

Action Plan for a Sustainable Planet in the Digital Age



This publication may be reproduced in whole or in part and in any form for educational or non-profit services without special permission from the copyright holder, provided acknowledgement of the source is made. The citation is: Coalition for Digital Environmental Sustainability (CODES). 2022. Action Plan for a Sustainable Planet in the Digital Age. <https://doi.org/10.5281/zenodo.6573509>.

No use of this publication may be made for resale or any other commercial purpose whatsoever without prior permission in writing from the Coalition for Digital Environmental Sustainability. Applications for such permission, with a statement of the purpose and extent of the reproduction, should be addressed to CODES@UN.ORG

Disclaimers

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the United Nations concerning the legal status of any country, territory or city or its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of a commercial company or product in this document does not imply endorsement by the United Nations, collaborating organizations or the authors and contributors. The use of information from this document for publicity or advertising is not permitted. Trademark names and symbols are used in an editorial fashion with no intention of infringement on trademark or copyright laws.

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the United Nations. We regret any errors or omissions that may have been unwittingly made.

© Maps, photos and illustrations as specified.

Acknowledgements

This Action Plan for a Sustainable Planet in the Digital Age has been developed through a global consultation and co-design process by the Coalition for Digital Environmental Sustainability (CODES) as a follow-up to the Secretary-General's Roadmap for Digital Cooperation. It represents a synthesis of inputs from the contributors listed in the Annex.

Executive Summary

Digitalization – the use and adoption of digital technologies – is driving massive economic, social and environmental changes. The future of humanity and the health of planet Earth depend to a large extent on how we undergo this digital transformation. We have an opportunity to drive this transformation in a manner that helps build a healthier, safer, cleaner and more equitable future, rather than one of exacerbated environmental degradation, inequality and social division. However, achieving global sustainability is not an inevitable or an obvious outcome of digitalization. Indeed, digital technologies, through their energy and material requirements and influence on consumer demands, have accelerated the exponential rise of the human impact on the natural environment that now threatens the resilience of our ecological systems, alongside worsening societal inequalities and escalating social injustice.¹ Digitalization has the potential to help transform society and business models to a more sustainable and equitable world but only if there is a conscious and deliberate effort to steer it in that direction. This Action Plan offers a vision on three systemic shifts needed to achieve this goal together with a set of 9 Impact Initiatives to spark immediate collective action and multi-stakeholder collaboration.



Coalition for Digital Environmental Sustainability (CODES)



The Coalition for Digital Environmental Sustainability (CODES), is an international multi-stakeholder alliance created in March 2021 in response to the UN Secretary General's Roadmap for Digital Cooperation. CODES' purpose is to advance digital sustainability, understood as the design, development, deployment and regulation of digital technologies to accelerate environmentally and socially sustainable development while mitigating risks and unintended consequences.² CODES is specifically striving to reorient and prioritize the application of digital technologies to meet the 2030 sustainable development agenda and to achieve the multiple global environmental agreements that have been adopted by UN Member States. Digitalization will be crucial in achieving the UN Sustainable Development Goals (SDGs) by 2030. An assessment in 2020 found 70 per cent of 169 targets base-lining the world's sustainability goals can be positively influenced using digital technology applications.^{3,4} This requires facilitating collective action that can lead to systemic transformation and to removal of barriers and perverse incentives that undermine the adoption or scaling of digital technologies for sustainability.

To date, CODES is the only entity of its scale and credibility to undertake and progress this mandate, and is uniquely positioned to facilitate this work. CODES offers an inclusive trans-national platform backed by the impartiality of the UN, where key global stakeholders across governments, private sector, academia, and civil society convene and align to forge the collective action needed to make digitalization itself sustainable and to harness digital innovations for sustainability.

The founding co-champions of CODES include the United Nations Environment Programme (UNEP), the United Nations Development Programme (UNDP), the International Science Council, the German Environment Agency, the Kenya Ministry of Environment and Forestry, Future Earth, and Sustainability in the Digital Age. The co-champions act as the Secretariat for CODES in close coordination and cooperation with the Office of the Secretary General's Envoy on Technology.



CODES Action Plan

The CODES Action Plan for a Sustainable Planet in the Digital Age marks the 50th anniversary of the Stockholm Conference on the Human Environment and the establishment of the United Nations Environment Programme (UNEP) set-up to promote global environmental sustainability. The goal of the Action Plan is to offer a vision and set of priorities to advance digital sustainability through a series of multi-stakeholder Impact Initiatives that require collective action and collaboration.

As a result of a consultative process over the past 12 months, this Action Plan describes 3 systemic shifts and 6 strategic priorities within each shift that are needed to harness digital transformation as a positive and exponential force for progressing environmentally and socially sustainable development (see Figure A). This is followed by a set of 9 global Impact Initiatives as actionable items with measurable targets that have the potential to trigger systems-level or sector-level transformations through multi-stakeholder collaboration at the regional and global scales (see Table).

This Action Plan is meant to inform the emerging set of priorities for the Global Digital Compact proposed by the UN Secretary-General's latest report "Our Common Agenda", which calls for a new landscape of digital governance and collaboration. It will also contribute to the long term legacy initiatives of the Stockholm +50 conference. The contents of this Action Plan have also been designed to inform on-going deliberations in the UN Environment Assembly, the UN Human Rights Council, the International Telecommunications Union and by the UN Development Programme linked to digital transformation and the recognized human right to a clean, healthy and sustainable environment.⁵

This Action Plan is being published with two supplements. The first supplement "Accelerating Sustainability Through Digital Transformation - Use Cases and Innovations" includes a number of use cases and innovations on digital sustainability on policies, partnerships and applications. The second supplement "Mapping Global and Regional Stakeholders Working on Digital Sustainability" includes an ongoing mapping of key international and regional stakeholders against the three shifts and 6 priorities within each shift. These supplements are living documents that will be continuously updated on www.sparkblue.org/CODES.

