



Digitalisation and sustainability

Position paper

Calls by the Parliamentary Advisory Council on Sustainable Development regarding political action to shape digitalisation in a sustainable way

1. The digital transformation requires resolute and competent action by policy-makers to ensure that it develops in line with the Sustainable Development Goals. Digital policy must align digitalisation with the principles of the 2030 Agenda and implement these principles “in, with and by Germany”.
 - The debate about how to shape digitalisation must take place within Germany. Nonetheless, the European and international dimension must always be taken into account.
 - Digital technologies must be used as a tool to address social, environmental and economic challenges. However, digitalisation must not be seen as an end in itself. In other words: the use of digital technologies must be carefully considered in view of their positive and negative effects on the environment, society and the economy, and compliance with existing legal requirements, e.g. in data protection law, is essential.
 - Policy-making in relation to digitalisation must be built on an in-depth and transparent exchange of knowledge between public stakeholders (universities, non-university research institutes, public authorities) and private stakeholders (businesses in the tech industry) and in cooperation with civil society, and it must be based on scientific research into the environmental, social, economic and global impacts of digitalisation. Greater support should be provided for studies examining these issues. In international discussions on digital policy, greater use should be made of the multi-stakeholder approach, which has proved to be effective.
2. Securing individual and equal access for all to the benefits of digitalisation is a key issue in ensuring it is sustainable. We are therefore calling for digitalisation to be made accessible to everyone, irrespective of where they live and their social environment. At the same time, digital solutions should be the primary, not the sole, means of communication and participation in society, with efficient non-digital solutions also available.
 - Functioning (broadband) infrastructure is a prerequisite for equal participation and a key issue for public services in the 21st century. However, access issues also affect policy-making on net neutrality, gender issues, etc.
 - Individual and societal participation in digitalisation should be specifically regulated by participatory processes, among other things.



3. If digitalisation is to be socially and environmentally compatible, a fundamental change is needed in the consumption and production of digital devices and in software development. For, given the worldwide expansion in the use of mobile devices and their shortening lifecycles (obsolescence), digitalisation is based to a large extent on a depletion of resources which is environmentally damaging and takes place without regard for human dignity. One potential solution is to extend devices' lifecycles and create an ideally zero-waste, circular value chain.
 - In this context, political and societal solutions are needed to address the unequal global distribution of the eco-social costs of digitalisation, which are borne to a large extent by the people and the environment of emerging economies and developing countries.
4. We want digitalisation to serve the climate, the environment, our limited planetary resources and nature.
 - If digitalisation is to be shaped in a sustainable way, it is important to keep in mind that the shift from analogue to digital solutions is not intrinsically sustainable in economic, environmental and social terms. On the contrary, there has been a huge rise in IT-related electricity and resource consumption. At the same time, IT and digitalisation offer many opportunities. A clear framework is needed to encourage sustainable innovation and prevent rebound effects.
5. In the global economic system, digitalisation has led to monopolies and a strong concentration of power. This is due to the combination of digitalisation's enormous financial potential for value creation based on large amounts of data and the lack of political action to shape digitalisation so far.
 - One key area for political action is data usage rights for personal and non-personal data, which need to be debated by society as a whole and legally regulated.
 - To counter the monopoly positions of the major IT companies, investment in alternative solutions, in free and open systems, should be boosted and public procurement law should be reformed. One approach to achieving this is to equip smart systems (energy, water, waste and traffic management, etc.) in towns and cities with open source software and hardware and open data solutions.



Introduction

New communication and information technologies, connectivity between people and things and between different objects, and related topics such as the Internet of Things, dematerialisation, the Smart City, robotisation, automation, smart solutions, Big Data, algorithms, artificial intelligence (KI), open source, data protection and IT security, autonomous vehicles – all of these issues are key subjects for discussion and leverage points for political action to shape digitalisation.

The digital transformation and the rapid pace at which it is taking place are leading to far-reaching, disruptive change processes in society. The transformative potential of digital technologies offers valuable opportunities, but also harbours significant risks. The varied rebound effects and interdependencies, in particular, require political management to promote the sustainable development of our society, environment and economy. Policy-makers, businesses and civil society are therefore facing the vital task of taking fundamental and resolute action to shape digitalisation in the spirit of sustainability. To date, digital technologies have been developed and controlled by a small number of (financially) powerful companies, largely without active political guidance. However, monopolies should be seen as a threat to fair competition in digital markets, free pricing and our economic system, and thus also as a threat to sustainable development.

