

#SustainableDigitalAge

WBGU

German Advisory Council on Global Change

# Transforming our World in the Digital Age

Digitalization fundamentally changes the possible pathways for future development. At the same time, implementing the 2030 Agenda for Sustainable Development requires a fundamental transformation of the economy and society. So what could be more appropriate than to harness the momentum of digitalization to launch decisive stimuli for the Transformation towards Sustainability? What interventions and collaborations does this require? And what are the risks if such a technological revolution is not properly monitored? The world society is only gradually beginning to discuss such questions. Yet it's high time. This is an invitation.



# Literacy and Agency instead of 'Hope, Horror and Hype'

Digitalization opens up a wide spectrum for our possible futures. Universal humanism in a networked global society is just as conceivable as a slide into digitally empowered totalitarianism. A look at (popular-)scientific visionary and speculative visions of the future reveals the impressive spectrum – but what kind of future do we all want to live together in?

## Natural Life-support Systems



**Hyperconsumer Society**  
Growing disinterest in the natural living environment; rising resource consumption and progressive ecocide.

## Digital Literacy



**Dark Age**  
Digitalized surveillance state ('Orwell 2084') with no digital oblivion; instead absolute boredom and outsourcing of all forms of (mental) work to machines.

## Self-determination in an Open Society

Informed (personal) responsibility; digital sovereignty and data sovereignty; free access for all to digital commons.



## Human Development



**Digitally Enhanced Human**  
Dignified, natural life, digitally enhanced with individualized offers for development and cures for suffering.



**Human Enhancement**  
Privileged elites in the cyborg race maximize their own physical and mental performance, radically intensifying societal division.

## Digital Pluralism

Strengthening of sustainable competition and collectively organized forms of economic activity with a diversity of digital commons and public-service ICT.

## Digital Sustainability Society

Comprehensive use of renewable energy; as complete a circular economy as possible; and successful dematerialization with long-term conservation of biological diversity and ecosystems.

## Power Shifts



**Digital Imperialism**  
Market and power monopolies instead of diversity; a deepening of unequal distribution; and enforcement of destructive individual interests.



## Digital Change Needs to Be Actively Shaped to Ensure Sustainable Futures

Technological revolutions are neither a force of nature nor an end in themselves, but a development driven by human beings. Digital applications should be rapidly deployed for the UN Sustainable Development Goals (SDGs). Digitalization itself also needs to be sustainably shaped, e.g. when it comes to energy and resource consumption. Otherwise, digitalization threatens to become an accelerator of the growth patterns that breach the planetary guard rails and undermine social equality and democratic processes. Digitalization should therefore be systematically placed at the service of global sustainability. This requires a strengthening of societal discourses and an ability to act: we need competence-building in parliaments and ministries, in business and civil society, in science and education – in order to energetically realize 'hopes', to avert 'horror', and to earth the 'hype'.



## Inequality



## Inclusive Digital Society

Self-determined work; social security; and digitally enhanced, improved access to medicine, education and food for all.



## Digitally Exacerbated Divides

Increasing inequalities in the distribution of wealth, income and inclusion within and in between societies.

# Understanding Digital Change

The Transformation towards Sustainability can only be understood and shaped in anticipation of the changing conditions of the Digital Age. To gain an understanding of the potential benefits and risks of new technological possibilities in the implementation of key sustainability goals, it is helpful to distinguish five core characteristics of the Digital Age. They impact on all five areas of the 2030 Agenda – people, planet, prosperity, peace and partnership – and even raise the question of the future of humanity.

## Core Characteristics of the Digital Age

### Virtuality

People can meet regardless of their physical location, collaboratively change online environments, or turn avatars into companions. Ecosystems and distant cultures can thus be experienced, but new space is also offered for dark fantasies. Virtual experience and connecting can enrich analogue living, but it can also drive a loss of reality and decoupling from physical environments.