Three Systemic Shifts and Priorities

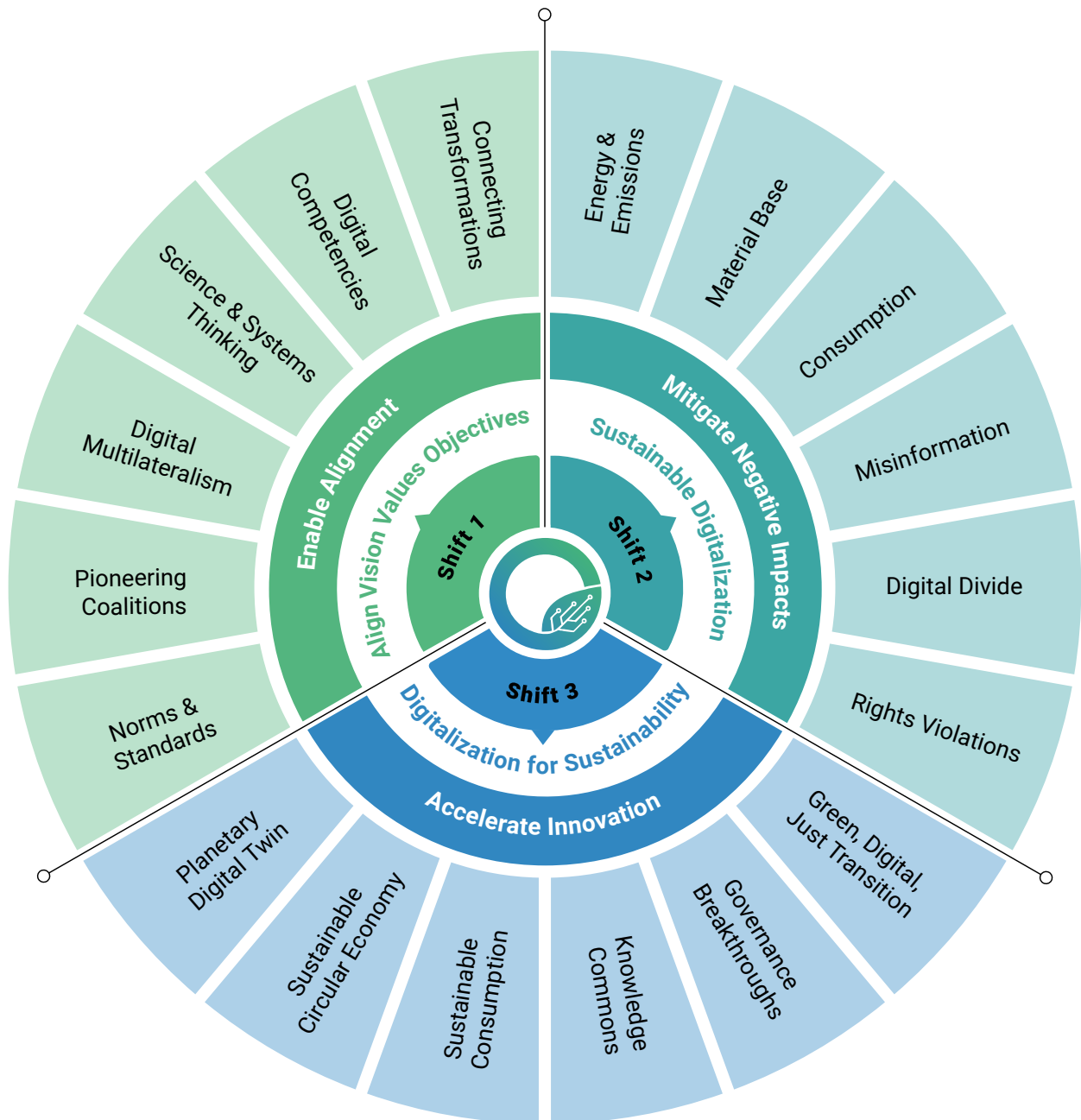


Figure A: **Three Shifts and 18 Strategic Priorities to Achieve a Sustainable Planet in the Digital Age.** These shifts and priorities were identified by CODES stakeholders through a 12 month consultation and co-creation process. To catalyze these shifts, CODES stakeholders recommended nine global Impact Initiatives requiring collective action and multi-stakeholder collaboration.

CODES Impact Initiatives

SHIFT 1	1. World Commission on Sustainability in the Digital Age	Undertake new research and/or leverage existing bodies of research to provide science-driven recommendations on accelerating sustainability in the digital age.
	2. Clearing House for Digital Sustainability Standards	Platform to co-define key standards for digital sustainability and offer a clearing house, taking into account the recommendations put forward by the World Commission and other bodies.
	3. Education for Digital Sustainable Development	Decentralized approach to develop literacy and education programmes on digital sustainability that are needs based, localized and contextualized.
SHIFT 2	4. Harmonization of Digital Companies' GHG Inventories	New international platform(s) to facilitate harmonization, interoperability and adoption of GHG inventories and reporting standards for digital companies, products and services.
	5. Sustainable Procurement and Green Digital Infrastructure Pledge	International framework to enable standardization and harmonization of sustainable procurement principles and green digital infrastructure across governments and corporations.
	6. Digital Product Passport for Circularity	Initiate the design and development of standards and pilot testing for digital product passports that track a product's climate, environmental, and social impacts throughout the value chain.
SHIFT 3	7. Digital Sustainability Innovation Hubs and Accelerators	Global network of connected and collaborative Innovation Hubs to accelerate digital sustainability innovations and offer real-world laboratories and scaling opportunities for digital sustainability solutions.
	8. Data and Assessments as Digital Public Goods for Sustainability	Open global standards and governance frameworks for environment and climate data, as digital public goods, to drive sustainability assessments, global stock taking and decision-making.
	9. Decentralized Financing of Sustainable Solutions	Decentralized financing and matchmaking for sustainability solutions, including crowdfunding, payment for ecosystem services, sustainability filters, algorithms, etc.

CODES Engagement Pathways

The founding co-champions of CODES collectively initiate and engage in multi-stakeholder consultations to pool academic, policy and industry-oriented knowledge from across the public and private entities, civil society and indigenous groups on advancing digital sustainability. CODES aims to conduct collective intelligence and co-creation processes with stakeholders as the basis for collective action, with an emphasis on diversity, inclusion and gender balance.

To date, the CODES co-champions have mapped over 240 stakeholders working on digital sustainability at the global and regions levels and have engaged over 1,000 people from 100 countries working on the digital transformation and sustainability nexus.

CODES stakeholders are invited to join and collaborate with CODES through 3, intersecting engagement pathways.

- **Catalyser:** Stakeholders seeking to engage directly with one or more of the Impact Initiatives that are proposed in the Action Plan or future iterations.
- **Action Network:** Stakeholders contributing to and leveraging the 3 shifts proposed in the Action Plan to support the progression of digital sustainability.
- **Advocates:** Stakeholders seeking to contribute their expertise to the CODES community and become an advocate for the CODES vision and values.

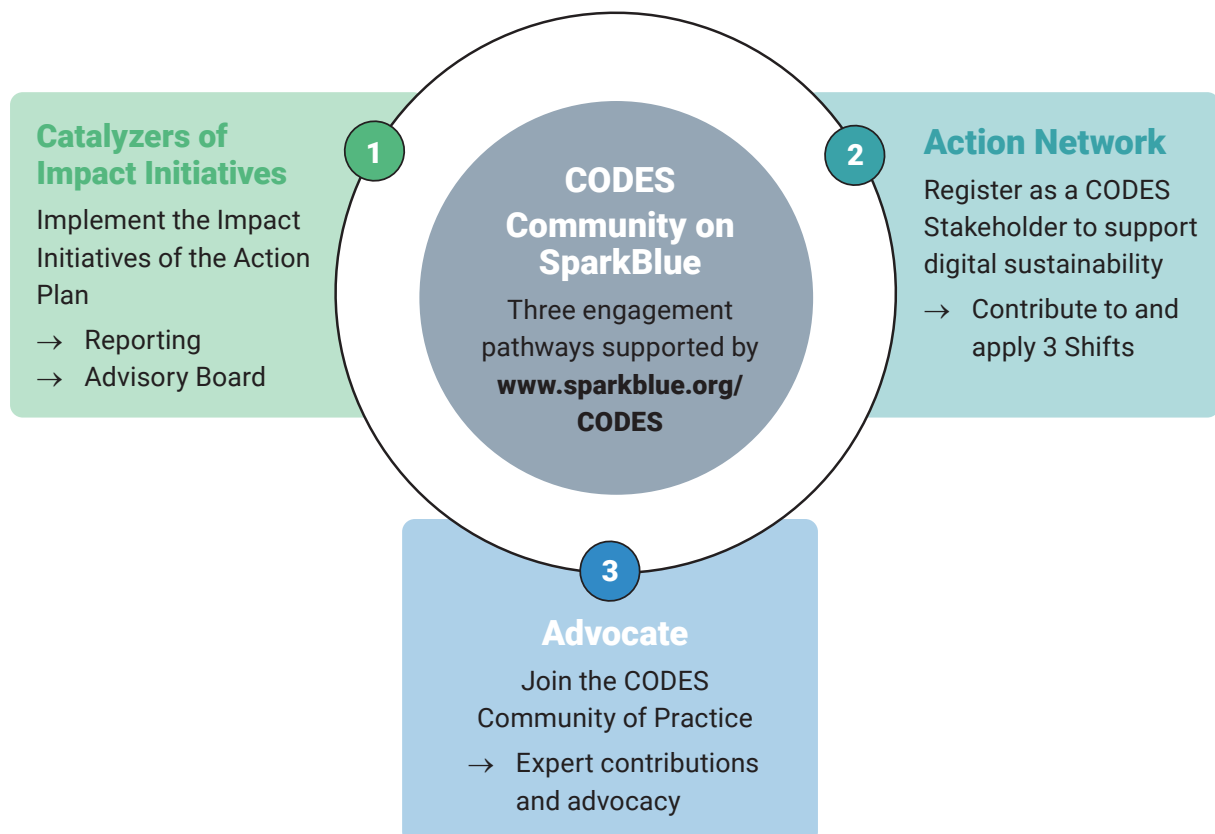




Table of Contents

Executive Summary	01
Coalition for Digital Environmental Sustainability (CODES)	03
CODES Action Plan	04
Three Systemic Shifts and Priorities	05
CODES Impact Initiatives	06
CODES Engagement Pathways	07
1. Overview: A Sustainable Planet in the Digital Age	10
What's at Stake	10
The Challenge and the Opportunity	11
The Action Plan - Seizing the Opportunity	13
2. Three Shifts for a Sustainable Planet in the Digital Age	16
Shift 1: Enable Alignment - Aligning vision, values, and objectives of the digital age with sustainable development	17
Shift 2: Mitigate Negative Impacts - Ensure sustainable digitalization to mitigate negative environmental and social impacts	20
Shift 3: Accelerate Innovation - Directing innovation efforts toward digital sustainability	24
3. Impact Initiatives for a Sustainable Planet in the Digital Age	28
Key Messages	28
Impact Initiatives	29
Pathways to engage in the CODES Action Plan	37
4. Annexures	38
Annex I: Stakeholder Mapping	39
Annex II: Summary of Digital Transformation needs	49
References	56
Contributors	60

Supplemental materials to this Action Plan include:

- **Supplement 1:** Accelerating Sustainability Through Digital Transformation - Use Cases and Innovations.
- **Supplement 2:** Mapping Global and Regional Stakeholders Working on Digital Sustainability