The aim must be to make forward-looking use of new technologies to promote sustainable development. To this end, as policy-makers seek to shape the digital transformation, social, environmental and economic factors must be assessed in terms of the wellbeing of our citizens. The following questions, with which the Study Commission on Artificial Intelligence, for example, has long been grappling, are key in this context: What social, environmental and economic action is needed? How can digital technologies help us to counter failings and undesirable developments? For what purposes do we want to use technologies? A technology-based approach only helps to promote sustainable development if it is clear that these aims can be achieved through digitalisation.

In this paper, we intend, in our capacity as members of the German Bundestag's Parliamentary Advisory Council on Sustainable Development, to set out our position on the various intersections between digitalisation and sustainability.

1. Social and societal aspects of digitalisation: making technology work for the public and for democracy

The fundamental principle in policy-making on digitalisation must be that its social, environmental and economic benefits must be accessible to all. The nationwide rollout of high-speed internet and equal access to digital infrastructure are essential to achieving this. Like a broadband internet connection, mobile internet access is indispensable today for participation in society and is part of what are termed "vital e-services". This is the only way to create equivalent development opportunities and thus establish the conditions for fair competition and equal enjoyment of the benefits of changed forms of work.

Access to connected communication and information technologies opens up opportunities for participation in politics and society. At the same time, regarding the large amount of online information and data, there is a lack of review mechanisms for the at times unhindered propagation of content and reproduction of content over long periods of time, for the non-



transparent means used to influence discourse and the formation of opinions online, and mechanisms to correct or erase false information. Large digital companies have immense influence on the formation of public opinion, and this has a negative impact on media diversity and accelerates concentration processes. Against this background, it is no longer a question of whether quality journalism should receive greater support at local, regional and national level; it is only a question of how this should be achieved. A separation must be maintained between the media and the state in the context of such support.

This is exactly where political action is needed to shape digitalisation, to ensure the technologies work for all groups in society and for democracy. The use of freely available open source software and open data creates opportunities for participation and development.

Furthermore, digitalisation, and in particular new developments in the use of AI, is leading to new scientific and research findings, which are being applied in medicine or public services, for example. Online services in the e-government structures of public administrations are paving the way for cuts to bureaucratic procedures, waiting times and red tape. Online higher and continuing education courses are enabling people to learn anywhere and at any time. Telemedicine can play a major part in enabling people to consult a doctor no matter where they are. In the long-term care sector, administrative procedures can also be digitalised, for example, leaving care workers with more time for those in need of care.

That said, there are also limits to these trends. At the current stage of technical development, telemedicine services are no substitute for a thorough medical examination. Online education programmes are not a substitute for classroom learning in all areas. It is also essential not to ignore the issue of societal participation in this context. Digital access to services must be organised in such a way that older people, too, can understand and use the processes. Broad usability and accessibility must form the basis for these kinds of innovative processes.

In the current Digital Pact for Schools, the Federal Government sets out the following guiding principle: “Skills are nothing without equipment – and equipment is nothing without skills”. We note that the digital skills which are needed are not only comprehensive and varied; they are also changing as the transformation progresses. Software literacy and the ability to confidently navigate social media and the virtual world are necessary first steps. However, the road to a digitally literate society also requires targeted training to equip people with a basic understanding of digital issues and to empower them to deal with autonomous systems, stochastic Big Data issues and other new technologies. Open source software and open educational resources (OER) can help to promote comprehension of and learning about digitalisation (e.g. in schools). We therefore recommend that the Federal Government should, in line with its guiding principle, intensify the expansion of digital infrastructure and rapidly launch an ambitious OER strategy. We also regard it as essential to provide comprehensive support for the development of digital skills. Alongside the Digital Pact, research projects on digital education and its effects in lessons should therefore also be promoted. To support teachers in the development of lesson plans, cooperation with scientific experts should be encouraged and steps should be taken to make it easier for such experts to move into teaching. The Digital Council should make skills development a priority in its discussions and, where appropriate, consult experts in this field.