### Interconnectedness

Technical systems, as well as people, products, processes and organizations, are becoming more and more interconnected. This development can multiply opportunities for cooperation and learning, and create qualitatively novel, networking structures. At the same time, the vulnerability of such interdependent infrastructures increases and manipulative control becomes possible.

### Arenas of Digital Change

The WBGU's report analyses concrete topics in 21 'arenas of digital change' and deduces recommendations for action and research for each. Some of these arenas are presented here.

### Knowledge Explosion

Digital methods are expanding quantitative and qualitative research. Data acquisition and processing, modelling, simulation and visualization offer new approaches to understanding and to shaping our natural and societal realities. In addition, digital methods offer novel approaches to knowledge, education and exchange across the globe.

### Autonomy

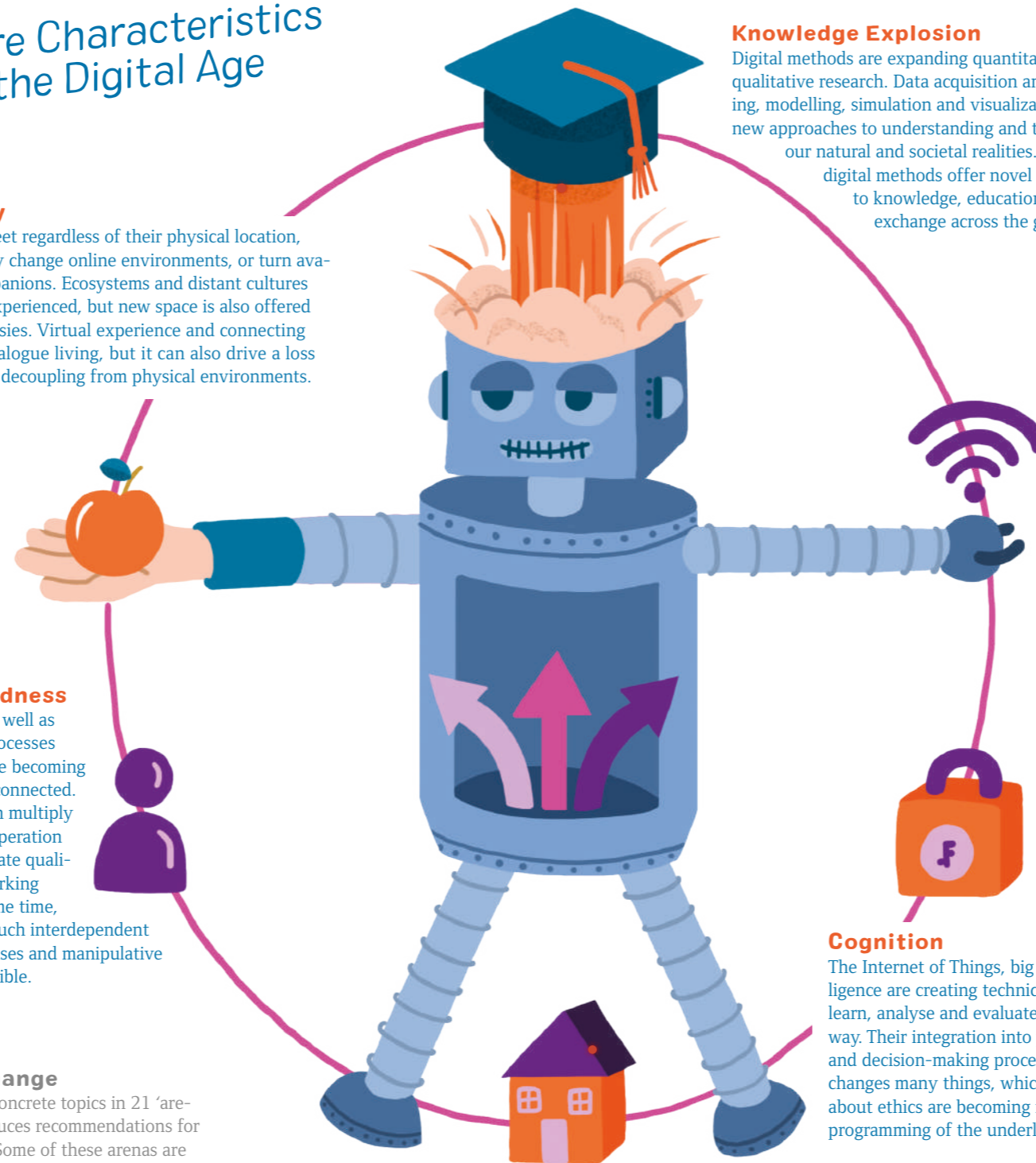
Technical systems that make autonomous decisions based on data are already being used, e.g. in industry, passenger controls or online ordering. And in the future, such autonomous technical systems will be used in many different areas: in transport, the banking system, social services, the judicial system, and political negotiation processes. They can help to make better-informed decisions – but they can also lead to a loss of control, discrimination or an undermining of privacy and freedom.