Overview: A Sustainable Planet in the Digital Age



What's at Stake

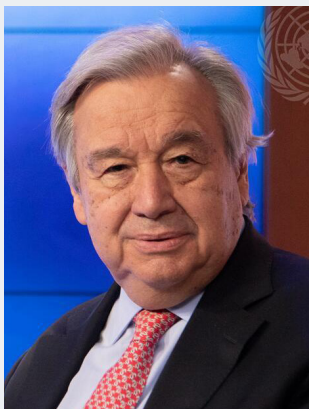
In 2015 the international community set itself 17 ambitious Sustainable Development Goals (SDGs), which are to serve as a common vision and action agenda for all countries until the year 2030.⁶ They are intended to promote human dignity, the protection of the planet, peace and prosperity for all, and to promote global partnerships. However, the SDGs 2020 Progress Report shows that the world is not on track to achieve these goals by 2030.⁷ The current trajectory of the triple planetary crises of climate change, biodiversity loss and pollution, threatens to take us beyond the limits of the earth's capacity to sustain human society at near to present levels of social or individual wellbeing.⁸ The resulting environmental crises are already being felt across the world. We now have less than ten years to achieve the SDGs, and the reality is that we will not achieve these goals by 2030 without major systems transformation. While we grapple with this understanding, digital technologies and capabilities are rapidly accelerating, with the potential to either hinder our ability to achieve the SDGs or facilitate the speed and scale of change needed.

There is a foundational sustainability question about whether humankind is capable of directing digital change for a civilizational shift towards a renewed humanism. Are we able to realize and safeguard the idea of human rights, liberal freedoms, science, rule of law, and democracy against totalitarian temptation, surveillance capitalism and human enhancement? This is an ethical endeavour that needs broad discourse and public response. What are the implications for emerging digital governance patterns that could challenge our current system of sovereign nation states? Will privacy, trust, deliberation and democratic procedures be undermined or are we heading towards civic empowerment and a transnational 'Earth system consciousness'? These are big questions, but they are imprinted in every step we take forward in further developing our digital infrastructure: how we generate and operate data, how we nudge for sustainable lifestyles, how we build transparent supply chains with safeguards, how we share knowledge, how we provide access to basic services and breakthrough technologies, how we strengthen democracy or how we as human beings define our relationship to nature. The global community needs to invest in inclusive fora and frameworks to deliberate, assess, govern and take collective action on these issues. Scientifically driven and socially embedded anticipatory assessment processes and foresight should support this endeavour.

The implications of the digital divide sit at the heart of these fundamental questions. There exist deep inequalities in the accessibility and availability of digital rights and services and a wide gap between the digitally connected and unconnected. According to data from the ITU, approximately 4.9 billion people – or 63 per cent of the world's population – used the Internet in 2021.⁹ This represents an increase of 17 per cent since 2019, with 782 million people estimated to have come online during that period. Of the 2.9 billion people off-line, 96 per cent live in developing countries. Indeed, the WEF Global Risks report for 2021 listed "digital power concentration" and "digital inequality" as number 6 and 7 on the critical short-term threat list – both representing a clear and present danger to social and political stability (see CODES Action Plan Supplement 1, Box 1).¹⁰ If digital capacities are to be leveraged for global environmental and social sustainability, the digital divide needs to be closed in a sustainable and equitable manner.

The Challenge and the Opportunity

The UN Secretary Generals' Roadmap for Digital Cooperation makes a number of key observations about the challenges and opportunities between digital technology and the evolution of society as captured by the following sentiment:



“Digital technology is shaping history. But there is also the sense that it is running away with us. Where will it take us? Will our dignity and rights be enhanced or diminished? Will our societies become more equal or less equal? Will we become more, or less, secure and safe? The answers to these questions depend on our ability to work together across disciplines and actors, across nations and political divides. We have a collective responsibility to give direction to these technologies so that we maximize benefits and curtail unintended consequences and malicious use.”

António Guterres, UN Secretary General

Photo: Eskinder Debebe / UN Photo

We are witnessing fundamental shifts in how different economic sectors define, create, and distribute value. Digital capabilities are disrupting most economic sectors including water, agriculture, energy, transport, cities and buildings (see Supplement 1, Boxes 2-8). New trans-sectoral and trans-national business models and marketplaces are emerging with often unforeseen or opaque social and environmental consequences.¹¹ New dimensions of cost optimizations, operational efficiencies, and extremely fast and cheap expansions of products and services, incentivized by rapid growth and profit are accelerating unsustainable lifestyles and values. At least 1.5 billion people consume products and services through e-commerce platforms,¹² and 60 per cent of the global population is anticipated to engage with social media by mid-2022 - roughly 4.6 billion.¹³ In 2021, global media advertising spending grew by almost 22% to reach a high of \$710 billion, with digital formats now representing 62% of total advertising sales.¹⁴ The transition to a digital economy under the current “business as usual” paradigm will increasingly enable and accelerate operating models, values and consumption behaviours that are not in line with the SDGs.

The digital sector itself is energy and materials-intensive. According to some estimates, the share of the global carbon footprint of digital gadgets, the internet and the systems supporting them is 2.3 per cent, roughly the same as global air travel.^{15,16} As the world prepares for increasingly decentralized internet models like Web 3.0, reliance on energy-intensive technologies like blockchain and AI computing could also increase. In terms of material demands, globally, the world produces as much as 50 million tons of electronic e-waste a year, while only 17.4 per cent of this e-waste is recycled.¹⁷ In order to meet the high demand for hardware, extraction of rare earth elements and other precious metals like cobalt and lithium is increasing steadily with important geopolitical implications.

Addressing these challenges is more possible than ever before. We can collectively choose to build a future in which digital technologies accelerate and scale environmental and social sustainability, underpin sustainable economies, and empower citizens and local communities. However, accelerating sustainability with digital technologies will not happen without deliberate decisions. Indeed, if governed effectively and reflexively, the emerging digital products, services, platforms and business models can help address and unlock many of the systemic level barriers and perverse incentives that have inhibited sustainable markets, behaviours and lifestyles from scaling.

The Coalition for Digital Environmental Sustainability (CODES) is a multi-stakeholder alliance formed as a follow-up to the UN Secretary General's Roadmap for Digital Cooperation. Its mission is to facilitate the needed cooperation to leverage digital transformation as a positive and exponential force for progressing environmentally and socially sustainable development, while mitigating risks and unintended consequences. The CODES Action Plan, generated through a global multi-stakeholder co-creation process with the CODES community over the past 12 months, calls for 3 systemic shifts and 6 strategic priorities across each shift that are needed to accelerate environmentally and socially sustainable development through digital transformation pathways. This is followed by a set of 9 global Impact Initiatives as actionable items and measurable targets that can be undertaken to consolidate and coordinate existing efforts to catalyse the 3 shifts during the 2022-2025 time-frame. These Initiatives have the potential to trigger systems-level or sector-level transformations through multi-stakeholder collaboration at the regional and global scales. They will require a massive, coordinated effort across actor groups, digital value chains, services, platforms and within business models. Thus redefining the ecological, social and economic objectives that are necessary for a sustainable planet in the digital age.

Definitions of Key Terms

Digital economy: The global network of economic and social activities that are enabled by digital technologies, such as the internet, mobile technology and internet of things (IoT).^{18,19}

Digital sector: Combination of manufacturing and service industries whose primary purpose is to both create and sell digital technology products, services or solutions.^{20,21}

Digitalization: Use of digital technologies to turn products and services into a digital format to drive efficiency and innovation.^{22,23}

Digital transformation: Systems-level economic, societal and environmental transformations triggered as a result of digitalization.²⁴

Digital sustainability: The design, development, deployment and regulation of digital technologies to secure sustainable economic, environmental and social development.^{25,26,27,28} In the CODES Action Plan, this refers to an overarching aim, embodying all 3 shifts of the Action Plan.

Sustainable digitalization: Digital infrastructures, software and applications that are socially responsible, ethical and environmentally sustainable throughout their lifecycle.^{29,30} In the CODES Action Plan, this refers to shift 2 and the 6 related strategic priorities.

Digitalization for sustainability: Digital innovation that seeks to proactively enable, accelerate and scale environmentally and socially sustainable development.^{31,32} In the CODES Action Plan, this refers to shift 3 and the 6 related strategic priorities.

Corporate digital responsibility: A set of practices and behaviours that help an organization use data and digital technologies in ways that are perceived as socially, economically, and environmentally responsible.³³

The Action Plan: Seizing the Opportunity

There appears to be emerging political will to address digital ethics, norms and governance as expressed in initiatives including, among others, the UN Secretary General's Roadmap for Digital Cooperation,³⁴ Our Common Agenda,³⁵ and the planned Global Digital Compact. There is now an opportunity for increased agility in the governance and execution of these initiatives that reflects the pace of change of digital advancements and a deeper sense of urgency to consolidate intersecting priorities and solicit collective multilateral stakeholder agreements. This must be accompanied by a set of priorities for advancing environmentally and socially sustainable development within a renewed social contract for the digital age.