The development of digitalisation is being driven forward to a large extent by the research and scientific community. The next major innovative steps are already clear: AI will play an



increasingly important role in day-to-day life. The Federal Government's "AI made in Germany" strategy contains initial support for AI applications to benefit the environment and climate. This support must be ambitiously expanded and implemented. The cross-cutting issue of security, in particular, is enshrined in the implementation strategy as a fundamental prerequisite for sustainable and successful digitalisation.

Startups play a major role in bridging the gap between research and application. The founding of businesses in this field should therefore be supported, as startups are incredibly important for innovation in the digital sector. They often do not carry out primary research, but instead concentrate on how the research findings of universities, for example, can be used in business models.

2. Eco-social costs of digitalisation in terms of the depletion of resources

Computers, smartphones or (smart) cars – every day, we use products which contain a vast number of mineral resources and electronic components, which in some cases consist of precious metals, rare metals or rare earths. Today, well over half of the world's population is already online and using digital devices – and this proportion is growing rapidly. Constant technological advances incentivise affluent consumers to buy new devices. Moreover, in 2020 there are expected to be around 20 billion connected devices in the Internet of Things (IoT)¹. As devices become increasingly prevalent, our consumption is leading to ever-growing industrial demand for raw materials. The short renewal cycles encourage our rising consumption and industry's demand for raw materials. The short lifespan of devices poses a particular problem which is further exacerbated by planned obsolescence, hardware that cannot be repaired and a lack of software updates. In addition, the low recycling rate also leads to valuable resources being lost from the production cycle for a long time. We are calling for clear statutory provisions in this area.

As a result, more and more valuable and scarce resources are being consumed; in some cases, the extraction of these raw materials causes severe environmental damage such as land degradation, water scarcity or biodiversity loss, which compromises ecosystems' natural function and resilience. The social and environmental impacts are very unevenly distributed worldwide. People living in affected areas (often in developing countries and emerging economies) suffer from these environmental consequences. The extraction of raw materials is also often linked to conflicts and serious human rights violations.

The EU's Conflict Minerals Regulation, which will enter into force from 2021, establishes binding due diligence obligations for importers of the conflict minerals tin, tantalum, tungsten and gold, and represents a first step towards a more sustainable, environmentally friendly and human rights-compliant approach to extraction at extraction and production sites worldwide. More widely, however, legal provisions must be expanded and greater responsibility must be placed on businesses. At the same time, the production and extraction countries, especially emerging economies and developing countries, must be able to benefit from the extraction of

¹ See: <https://de.statista.com/statistik/daten/studie/537093/umfrage/anzahl-der-vernetzten-geraete-im-internet-der-dinge-iot-weltweit/>.



raw materials in a manner which is more sustainable not only in environmental and social terms, but also economic terms.

We attach great importance to the framework established by the Federal Government for compliance with human rights due diligence requirements throughout global supply and value chains. A multilateral approach must be developed at European and international level for sanctions to enforce good governance and respect for human rights.

To protect natural resources, an ideally zero-waste, circular value chain must be created. To achieve this, we need binding regulations on sustainable production methods and business models for the recovery of raw materials. The Federal Government should enshrine in law targets and incentives for sustainable resource recovery and waste avoidance in the digital sector. Particular attention must be devoted to the significance for devices of the obsolescence and reusability of the material used.

New strategies and innovations in product development are therefore needed. Whenever a new product is planned, sustainable solutions such as a modular design allowing technical upgrades, better reparability, replaceability (removable batteries) or recycling-friendly design should be at the forefront of considerations. The aim must be to enable devices to be used for longer. To ensure electronic devices are returned to the resource cycle, we need sophisticated return systems. The circular economy must be consistently developed and expanded as an economic approach geared towards sustainability, with all waste being returned to the production process as high-quality raw materials. Only in this way can we succeed in breaking the link between technical advances and the consumption of natural resources.