### Cognition

The Internet of Things, big data and artificial intelligence are creating technical systems that perceive, learn, analyse and evaluate in a digitally enhanced way. Their integration into production, analytical and decision-making processes fundamentally changes many things, which is why discussions about ethics are becoming more common in the programming of the underlying algorithms.

## Fundamental Changes

The underlying structures of our societies will change as fundamentally through digitalization in the 21st century as they did during the Industrial Revolution. A new energy system, new production processes, new spaces and ranges of cooperation and new knowledge are advancing this change. Unless this change is embedded in strong systems of norms and social rules, dystopian developments of the digital society are likely.



### PEOPLE

#### Digital technology as a gender bender

Despite growing political attention, gender equality has not been achieved in any country of the world. Existing gender inequalities and stereotypes are reproduced in socio-technical systems such as the internet, and this can lead to new discrimination. Equal-opportunity measures are still necessary, and not only in the context of a two-gender understanding of the issue. Digital technology offers emancipatory potential by providing access to information and networking, exposing discrimination, and raising awareness in digital spaces for experimentation.

### PEACE

#### Contain scoring

Scoring procedures map human behaviour using numbers. They are being used in more and more core areas of society (e.g. healthcare, law enforcement) as a basis for decision-making, often without the knowledge of those affected. The potential for more objective decision-making is being undermined by a lack of transparency concerning areas of application, methods and data, as well as by a lack of supervision. Individuals should maintain a right to privacy, to have decisions justified by rational reasons, and to channels for lodging objections.

### PARTNERSHIP

#### Digital commons

Digital commons are data, pieces of information, educational and knowledge artefacts in the public interest that are available to the public barrier-free. They must be protected from exclusionary use for profit maximization and from abuse. Making them accessible with a public-welfare orientation requires fundamental organizational, regulatory and financial decisions and obligations to provide information.

### PLANET

#### Sustainable agriculture

Precision agriculture can help reduce environmental damage from fertilizers and pesticide inputs and promote diversity in forms of cultivation and landscape design. The focus on data sovereignty, open data and open source aims to prevent farmers from becoming dependent on agricultural corporations. In developing countries, improved digital access to information and advice can increase the productivity and sustainability of small farms.

### PEACE

#### Protecting public discourse spaces

Digital technologies change how we communicate, how we perceive societal debates, and how we can take part in them. New forms of participation, algorithmic pre-structuring of media content, social media, and new forms of content editing are restructuring public discourse. New skills and legal and institutional frameworks are needed to ensure that the foundations of democratic opinion-forming and journalistic quality are preserved in the long term.

### PROSPERITY

#### New approaches to sustainable business management

Digital technologies enable new, collectively organized economic systems that are oriented towards the common good. These include new business models (sustainable digital entrepreneurship, green digital start-ups) and corporate forms (platform cooperatives), alternative forms of production (prosumer, commons-based peer production), and participatory value creation (sharing economy). Appropriate legal frameworks, infrastructures and economic development promotion can spread such solutions.