The vision for this Action Plan is therefore to establish actionable impact initiatives that will enable environmental and social sustainability to be firmly encoded in the global digitalization efforts. The CODES community has collectively identified 3 major shifts that must be addressed for this vision to be realized. Strategic priorities to catalyse these three shifts are described in detail in Section 2 of this Action Plan. Important overarching messages and actionable Impact Initiatives to advance the strategic priorities are summarized in Section 3. The aim is to encourage the expansion of existing efforts, intersecting and coordinating parallel initiatives and catalysing new efforts. This also includes integration of the shifts and strategic priorities in relevant international processes such as the UN Environment Assembly, Stockholm +50 and the planned Global Digital Compact (Figure 1). The target audience includes national and local governments, policy makers, international organizations, private sector companies, civil society, academia, and the science community.

The first shift that is needed is to align the visions, values and objectives of digital capabilities with those of environmentally and socially sustainable development. Greater commitments to sustainability require shifts in values and norms that drive a transition beyond profit towards positive social and environmental outcomes. The mindset of maximizing shareholder value must evolve to a new set of values focusing on transparency, accountability and inclusive stakeholder engagement. A shared set of sustainability values and standards must be encoded into the design, development and deployment of digital products, services, platforms and business models. Enabling such a shift requires connecting communities, building digital competencies, embedding both science and the arts, advancing multilateral action, building pioneering coalitions, and adopting norms and standards.

The second shift is to ensure inherently sustainable digitalization. We must confront the paradox that increased reliance on digital technologies comes at an environmental cost. Indeed, digitalization is encouraging unsustainable consumption, causing environmental impacts across supply chains, increasing demands on energy and resources, entrenching and exacerbating social divides, amplifying misinformation, dislocating labour markets, exacerbating inequality within and between societies, and consolidating the power of the few over the many (see Supplement 1, Box 1)³⁶ This shift requires a focus on six problem areas entrenched in digitalization: energy and emissions, materials, consumption behaviours, misinformation, digital divides and rights violations.

The third shift is to direct and incentivize innovations towards digitalization for sustainability. Digital technology and innovation, if driven inclusively and with intention, can empower government, businesses, communities and individuals to make decisions and take action that can enable planetary sustainability and equitable human development. Digital transformations across sectors and scales must be actively guided through conscious choices and values. Shift 3 requires six suggested areas of innovation that must be intentionally incentivized to support digitalization for sustainability. These include building a digital twin of the planet, enabling a circular economy, supporting sustainable consumption, enabling a knowledge commons, creating networked and agile

governance and prioritizing digital technologies that catalyse the transition to a green, just economy for the whole of society.

The contents of this Action Plan are based on a series of open dialogues and collective intelligence processes undertaken with over 1000 stakeholders. This co-creation process involved structured round-tables, a global conference, online consultations and collective intelligence exercises, and international events, including at the UN General Assembly and the UN Environment Assembly (see Figure 2). The process captured a diverse range of views, experiences and priorities from stakeholders in over 100 countries and from across multiple major stakeholder groups. These inputs have been synthesized by the co-champions of CODES in close collaboration with the Office of the UN Secretary General’s Envoy on Technology within the framework of the Roadmap for Digital Cooperation.

As the digital age unfolds, it must become the responsibility of governments at all levels to ensure the availability of digital infrastructure and to catalyse and incentivize the use of digital products and services to create social, economic and ecological benefits. Furthermore, governments must strengthen the standards and open source communities that provide the technologies which enable those products, services and the digital transformation at large. This must go hand in hand with paying due attention to trust building, transparency and the protection of human and civil rights as part of the digital governance framework. Cooperation is needed to ensure uniformity of intent behind key legislation, regulations and policies given the global reach of digital products, services and platforms and the existence of international businesses operating in multiple geographies. It is also equally clear that action cannot be undertaken by governments acting alone. Success depends on deep collaboration within and between international organizations, the global science community, arts and open technology communities, all levels of government, civil society, the private sector and digital-native companies.



Figure 1: **International processes that anchor the CODES Action Plan for a Sustainable Planet in the Digital Age.** Three main international processes served as the catalyzing force for the CODES Action Plan including the SDGs, the Roadmap for Digital Cooperation and the Secretary General’s Common Agenda. The CODES Action Plan has been designed to influence three major processes going forward including Stockholm +50, the Summit of the Future and Global Digital Compact and the 6th UN Environment Assembly.

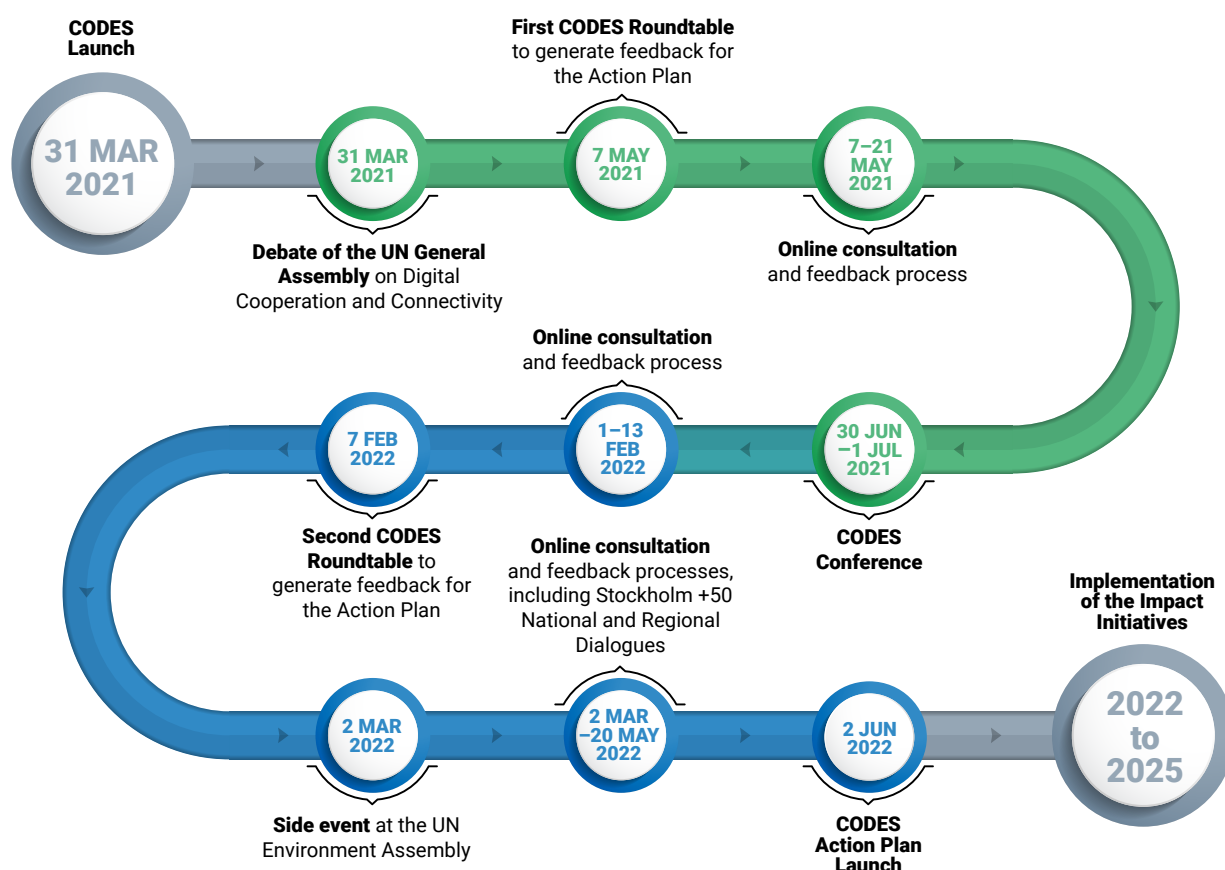


Figure 2: **Co-creation process behind the Action Plan for a Sustainable Planet in the Digital Age.**

All CODES products are based on an inclusive multi-stakeholder co-design process involving multiple touchpoints and opportunities for peer contributions. The Action Plan has been based on a wide stakeholder engagement and co-design process that invited over 1,000 people to contribute to the shifts, priorities and impact initiatives over a 12 month period. A range of digital collaboration and collective intelligence tools were used to support this process including Sparkblue, Google Docs, Mentimeter and Thought Exchange. The Action Plan also benefited from a series of national and regional consultations that were undertaken as part of the Stockholm +50 preparatory process. The digital needs that were identified in these processes are summarized in Annex II.