3. Environmental costs and benefits: energy consumption, grey energy, rebound effects

Digitalisation harbours great potential when it comes to addressing many of the social, environmental and economic challenges facing society. Digital solutions can offer significant improvements, whether in authorities' administrative processes, traffic management, the reduction or avoidance of waste and emissions, more efficient use of resources, greater efficiency in energy generation and use, or industrial production processes. However, digitalisation is also subject to rebound effects. This means that the increase in the consumption and production of devices and technologies offsets or even surpasses the energy, resources and space saved through the use of digital solutions. E-commerce is an ambivalent example of how digitalisation and consumption interact. On the one hand, consumption in general has risen in recent years as a result of e-commerce; on the other hand, digitalisation also offers "a variety of opportunities for sustainable consumption" (ability to obtain information, easy market access, etc.).²

In general, digitalisation is leading to a shift in resource consumption – in spatial and quantitative terms, and in relation to the resources themselves. For end consumers, digitalisation usually tends to result in a reduction in resources (books versus ebooks, letters versus email, etc.). Yet the servers, server capacity and data storage capacity required, as well

² See: Anja Höfner, Vivian Frick (eds.), Bits und Bäume, Digitalisierung nachhaltig gestalten, 2019
https://www.oekom.de/fileadmin/diverses/9783962381493_klein.pdf



as the manufacturing of the devices, consume vast quantities of grey energy and (fossil) resources.

One of the causes of the steady rise in electricity consumption in Germany and worldwide is digitalisation and, in particular, the processing of vast amounts of data. More widespread use of autonomous vehicles and 5G network expansion will also increase energy consumption many times over. Cryptocurrencies (Bitcoin, etc.), in particular, also have a high level of energy consumption and a negative environmental impact. When powered by fossil energy sources, this leads to a large amount of additional CO₂ emissions. According to the WWF, annual global CO₂ emissions from information and communications technology are currently on a par with those caused by aviation.

To reduce energy consumption, we must therefore design hardware and software structures to be more energy-efficient and use renewable energy sources for the remaining consumption. In view of the global production chains for digital devices and software, new international agreements and internationally applicable standards are needed.

Nonetheless, digitalisation in the energy sector can make a significant contribution to sustainability and to action to prevent climate change. Smart technologies allow the heat generated by servers to be used to heat surrounding rooms and buildings.

Smart meters and smart grids also have a great deal of potential. Smart grid management through flexible load shifting and measures to increase demand flexibility are used by energy supply networks to allow them to feed in adequate renewable energy and ensure the available energy is used efficiently. Another opportunity offered by digitalisation, for which a suitable framework should be sought, is automated energy trading through smart contracts. This paves the way for the development and organisation of decentralised and flexible generation, storage and consumption systems.

Digitalisation is key when it comes to the issue of sustainable consumption. Information and transparency about products' energy content and grey energy creates a level playing field between consumers and manufacturers and enables consumers to take informed purchasing decisions. The prerequisite for this is the creation of a suitable framework and the reliable provision of relevant information to enable consumers to compare products.

4. Economic aspects of digitalisation

The economic impacts of digitalisation affect the whole of humanity. They can result in positive and negative consequences in terms of sustainability. In view of the rapid pace at which this process is taking place, it is not always easy to influence it, let alone control it, and so a proactive approach must be taken to seize the opportunities and minimise the risks.

Digital connectivity facilitates the development of globalised business models by business which operate worldwide. This can lead to greater prosperity, but it also carries risks. Interdisciplinary teams from various fields can work together across various sites thanks to digitalised design and work processes. This allows valuable synergies to be achieved in terms of expert knowledge worldwide. However, the necessary security must be ensured from manipulations, etc., through hacker attacks. Greater involvement of specialists such as



engineers and IT experts in globalised development work at a great many sites around the world can create new development and synergy opportunities.

In the financial system, digitalisation has already led to fundamental changes, and the pace of change remains high, including the possible introduction of further digital payment systems (PayPal, Libra) and cryptocurrencies. This creates new opportunities. Around the world, more and more people are benefiting from access to money transfers, investments and loans. However, there are also new risks for individuals, e.g. cybercrime (money laundering), and risks for the stability of the financial system. Cryptocurrencies, in particular, are highly controversial for this reason. The mining of cryptocurrencies, their transactions and storage also consume a vast amount of energy. Companies which operate globally online can easily assign their profits to countries which are especially advantageous for them in terms of tax law.