### PLANET

#### Monitoring biodiversity

Digitally enhanced ecosystem monitoring does not influence the biodiversity crisis directly, but it does provide valuable data and improves the monitoring of rules on use and bans aimed at preventing the overexploitation of biological resources. A global biodiversity monitoring system with semi-automated inventories of species and ecosystem services is becoming more realistic and requires robust data-protection rules.

### PARTNERSHIP

#### International division of labour

The ongoing digital structural transformation in the international division of labour is changing the role of developing countries and emerging economies. Unequivocal conclusions are currently limited. On the one hand, there are large potential job losses due to digitally supported automation and production relocation processes; on the other, new markets are accessible, primarily via digital platforms.

# Shaping the Digital Age Sustainably

Only if the use of digital technologies is embedded in a strategy of sustainable development can it make a positive contribution to our common digital future.



Sustaining the Natural Life-support Systems

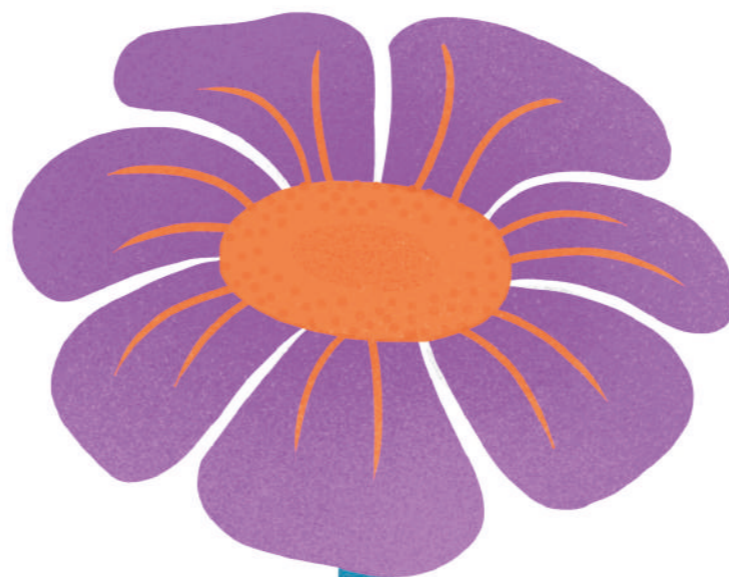
Dignity

Eigenart

Inclusion

## The Normative Compass

The WGBU's normative compass serves as a guiding concept. In addition to the sustaining of the natural life-support systems, the comprehensive inclusion of all people and *Eigenart* (a German word meaning 'character') in the sense of diversity and creativity, it also comprises human dignity as a key category.



## Societal 'update'

There have long been demands for sustainability to be embedded as a cross-cutting task in political and societal institutions, but they have still not been sufficiently implemented. Combined with digital literacy, a systematic modernization programme can develop for research, corporations, public institutions and ministries right up to EU and the UN.

## Establish a model for digitalized sustainability societies

China currently illustrates the dangers of interlinking state power with digital tools (social scoring). And in the USA one can observe the effects of interlinkage between the economic dominance of a few corporations and control over digital infrastructures. Digitalized sustainability societies need democratic and market-economy structures, the protection both of public spaces and of their citizens' privacy, as well as strong civil-society actors as advocates of civil rights and the common good. By systemically combining long-term political strategies for sustainable development and for digital change, the EU can give the global technology race a common-good-oriented character. Thought on technological innovations should be merged with thought on social, cultural and institutional innovations.

## Provide public-service ICT and establish digital commons

As part of basic public services, all people should have non-discriminatory and barrier-free access to ICT infrastructures, to reliable and high-quality data, information, services and discourse spaces. Data protection and data security should be guaranteed technically and organizationally.

## Create inclusive discourse arenas

Inclusive 'discourse arenas' should be set up to discuss digital-ethical topics, key future issues relating to a broad understanding of sustainability, and fundamental questions about the future of being human.

## Strengthen research and innovation sustainably

Both basic transformation research and transdisciplinary and application-oriented transformative research for digital change should be strengthened. Responsible innovation strategies should systematically integrate ethical and sustainability aspects into in-house corporate research.