Three Shifts for a Sustainable Planet in the Digital Age

The following sections identify and describe the 3 systemic shifts and 6 strategic priorities within each shift needed to enable digitalization as a force for good towards accelerating environmentally, socially and economically sustainable development.

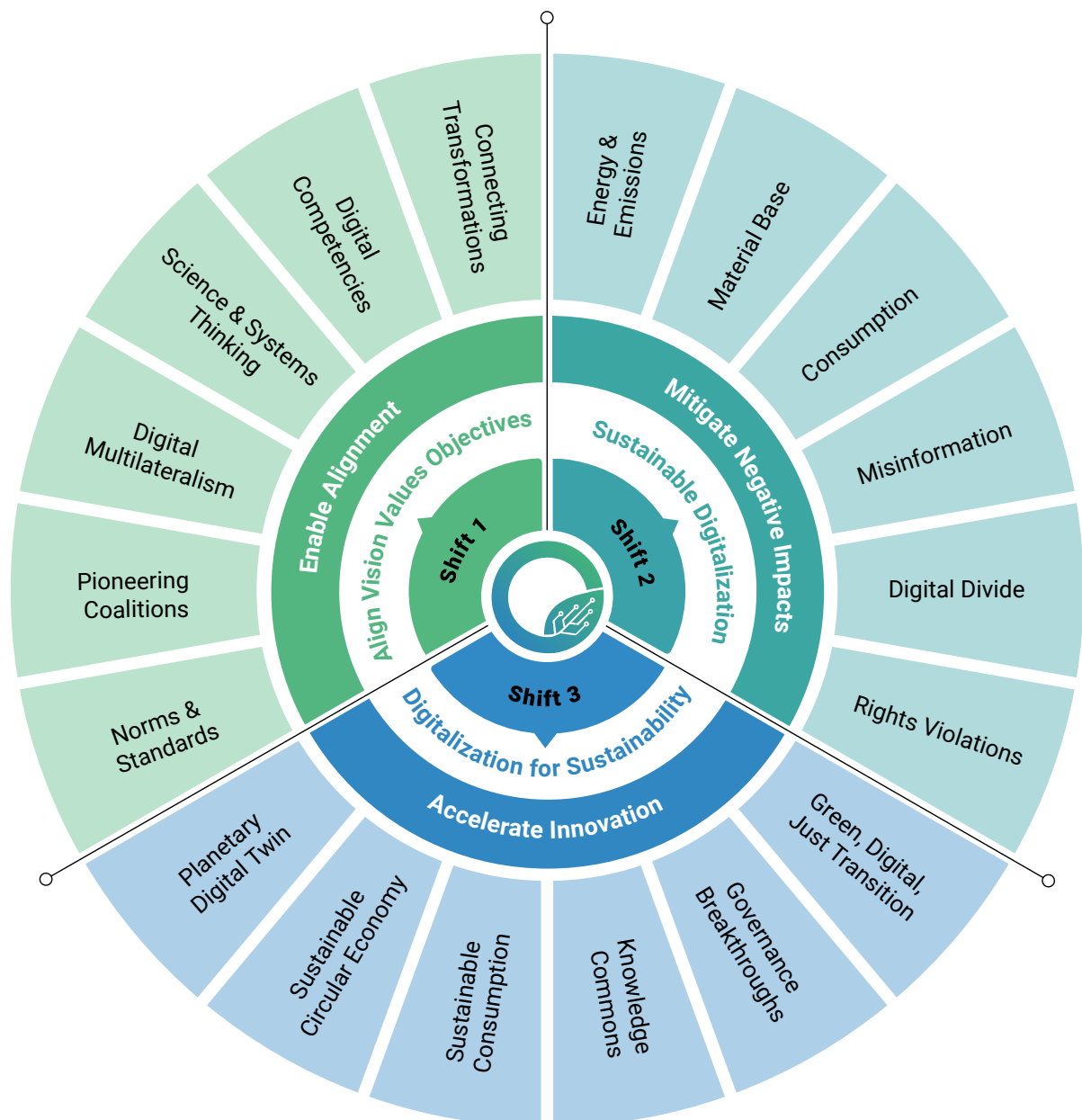


Figure 3: **Three Shifts and six strategic priorities within each shift to achieve a sustainable planet in the digital age.**

Shift 1: Enable Alignment

Aligning vision, values, and objectives of the digital age with sustainable development

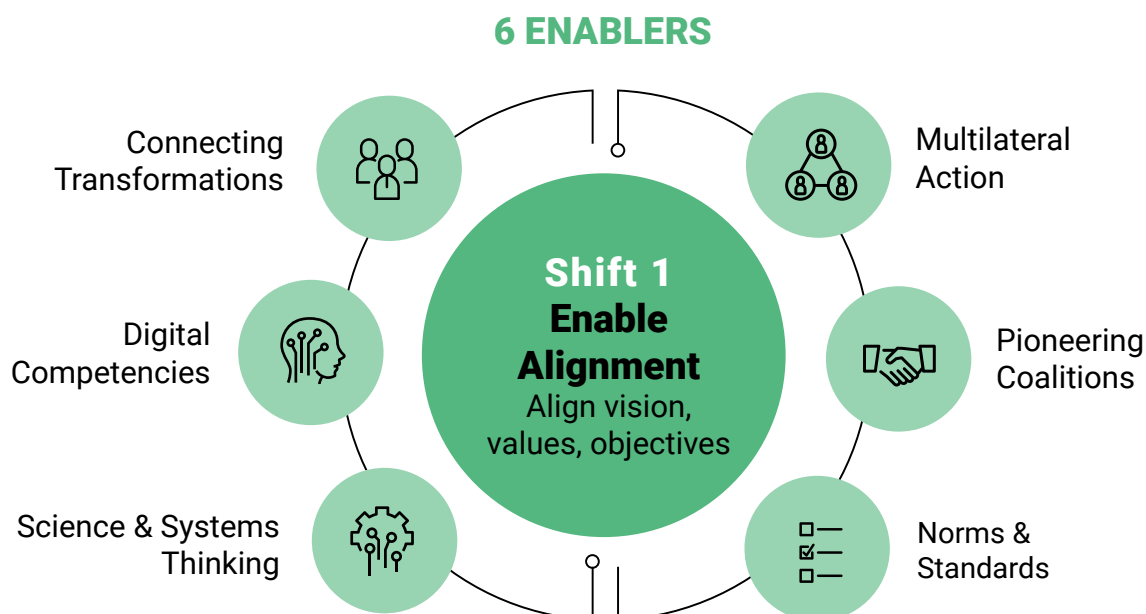


Figure 4: **Shift 1: Enable Alignment - Aligning vision, values, and objectives of the digital age with sustainable development.**

The first shift strives to progress the convergence of digitalization and sustainability as the foundation for accelerating environmentally, socially and economically sustainable development. It proposes a reorientation of the purpose of digitalization, development of common visions, values and renewed objectives for sustainable development in the Digital Age.

To drive this first shift, strong coalitions across public and private entities, including members from academia and civil society must proactively shape the digital age towards sustainable futures. CODES stakeholders identified **6 strategic priorities** that act as fundamental enablers to achieving the systems-level change needed for this shift (see Annex 1, Table 1 for initial mapping of global stakeholders addressing this shift):

ENABLER 1

Connect Communities and Transformations: Connect digital and sustainability communities to catalyse the twin transformation.

Indigenous and modern understandings of environmental and social sustainability values must be systematically considered by actors at the forefront of existing and emerging digital technologies, innovations and governance frameworks (see Supplement 1, Box 9). Similarly, sustainability commitments and multilateral environmental agreements must consistently consider how they can be enabled through digital transformation. Strategic dialogue and mutual learning between the digital and sustainability communities is needed to enable greater cohesiveness of visions and mindsets and can be used as an opportunity to solve systemic barriers to environmental and social

sustainability. This integrated approach should be consequently implemented in, and incentivized by, national and international policy agendas and organizations, research and education programs, technology development and civil society action alike. Silo-thinking and business as usual must end in order to systematically address digitalization and sustainability as closely interlinked cross-cutting twin transitions.

ENABLER 2

Develop Digital Competencies: Build interdisciplinary skill sets.

Many of the key actors with the ability to influence the trajectory of digitalization and sustainability lack a number of essential digital competencies and skills needed to catalyse this shift. On the one hand, public sector and policy makers need to understand both the environmental opportunities and risks from digital transformation. They must build up their own digital capacities to understand what they want to regulate, enable and incentivize. On the other hand, entrepreneurs, computer scientists as well as hardware and software engineers also need to understand how their products and services generate different sustainability incentives and impacts in the real world in order to take these into account in the design process. They must enhance their understanding of today's sustainability challenges, especially on decarbonization, dematerialization, detoxification and economic circularity. This must be centered on a renewed humanism mindset that recognizes empathy, ethics and traditional indigenous knowledge. Academic curricula, vocational training, professional associations all need upskilling to reflect digital sustainability needs and outcomes. Moreover, to overcome the digital divide, digital and sustainability literacy has to be an integrated effort.