In the digitalised world, network effects mean that existing successful providers and platforms tend to grow further. This increases the risk of monopolies developing. Many businesses with extremely high market penetration are concentrated in a few countries around the world, predominantly the United States and China. This is creating a new challenge for market regulation policy. Consistent use of existing tools offered by competition law, updates to competition law with greater attention being paid to the data power of companies in, for example, merger control procedures, stronger powers for the relevant supervisory authorities, regulations on data portability and interoperability between different providers and even an examination of the possibility of unbundling dominant IT companies and of providing targeted support for startups and IT SMEs: these are necessary prerequisites for fair competition in digital markets.

Digitalisation is transforming the world of work and the development of occupational profiles to a growing extent. Teleworking allows greater flexibility in terms of when and where work is performed, among other things, and can also make it easier to combine work and family life. However, action must also be taken here to avoid the risks of a breakdown of the boundaries on work. Rising flexibility will mean a steady increase in gaps and breaks in people's employment histories. Our social security systems are financed through contributions. Pension entitlements rise in line with the extent to which an individual's employment history is free of gaps. However, this will be increasingly rare in future. It will be more common for people to be self-employed, work in several occupations at the same time or in succession, and have bigger gaps in their employment. It is therefore important to have new or additional ways of accessing a social safety net. Education and training will be lifelong processes in future. Different models of gainful employment, such as simultaneous employment and self-employment or holding multiple jobs with different employers, must be simplified in tax, social security and bureaucratic terms. A suitable framework must be created for these new forms of employment and for self-employed individuals, but in particular for occupations which are carried out on a self-employed basis by workers who are also in employment. The current legal regulations for employees, self-employed persons and employee-like persons are inadequate to ensure comprehensive social security coverage and co-determination rights for workers in the new forms of employment emerging as a result of digitalisation.³

³ See: <https://www.bundestag.de/resource/blob/482664/0a9d764196d96fff4608b029d7b787f6/wd-6-123-16-pdf-data.pdf>



The development of automation processes has led to repetitive production processes being controlled by machines. AI will reinforce this trend by allowing non-repetitive processes to be controlled. At the same time, digitalisation is increasing the polarisation of employment structures, including through the emergence of many precarious employment models in the framework of digitally driven business models.

To ensure that the digitalisation of the economy develops in a sustainable manner, legal regulations and economic incentives are needed for IT companies. A clear framework of this kind provides planning reliability, ensures fair competition – including at international level – and protects consumers.

5. Equivalent support for digitalisation in rural and urban areas

Digitalisation offers great potential to support the sustainable development of towns and cities, municipalities and rural areas and to help them to become environmentally friendly areas which are worth living in. That said, urban and rural areas face different challenges. Nonetheless, long-term sustainable development requires equivalent support for and policy-making on digitalisation in these different areas.

As described above, digitalisation has great potential to promote an expansion in participatory processes. In urban and regional development, participatory digital systems can give the public a greater voice in planning processes in which they are directly involved. The possibilities are wide-ranging: platforms to collect possible or requested projects, platforms to compile climate data collected by the community, creation of community-generated open map data (e.g. OpenStreetMap), etc.

Rural areas are still all too often overlooked in the debate on digitalisation. “Hidden champions” located there suffer from a lack of digital infrastructure and a shortage of skilled labour. An essential prerequisite in rectifying this is a high-speed broadband internet connection for all individuals, households, public institutions, schools, SMEs and non-profit associations.

Agricultural and craft businesses, many of which are based in rural areas, are also dependent on the use of new digital technologies to stay competitive. The development and expansion of digital infrastructure and support for smaller businesses in the context of digitalisation is essential to preserve Germany’s SME sector, to enable people in rural areas to participate in digitalisation, and to encourage innovation in organisations through collaboration and mobile working. Current projects which encourage coworking spaces in rural areas should be supported and expanded.

Digitalised agricultural processes can also pave the way for more sustainable resource use through reduced and more efficient use of seeds, fertilisers and other substances. Particularly in the agricultural sector, issues such as market concentration, access to data, monopolies, open data, etc., are highly relevant. The opportunities of digitalisation are huge in this sector, but there is also a risk of dependence on monopoly companies.