# Sustainability in the Digital Age Beyond 2030!

Many SDGs will remain relevant beyond 2030. The sustainability agenda therefore needs to be rethought and further developed over the long-term in the context of digital change. The UN should prepare in good time for these challenges. It is a question of the prospects of a networked world society that lives within planetary guard rails and is based on global solidarity, strengthened democracies and massively reduced inequalities. Appropriate measures for this would be:

## Charter

Adoption of a charter of the international community entitled 'Our Common Digital Future' containing principles and guard rails for the digitalized sustainability society.

*WGBU.de / charter*



## UN Summit

Convening of a UN summit in 2022 - i.e. 30 years after the Rio Earth Summit - to lay the initial foundations for continuing the sustainability agenda beyond 2030.

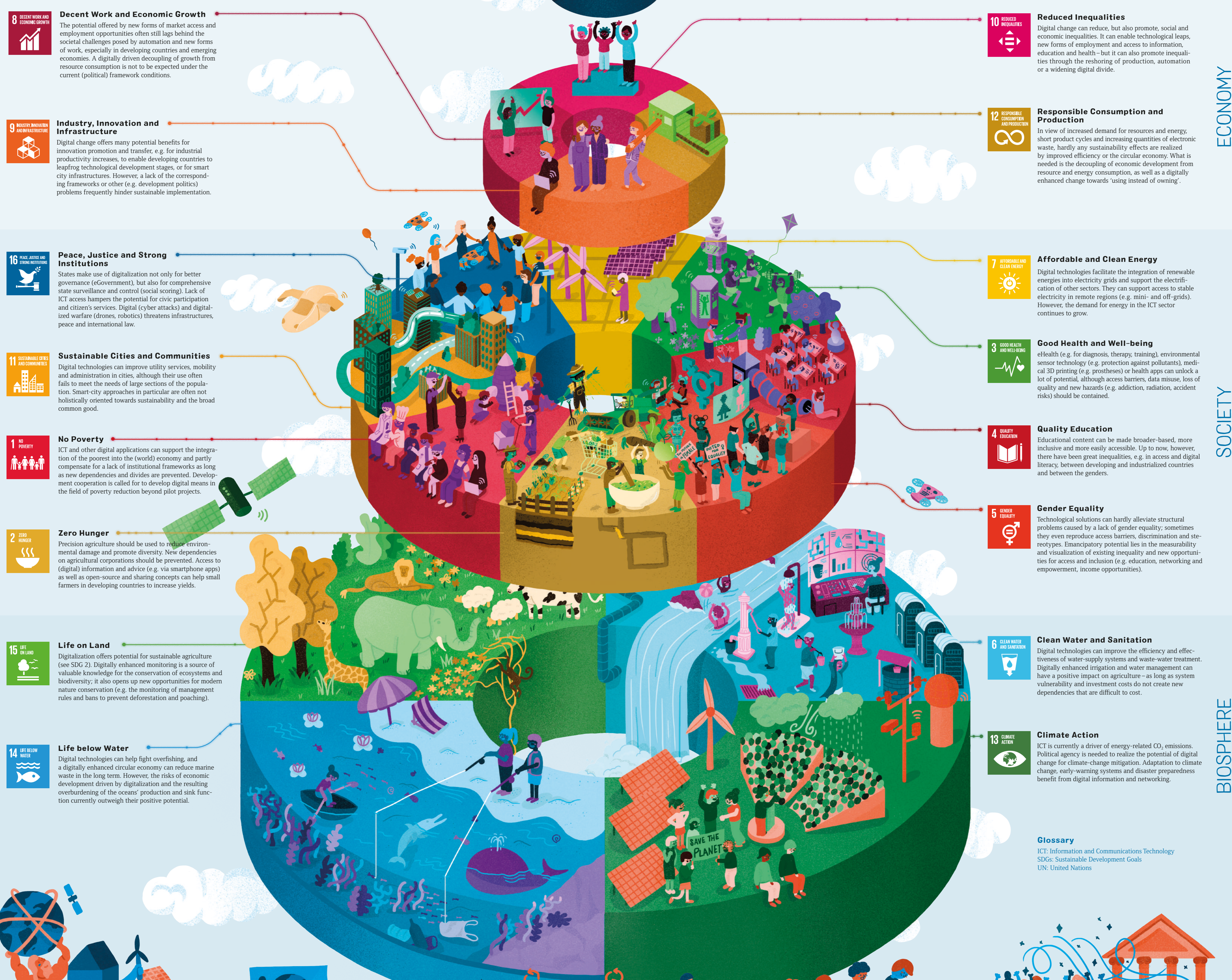
## Decade of Action

Everyone must play a part in order to make the coming years up to 2030 a powerful decade of implementation for sustainable development. The Digital Age is the age of networking - and many old and new collaborations, pioneers and alliances will be needed to initiate a worldwide trend reversal towards a digitalized sustainability society.



# Our Common Digital Future

'Our Common Future' was the title of the Brundtland Report, which was published by the UN in 1987. It formed the basis for a worldwide discussion on sustainability. The 2030 Agenda by the UN, with its 17 Sustainable Development Goals (SDGs), is entitled 'Transforming Our World'. In view of the changes, often described as disruptive, caused by the digital technology revolution, the WBGU asks how digitalization relates to the Transformation towards Sustainability. This chart illustrates the WBGU's assessments of the current state of digitalization in relation to achieving the SDGs.



**8 DECENT WORK AND ECONOMIC GROWTH**  
**Decent Work and Economic Growth**  
The potential offered by new forms of market access and employment opportunities often still lags behind the societal challenges posed by automation and new forms of work, especially in developing countries and emerging economies. A digitally driven decoupling of growth from resource consumption is not to be expected under the current (political) framework conditions.

