, 5G and Their Effects on the Climate" at <https://diagnose-funk.org/1752>

98 Bauriedl/Strüver (2018): "Smart City. Urban Studies" - Critical Perspectives on Digitalisation in Cities (Urban Studies), transcript Verlag

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