ENABLER 3

Harness Science and Systems Thinking: Mobilize science to understand how the sustainability of complex systems can be enhanced through digital transformation.

Understanding the inherent complexity and trade-offs of achieving planetary sustainability is one of the biggest challenges facing modern science. This entails the earth system as such, including its variety of complex and interlinked dynamics, as well as our economic and social systems and sectors. The question of how different feedback loops operate to either reinforce or shift system behaviours is also key. A "systems thinking" holistic approach will be needed that focuses on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems. A science-based understanding of how digital technologies are changing key economic, social and environmental systems and how they can be aligned towards sustainability outcomes is needed as part of the new social contract for the digital age (see Supplement 1, Box 10).

ENABLER 4

Advance Digital Multilateralism: Develop new multilateralism for digital sustainability and a culture of multi-stakeholder collaboration and collective action.

The digital ecosystems of data, analytics and applications are not confined to national boundaries, nor yet governed by the international community in an effective and inclusive manner. Instead, a handful of companies now have the ability to influence human attitudes and behaviours at a planetary scale with more money, power and reach than most national governments. For strong digital innovation ecosystems, we need to promote a culture of open collaboration and co-creation between governments, the private sector and civil society. This new kind of digital translateralism and multilateralism, with collaborative policymaking should define, implement and apply international standards and safeguards for a global, inclusive, and sustainable digital ecosystem. Additionally, opportunities to incorporate Indigenous and traditional knowledge and expertise should be leveraged when designing solutions for global sustainability. Finally, while respecting all nations' sovereignty

over their data, we must promote good data governance and stewardship that ensures the timely availability of relevant data in a user-friendly, accessible, portable, machine-readable and actionable format.

ENABLER 5

Build Pioneering Coalitions: Foster intersectional innovation ecosystems and solutions that support agile implementation and collaborative governance.

While new forms of digital multilateralism are needed, this alone is not enough to effectively govern and steer the pace and direction of digital technologies. Inclusive and mission oriented coalitions between governments, academia, private sector actors and civil society organizations will be needed to catalyse transformational investments in digital innovation ecosystems, infrastructure and emerging standards that are premised on planetary sustainability. Committed coalitions with a shared sense of common purpose and practice can serve as testing grounds for better standards and governance solutions. Agile approaches to define and test reflexive and iterative governance frameworks for digital technologies must be explored. This should be based on adaptive, forward looking and innovation-friendly regulation together with tiered and principle-based approaches to collective governance.³⁷

ENABLER 6

Adopt Norms and Standards: Adopt joint principles, normative frameworks and global standards for digital sustainability.

While the pace of digital innovation is dynamic, and although several international standards are emerging,³⁸ there are only a few nascent normative and ethical frameworks in place to guide its direction at the global level. Many of these frameworks lack clear principles and norms linked to environmental and social sustainability or climate action. In this context, it is critical to develop a global set of standards and guidelines for the sustainable production, use and adoption of digital technologies based on specific, measurable, achievable and time-bound indicators. Additionally, it is critical to set a global standard methodology for assessing and measuring the net impact of digital technologies³⁹ on sustainability and climate change. It is noted that standardization in this domain has been ongoing for a decade or more, so any effort in this direction should start from existing standardization process as well as the emerging field of Corporate Digital Responsibility (see Supplement 1, Boxes 11 and 12). Efforts in this direction will also need to cover the governance of data that is being used to fuel digital transformation and has become one of the new factors of production, alongside land, labour and capital.

Shift 2: Mitigate Negative Impacts

Ensure sustainable digitalization to mitigate negative environmental and social impacts

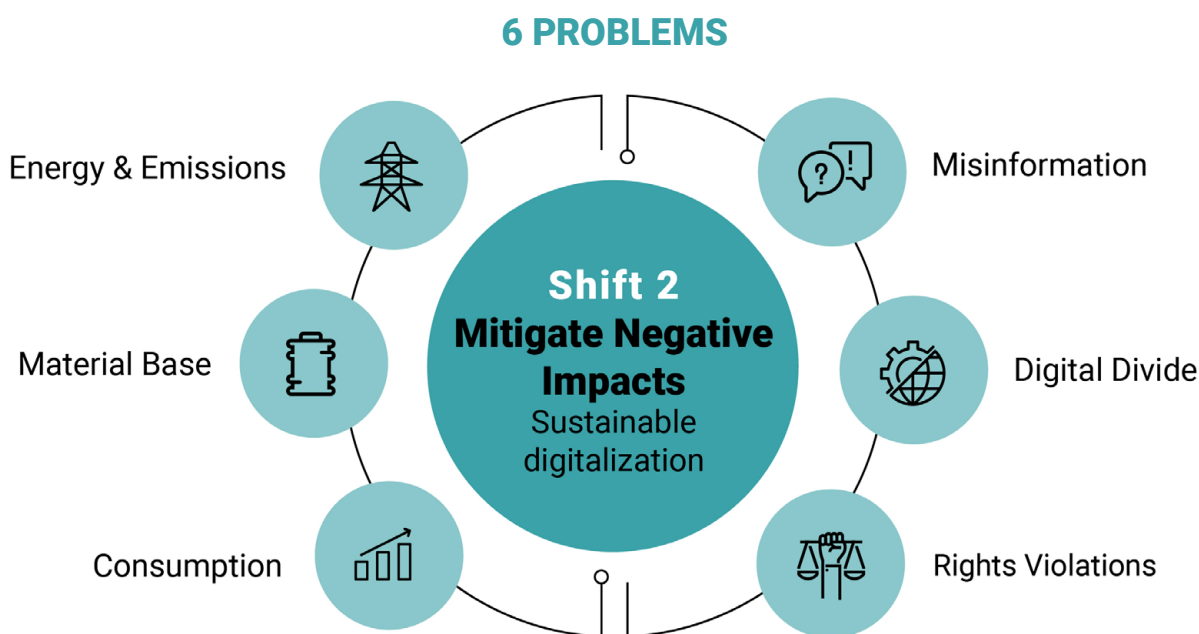


Figure 5: **Shift 2: Mitigate Negative Impacts - Ensure sustainable digitalization to mitigate negative environmental and social impacts**

The second shift calls for a commitment to sustainable digitalization to mitigate the negative environmental and social impacts from digital technologies and their supply chains. These include significant ecological impacts linked to energy and material consumption coupled with social impacts tied to unsustainable consumption patterns, misinformation, unequal access to digital technologies, discrimination in the provisioning of digital skills and capabilities, or targeted human rights violations.

CODES stakeholders identified **6 strategic priorities** that must be addressed to mitigate these negative impacts and to ensure Sustainable Digitalization understood as the digitalization that is responsible, ethical and sustainable (see Annex 1, Table 2 for an initial mapping of global stakeholders addressing this shift):

PROBLEM 1

Reduce Energy and Emissions: Reduce energy consumption and related CO₂ emissions.

According to the ITU, ICT's share of global electricity consumption was projected to reach 3.2 per cent in 2020.⁴⁰ Depending on scope and method of calculation, some estimates suggest that the ICT sector could be up to 7 per cent of the total global electricity use in 2020.⁴¹ Peer-reviewed studies estimate ICT's current share of global greenhouse gas (GHG) emissions ranging from 1.8%–3.9% depending on the calculation method.⁴² The explosion of digital cryptocurrencies is also accelerating energy consumption and associated carbon footprint. The carbon footprint of the Bitcoin network,

annualized from 2017-2022, was a staggering 114 megatons comparable to the carbon footprint of Czech Republic.⁴³ Some strategies to address this have focused on investments in sustainable decentralized renewable energy infrastructure and green data centers (see Supplement 1, Box 13). More broadly, common standards are needed to ensure the energy consumption and carbon emissions of digital platforms be transparently aggregated and calculated to support the calculation of Scope 1, 2 and 3 emissions for carbon accounting. Enabling policies and incentivization mechanisms such as sustainable public procurement can thus ensure compliance with such global standards.

PROBLEM 2

Minimize Material Base: Address material use and waste linked to digitalization.