**9 INDUSTRY, INNOVATION AND INFRASTRUCTURE**  
**Industry, Innovation and Infrastructure**  
Digital change offers many potential benefits for innovation promotion and transfer, e.g. for industrial productivity increases, to enable developing countries to leapfrog technological development stages, or for smart city infrastructures. However, a lack of the corresponding frameworks or other (e.g. development politics) problems frequently hinder sustainable implementation.

**16 PEACE, JUSTICE AND STRONG INSTITUTIONS**  
**Peace, Justice and Strong Institutions**  
States make use of digitalization not only for better governance (eGovernment), but also for comprehensive state surveillance and control (social scoring). Lack of ICT access hampers the potential for civic participation and citizen's services. Digital (cyber attacks) and digitalized warfare (drones, robotics) threatens infrastructures, peace and international law.

**11 SUSTAINABLE CITIES AND COMMUNITIES**  
**Sustainable Cities and Communities**  
Digital technologies can improve utility services, mobility and administration in cities, although their use often fails to meet the needs of large sections of the population. Smart-city approaches in particular are often not holistically oriented towards sustainability and the broad common good.

**1 NO POVERTY**  
**No Poverty**  
ICT and other digital applications can support the integration of the poorest into the (world) economy and partly compensate for a lack of institutional frameworks as long as new dependencies and divides are prevented. Development cooperation is called for to develop digital means in the field of poverty reduction beyond pilot projects.

**2 ZERO HUNGER**  
**Zero Hunger**  
Precision agriculture should be used to reduce environmental damage and promote diversity. New dependencies on agricultural corporations should be prevented. Access to (digital) information and advice (e.g. via smartphone apps) as well as open-source and sharing concepts can help small farmers in developing countries to increase yields.

**15 LIFE ON LAND**  
**Life on Land**  
Digitalization offers potential for sustainable agriculture (see SDG 2). Digitally enhanced monitoring is a source of valuable knowledge for the conservation of ecosystems and biodiversity; it also opens up new opportunities for modern nature conservation (e.g. the monitoring of management rules and bans to prevent deforestation and poaching).