The concept of the Smart City brings together many digital developments. The Smart City touches on the urban transport, energy and buildings sectors, among others, for example



through digital applications for end users in the transport sector (sharing services, local public transport, multimodal traffic control, parking space management), or through connected sensors in the Internet of Things (energy use, cycle/waste management). However, this also results in significant risks for consumers. Potential solutions which have already been put forward in the energy sector, for example, involve smart meters to improve control of sensors.

Given the diversity of digital applications, the Smart City offers varied potential applications for deployment of the latest technologies. This also means that many economic interests converge here, including those of monopoly companies. The public sector should, as a client for digital solutions in the Smart City, democratise and support open source and open data solutions in the implementation of the Smart City. These enhance transparency for users regarding data rights and diversify digital providers in general.

New personal mobility concepts such as car sharing, ride sharing, rent-a-bike schemes, e-mopeds and e-scooters offer potentially more sustainable ways of getting around in cities. However, this is only the case if these options are used instead of, rather than in addition to, private vehicles, thus freeing up public space for urban development. If the implementation is to be successful, all means of digital traffic management must be exploited or developed where necessary. A lack of studies on this subject means it is currently unclear whether these services are reducing CO₂, as intended, or whether they are actually producing larger quantities of electrical waste and thus causing new environmental problems. Better political control and management of digitalisation requires scientific analysis in this field as well as the development of adapted (including digital) transport models. In the transport sector, digitalisation can, in particular, contribute to intermodal use of different modes of transport.

6. Users' control over their data

Digital platforms, such as social media, provide services which can be used free of charge and open up new means of communication for users. The business models of these platforms are usually based on using the personal data they obtain to generate revenue, for example in the advertising market. Such clusters of Big Data are very valuable on the market. At present, the use of data is regulated through opaque and unequal processes, often to the benefit of the companies and to the detriment of end users.

Other collections of data are increasingly being produced by connected devices and sensors (some in public spaces) in the Internet of Things. A debate is needed about the societal consequences and legal regulations, in view of the datafication of society. To evaluate how data is handled, proposals must be put forward for processes allowing the whole of society to take a democratic decision on the handling of data clusters, for example in cities or municipalities, to determine how and for what purposes this data may be used. In other words, this is an area where political regulation is needed regarding data protection, data sharing and data storage, with a legal regulatory framework. This was legally enshrined in the General Data Protection Regulation, which must be continuously updated. In terms of sustainable development, it is useful to discuss and encourage users' control over their data.



7. Ethical considerations

In all reflections on digitalisation and AI, we should not lose sight of the fact that people must be at the centre of all developments.

AI is based on the principle of identifying patterns in large data collections. This is also used to make personalised suggestions regarding what to buy, what to read or what music to listen to, or to control what news items and posts are shown. As people respond on an emotional level, AI must not be allowed to manipulate our capacity for thought and judgement. One negative example is the use of “social bots”, which use fake personas and communication to influence people’s opinions.

AI systems learn from the data used to train them. In other words, the results depend directly on the data selected to feed the algorithms. If the data is skewed in terms of its distribution between, for example, men and women, this can lead to skewed algorithms which discriminate against one of these groups. The process of creating learning algorithms must therefore include precautions to prevent the potential reproduction of societal biases and failings.

It is therefore important to also discuss the boundaries and possibilities of the use of AI from an ethical perspective. What is technically feasible is not always desirable. AI must work for people, not vice-versa. In this spirit, the further development of digitalisation and AI requires a discussion about values and ethical parameters.

The use of new technologies raises far-reaching ethical, legal and societal questions. A common European framework for ethical, legal and societal issues relating to AI is indispensable. The Federal Government’s establishment of a Data Ethics Commission and the Bundestag’s Study Commission on AI were therefore initial steps in the right direction in terms of engaging in these important debates. The key questions for the Data Ethics Commission in the three fields of algorithm-based prediction and decision-making processes, artificial intelligence and data highlight the wide range of issues covered. However, the individual questions also make clear that these are only initial steps in a wide field. A discussion is therefore needed on whether and in what form the Data Ethics Commission’s mandate should be renewed when it expires. It is clear that the mandate must be expanded and revised in line with scientific findings and the issues facing society.