The fast-evolving digital economy demands an increasing number of elements for ICT devices such as computers, data centers, mobile phones, batteries, and networks. To meet the growing demand for green technologies associated with the energy transitions, the extraction of minerals, such as graphite, lithium and cobalt, could increase by 500 per cent by 2050⁴⁴ having a substantial impact on land, water, air and biodiversity. There are at least twenty-four elements that are considered important for the digital future, including a range of rare earth elements.⁴⁵ Each of these generate different environmental, social and political impacts during their extraction, transformation and disposal, often depending on the level of national and local governance capacity to monitor and mitigate those impacts. In 2019 a record 53.6 million metric tons of e-waste was produced globally.⁴⁶ The equivalent weight of 125,000 Boeing 747 jumbo jets – more than all of the commercial aircrafts ever created.⁴⁷ This makes e-waste the fastest-growing domestic waste stream with only 17.4 per cent of e-waste documented as formally collected and recycled, and only 78 countries having legislations to manage e-waste.⁴⁸ Digitalization, thus, must go hand in hand with a circular economy so that metals and minerals used for digital products can be tracked, traced, recovered and recirculated. ICT producers must be held accountable through the extended producer responsibility approach for the environmental impact associated with their products and services and legislation should enforce stricter sustainability requirements. Minimum standards for the procurement of green digital infrastructure, digital services and ICT products would also support a circular economy.

PROBLEM 3

Address Consumption Drivers: Restrain persuasive technologies and practices that accelerate consumption.

Current marketplace and social media business models often permit a one-way flow of user data and preferences to digital platform companies in an opaque manner. This information is then mined, transformed into targeted advertisements, and used to accelerate the consumption of products and services through persuasive digital technologies such as: (1) product customization; (2) influencer endorsements; (3) personalized advertising; (4) digital nudging; (5) and 24/7 opportunities for purchasing (see Supplement 1, Box 14). Additionally, digital technologies are optimizing supply chains and enabling efficiency gains by reducing the time, transaction costs or human capital needed for various tasks. This is lowering the costs of production and distribution of goods and as a consequence, creating “rebound effects”,^{49,50} by placing a downward pressure on the prices of goods and services, thereby enabling increased production and consumption. All of these catalysing factors, from persuasive technologies, efficiency gains, and associated rebound effects, need to be considered in any policy actions and economic accounting frameworks that promote sustainability through digital transformation. Measures at the systems-level, such as carbon prices and trading schemes, can represent the necessary tools to contain these factors and address indirect rebound effects. This must also include specific ethical frameworks combined with algorithmic transparency to govern digital nudging.

PROBLEM 4

Mitigate Misinformation: Prevent the amplification of misinformation and disinformation about sustainability and related themes.

4.6 billion people are now connected and exchanging ideas through social media and chat apps.⁵¹ This offers both powerful opportunities for accelerating social change as well as risks from the spread of misinformation of a magnitude different from anything we have experienced in human history. An MIT study found that false news stories are 70 per cent more likely to be retweeted than true news stories are. It also takes true stories about six times as long to reach 1,500 people as it does for false stories to reach the same number of people.⁵² The spread of misinformation about planetary sustainability topics such as climate change, biodiversity loss or pollution can undermine collective action and trust in institutions as well as magnify polarization and mistrust between divided groups.⁵³ Trusted sources of information must be more systematically identified and made accessible, and articles containing misinformation flagged or taken down (see Supplement 1, Box 15).

PROBLEM 5

Close the Digital Divide: Close the digital divide in an environmentally and socially sustainable manner.

The digital divide is the product of systemic inequities and power imbalances that must be addressed, amongst other measures, through agile governance frameworks and public investment in digital infrastructure together with digital literacy building. It goes beyond inequalities in access to the internet, and includes differential access to the tools, information, technologies, skills, capacities and agency in driving the direction of digitalization.⁵⁴ There are also important facets embedded within this divide that include gender, age, income, language and culture that must be considered. As such, efforts to usher an access revolution to close the digital divide must include a number of parallel investments. First, addressing pervasive biases in Science, Technology, Engineering, and Mathematics (STEM) that have ripple effects throughout the digital ecosystem (e.g. algorithmic bias, lack of representation). Second, shifting resources, financial incentives and talent funnels to promote Equity, Diversity, and Inclusivity in STEM. Third, directing investments towards increasing availability and affordability of digital infrastructure where access is currently limited. A whole-of-society approach is necessary in order to leave no one behind.

PROBLEM 6

Prevent Rights Violations: Protect human, civil and environmental rights.

In a digitally connected world, the question of how to respect, protect and implement human rights and access to environmental justice is becoming paramount. As ever more human beings, organizational systems and technical devices transition online, realizing human rights in online settings is becoming an essential consideration in the emerging governance framework. Human rights such as freedom of expression, privacy, free assembly, child rights, Indigenous land rights, or the right to a fair trial, are all heavily impacted by new digital technologies. Three important domains in the digital space need specific attention linked to environmental and social sustainability. First, human rights abuses linked to land use conflicts in mining minerals needed to power a green digital future, including cobalt, graphite, copper, and rare earths, particularly in lands inhabited by and/or managed by Indigenous Peoples and local communities.⁵⁵ Second, human rights violations in the form of digital surveillance and digital reprisals against environmental and human rights defenders, whistle blowers, journalists, and political dissidents. Third, violations of online data privacy by independent actors, private organizations and state governments. Human rights and access to environmental justice need to be safeguarded in the development, implementation, legislation,

and governance of digital technologies. They need to be entrenched and realized at every step of the value-chain of digital technologies.⁵⁶ Priority needs to be made for a new generation of rights protection and grievance mechanisms in the digital age, as enabled by digital technology solutions such as secure multi-party computation as well as personal data control. Finally, children under 18 make up one-third of all internet users,⁵⁷ and youth (15-24 year olds) are the leading internet usage cohort. Globally, 71 per cent of youth use the internet, compared with 57 per cent of the other age groups.⁵⁸ Considering both human and child rights, as enshrined in the Convention on the Rights of the Child, is thus essential to create an inclusive and right-based digital environment for all. Priority must also be given to the application of CARE Principles for Indigenous Data Governance,⁵⁹ and regulations around data must not just be limited to usage but considered to include (but not be limited to) environmental, social, economic, historical, cultural, and resource data. Such principles should consider the rights and protection of non-human entities.



Shift 3: Accelerate Innovation

Directing innovation efforts toward digitalization for sustainability

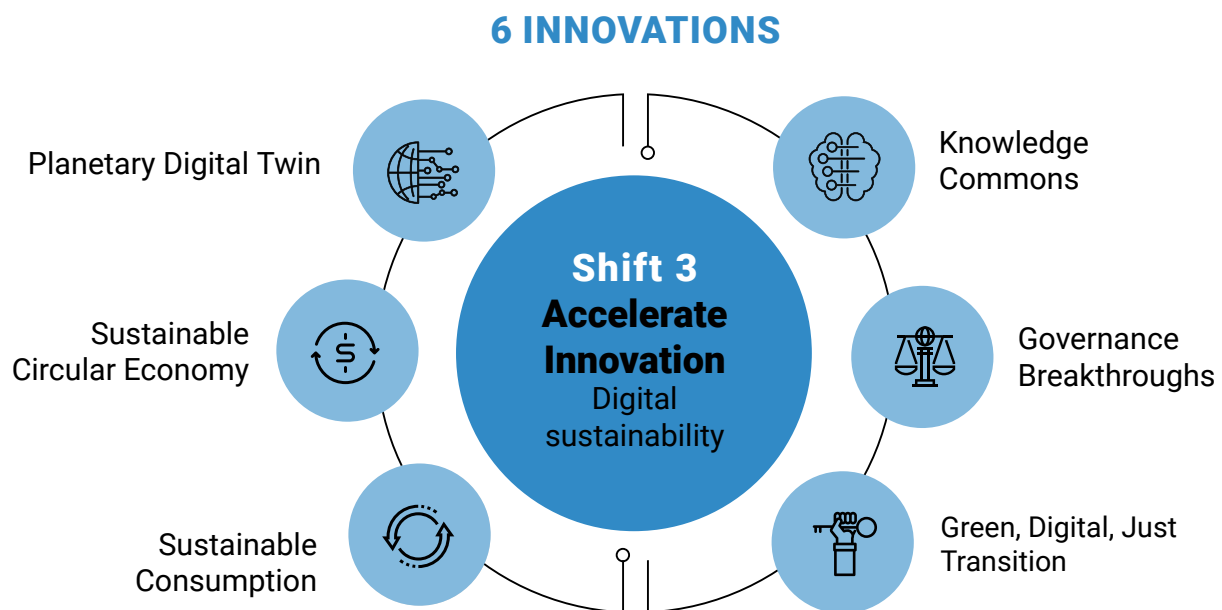


Figure 6: **Shift 3: Accelerate Innovation - Transform systems, incentives and business models through digital innovations for sustainability**

The third shift calls for the digital innovation community, including governments, development partners, private sector, informal economy actors, local communities and academia, to channel large investments, capacity development and collective efforts toward digitalization for sustainability with intention. The application of digital innovations needs to focus on achieving the implementation of the 2030 Agenda with its 17 Sustainable Development Goals and to progress the different global environmental commitments adopted through multilateral environmental agreements (MEAs).