**14 LIFE BELOW WATER**  
**Life below Water**  
Digital technologies can help fight overfishing, and a digitally enhanced circular economy can reduce marine waste in the long term. However, the risks of economic development driven by digitalization and the resulting overburdening of the oceans' production and sink function currently outweigh their positive potential.

**17 PARTNERSHIPS FOR THE GOALS**  
**Partnerships for the Goals**  
Political will to cooperate, financial resources and a suitable institutional framework are prerequisites for partnerships aimed at achieving the SDGs. Although digital means can help to improve cooperation and the transfer of knowledge and technology, they are still underused overall.

**10 REDUCED INEQUALITIES**  
**Reduced Inequalities**  
Digital change can reduce, but also promote, social and economic inequalities. It can enable technological leaps, new forms of employment and access to information, education and health—but it can also promote inequalities through the reshoring of production, automation or a widening digital divide.

**12 RESPONSIBLE CONSUMPTION AND PRODUCTION**  
**Responsible Consumption and Production**  
In view of increased demand for resources and energy, short product cycles and increasing quantities of electronic waste, hardly any sustainability effects are realized by improved efficiency or the circular economy. What is needed is the decoupling of economic development from resource and energy consumption, as well as a digitally enhanced change towards 'using instead of owning'.

**7 AFFORDABLE AND CLEAN ENERGY**  
**Affordable and Clean Energy**  
Digital technologies facilitate the integration of renewable energies into electricity grids and support the electrification of other sectors. They can support access to stable electricity in remote regions (e.g. mini- and off-grids). However, the demand for energy in the ICT sector continues to grow.

**3 GOOD HEALTH AND WELL-BEING**  
**Good Health and Well-being**  
eHealth (e.g. for diagnosis, therapy, training), environmental sensor technology (e.g. protection against pollutants), medical 3D printing (e.g. prostheses) or health apps can unlock a lot of potential, although access barriers, data misuse, loss of quality and new hazards (e.g. addiction, radiation, accident risks) should be contained.

**4 QUALITY EDUCATION**  
**Quality Education**  
Educational content can be made broader-based, more inclusive and more easily accessible. Up to now, however, there have been great inequalities, e.g. in access and digital literacy, between developing and industrialized countries and between the genders.

**5 GENDER EQUALITY**  
**Gender Equality**  
Technological solutions can hardly alleviate structural problems caused by a lack of gender equality; sometimes they even reproduce access barriers, discrimination and stereotypes. Emancipatory potential lies in the measurability and visualization of existing inequality and new opportunities for access and inclusion (e.g. education, networking and empowerment, income opportunities).

**6 CLEAN WATER AND SANITATION**  
**Clean Water and Sanitation**  
Digital technologies can improve the efficiency and effectiveness of water-supply systems and waste-water treatment. Digitally enhanced irrigation and water management can have a positive impact on agriculture—as long as system vulnerability and investment costs do not create new dependencies that are difficult to cost.

**13 CLIMATE ACTION**  
**Climate Action**  
ICT is currently a driver of energy-related CO<sub>2</sub> emissions. Political agency is needed to realize the potential of digital change for climate-change mitigation. Adaptation to climate change, early-warning systems and disaster preparedness benefit from digital information and networking.

**Glossary**  
ICT: Information and Communications Technology  
SDGs: Sustainable Development Goals  
UN: United Nations



**PLANET**  
**Digital Innovation Needs Direction and a Framework**  
It is an open question whether digitalization will contribute to climate-change mitigation, or rather undermine it. Digital technologies can be used either to technically implement the global transformation of energy systems—or to advance the exploration of fossil fuels. They can enable efficient climate-change mitigation through smart applications in buildings, industry, transport and agriculture, but they can equally cause further increases in emissions by promoting economic activity. It is therefore of the utmost urgency to create global frameworks for placing digitalization at the service of climate-change mitigation and environmental protection and thus to give a sustainable direction to global innovation policy.

**PEOPLE**  
**Future-proof Education for Digital Literacy**  
Science and education systems must be consistently geared to enabling people to become proactive agents of both digital change and the Transformation towards Sustainability. To this end, they must have access to the relevant knowledge, skills and learning environments. Approaches to digital education should be combined with those of Education for Sustainable Development and Global Citizen Education in an integrated programme for future-proof education and transformative learning. Open data related to sustainability and transnationally networked citizen-science projects are further levers for informational literacy and participatory agency.

**PROSPERITY**  
**Establish a Digitally Supported Circular Economy Worldwide**  
Digital change is currently leading to increasing amounts and export flows of electronic waste. But it also offers great potential for an ecological transition in industry. A rapid transition from a linear and resource-intensive economy to a near-complete circular economy is a key component for such a transition. To improve longevity, reparability and recyclability, the entire life cycle of a product must be considered, starting at the design stage. Accompanying strategies for eco-sufficiency and changed consumption patterns should support this change and should correct missing or wrong policy frameworks and economic incentives.

**PEACE**  
**Charter as a Normative Reference Point**  
Global sustainable development in the Digital Age needs a strong normative point of reference in order to guarantee peace and common-good-oriented development on a global scale even in times of profound upheavals. The WBGU has submitted a draft charter to this effect comprising three core elements: First, digitalization should be shaped in line with the 2030 Agenda to achieve the SDGs. Second, beyond the 2030 Agenda, societal risks should be anticipated and avoided, in particular by protecting the common good, civil and human rights, and people's decision-making sovereignty. Third, new ethical issues relating to interactions between humans and machines are emerging; forward-looking societies should counter these with research, education and understanding.

**PARTNERSHIP**  
**Modernize Sustainability Governance**  
Digitally enhanced governance can be used to achieve greater transparency, participation, networked learning, coherence and monitoring in international and transnational sustainability politics. In addition, the knowledge base and process qualities can be improved to counter the growing pressure faced by many nation states to act and justify themselves. The establishment of a globally coordinated digital SDG data-collection system by a coordinating institution at the UN can improve the topicality, comparability and verifiability of SDG reports as well as the monitoring of the SDGs by civil society and academia. In this way, more robust early-warning systems and future-oriented innovation systems can also be built up.

PARTNERSHIPS

ECONOMY

SOCIETY

BIOSPHERE

# WBGU Contributions

In its latest report the WBGU has examined the interplay and tension between two central dynamics of change of our time: digital change and the Transformation towards Sustainability.

## **'Our Common Digital Future'** ([wbgu.de/fr2019](http://wbgu.de/fr2019))

Two policy papers highlight challenges and recommendations for the United Nations and the European Union:

## **'Digital Momentum for the UN Sustainability Agenda in the 21st Century'** ([wbgu.de/pp10en](http://wbgu.de/pp10en))

## **'A European Way to Our Common Digital Future'** ([wbgu.de/pp11en](http://wbgu.de/pp11en))

These contributions offer many further exciting approaches, analyses, messages, as well as concrete recommendations for action and research that can help us shape our common digital future in a sustainable, cooperative and responsible way. This is a task that needs all of us – up to 2030 and beyond!



## **WBGU's Mission: Science for a Sustainable Future**

Global sustainability is a decisive issue for the future. It is therefore also a scientific issue. The societal search processes for this goal require concepts that are independent of vested interests, a systematic methodology, and long-term foresight. This is why the WBGU compiles scientific analyses, develops concepts, and proposes solutions for global sustainability. This is why our thinking is systemic, our work independent and interdisciplinary. This is why we reveal ways of achieving the Great Transformation through dialogue with policy-makers, society and international organizations.

*#SustainableDigitalAge*

WBGU – German Advisory Council on Global Change

The German Federal Government set up the German Advisory Council on Global Change (WBGU) as an independent, scientific advisory body in 1992 in the run-up to the United Nations Conference on Environment and Development (Rio Earth Summit). The WBGU's task is to analyse global environmental and development problems and to develop recommendations for action and research in the quest for solutions to these problems.



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ISBN 978-3-946830-29-0  
© 2019 WBGU