This translates into the commitment to advance a decade of digital innovation for sustainability. Redirecting the innovative powers of digital technologies towards achieving our sustainability agenda in time and scale is absolutely key. Shifting the collective effort towards harnessing the potential of digitalization for systems level transformation is an important strategic priority for positive change towards a sustainable planet.

CODES stakeholders identified 6 strategic priorities where digital innovations can be proactively used to implement, accelerate and scale sustainability globally as part of this shift (see Annex 1, Table 3 for an initial mapping of global stakeholders addressing this shift):

INNOVATION 1

Build Planetary Digital Twin: Prioritize innovations to measure, monitor and model the health of the planet's biosphere and interactions with economic and social systems.

Digital twins combined with AI have the capability to conduct automated monitoring of risks and threats to key protected areas (either natural or cultural areas under global protection frameworks), ecosystem services or endangered species. Digital twins can also assist in understanding options and trade offs for achieving different SDGs and MEAs. This can benefit not only national governments, but also private sector companies, research institutions, non-profit organizations, and local communities (see Supplement 1, Box 16). However, many efforts continue to be fragmented and unable to connect in order to monitor planetary health in real time. Major investments are needed to build interoperable digital twins of the earth and its various subsystems that can allow us to monitor and model complex relationships among environmental, social, and economic systems using the best science and data available as well as robust data-protection rules. First, investments to improve the sensing, connectivity and computational requirements for collecting and processing the vast volumes of data, especially for real-time data processing scenarios at a planetary scale. Second, adoption of transparency principles, data standards and safeguards, Open APIs (Application Programming Interface) and communication protocols that enable safety, privacy, interoperability, transferability, and quality control of key sustainability data across disparate systems. Third, ways to support, and integrate validated citizen science contributions and observations as well as other open-source tools and algorithms into the digital twin ecosystems. Finally, development of applications that enable real-time ingestion and processing of data from the digital twin ecosystem into governments, science, civil society, and private sector ecosystems and vice-versa to inform meaningful forms of analysis and decision support systems.

INNOVATION 2

Catalyse Sustainable Circular Economy: Prioritize innovations towards an inclusive, net zero, sustainable circular economy.

Digital transformation is an opportunity to rethink how private sector business models can contribute to a sustainable circular economy and how companies can achieve full environmental transparency and accountability across their entire value chain. To achieve circular business models, innovations are needed on multiple fronts. First, the digital transformation process itself should be used as an opportunity for companies to identify concrete pathways to advance decarbonization, dematerialization, detoxification and circularity goals across their value chains. This should also include a transitioning away from the provision of products to offering services as part of circular business models. Second, digital standards and infrastructure are needed for digital product passports to hold data and relevant sustainability information on their lifecycle. This includes a product's origin, composition, environmental and carbon performance, repair and dismantling possibilities as well as end of life handling. Third, increased use of eco-labels and provision of information from digital product passports to consumers to enable product comparability and inform decision-making in turn driving demand for sustainable products. Finally, aligning business models, financial and institutional procurement practices with sustainability goals, with the view to transitioning away from unsustainable products and services towards products and services that are fully Environment, Social and Governance (ESG) compliant. Ultimately, digital transformation should drive shifts toward a "beyond growth" paradigm where the application of digital technologies, in addition to profits, is baselined on social and environmental accountability with the goal of accelerating planetary sustainability and respecting planetary boundaries in the context of a circular economy (see Supplement 1, Box 17).

INNOVATION 3

Empower Sustainable Consumption: Prioritize innovations that empower sustainable lifestyles, behaviours and collaboration.

Digital tools can empower consumers to make and demand sustainable consumption choices and receive feedback on their behaviours. For example, digital applications embedded in e-commerce platforms such as product comparability, ethical nudging, gamification, carbon footprint calculators, positive feedback loops and green activations can support a shift in awareness and enable people to choose more environmentally sustainable products and services (see Supplement 1, Box 14). Social media, gaming platforms and fintech can also help amplify proof of environmentally sustainable lifestyles (see Supplement 1, Boxes 18 and 19). A range of digital marketplaces can also support the collaborative economy that enables giving, reselling, swapping, sharing and renting products and services directly between individuals. While strong privacy protection must be obligatory everywhere, digital innovations must be flexible enough to be adapted to the specific local, socio-economic, and geographic contexts on the basis of human-centered design and planetary boundaries. Digitalization also enables mass collaboration and mobilization of citizens through platforms enabling both citizen science and decentralized financing such as crowd funding. Opportunities to use digital technologies to empower sustainable lifestyles, behaviours and collaboration should be designed into digital platforms by default. They must become essential channels to influence sustainable consumption drivers at a planetary scale.

INNOVATION 4

Create Knowledge Commons: Prioritize innovations towards a broadly accessible knowledge commons.

Digital change continuously expands options to co-produce, process and share knowledge. Digital tools - from data collection and analysis, model building, knowledge aggregation, visualization to virtuality - can expand scientific methods in all disciplines, facilitate inclusive and cooperative forms of knowledge production (e.g. citizen and open science) and enable knowledge sharing across the globe for educational, scientific or practical purposes (see Supplement 1, Box 20). However, this valuable global public good needs to be actively built, managed and protected to serve as a strong lever for sustainability. It is yet too often challenged by a lack of understanding, accessibility, infrastructure and supportive framework conditions or by large public-private-imbalances towards well-resourced private innovation hubs (especially in tech-research and platform solutions). Inclusive and innovative knowledge commons will require: operationalized FAIR⁶⁰ and CARE⁶¹ principles for data, public funding and data for open science, research and knowledge, open science standards, broad investments in digital literacy, education and digital knowledge access around the globe. Creating a global knowledge commons has vast potentials for sustainable development, the empowerment of marginalized and underrepresented groups, the creation of a global (environmental) awareness and empathy as well as breakthroughs in sustainability solutions.

INNOVATION 5

Support Governance Breakthroughs: Prioritize innovations towards a revolution in networked, agile and collaborative governance.

Presently, many national laws, regulations and associated governance frameworks that implement global SDG and MEA commitments are not yet being designed to directly benefit from digital technologies, platforms, applications and SMART systems. Many national legal frameworks are still using traditional approaches for regulating the physical world while neglecting opportunities to harness digital tools to achieve sustainability outcomes and regulatory compliance.

As “whole of government” approaches to digitalization and e-governance are taken forward, a range of innovations are needed to catalyse a series of sustainability governance and rule of law breakthroughs. First, improving the ability of governance systems and regulations to dynamically adapt to changing sustainability risks and opportunities using real-time information feedback loops and AI in an agile and iterative manner (see Supplement 1, Box 21). Second, increased automation of Systems of National Accounts (SNAs)⁶² used to measure national economic activity with sustainability criteria included (see Supplement 1, Box 22). Third, transparent monitoring, reporting and verification (MRV) of legal compliance and progress towards national climate and sustainability goals as part of new accountability frameworks. Fourth, decentralized and distributed governance solutions to trigger and incentivize collective sustainability actions, finance and behaviours at scale through digital channels (see Supplement 1, Box 23). Finally, new digital mechanisms to support public participation in decision-making as well as crowdsourcing governance priorities and solutions from citizens and citizen science. None of this can be effectively done, however, without critically assessing how automated processes are designed, where data is sourced, what power dynamics are driving the governance systems we are seeking to optimize, and who is establishing environmental governance and sustainability goals. All of these governance innovations must prioritize the inclusion, ownership and agency of currently underrepresented groups, support subsidiarity and self-governance in an increasingly polycentric setting, and thoroughly account for integrated biases.⁶³ They must also help overcome the global-local divide by building inclusive fora connecting local interests with global decision-making.

INNOVATION 6

Realize Green, Digital, Just Transition: Prioritize innovations that catalyse the transition to a green, digital and just economy for sustainable development.

Emerging and frontier economies may reap multiple benefits from ‘leapfrogging’ into SMART cities, buildings, transport, agriculture, etc (see Supplement 1, Box 24). In addition, a number of benefits can be captured by increasing access to energy for rural populations through digitally enabled off-grid solutions and alternative financing mechanisms, enhancing resilience through risk-informed infrastructure planning and early warning, as well as supporting sustainable small-scale agriculture and realizing traceability from farm to fork (see Supplement 1, Box 25). Governments and businesses must prioritize investment into regionally relevant digital innovation that catalyses climate change mitigation and adaptation, and reduces impact on nature. Such innovation will need to happen with a healthy local digital innovation ecosystem, where local businesses, entrepreneurs and academia play a key role, and contribute to the co-creation of green digital jobs and livelihoods. Currently, the majority of digital technology innovation is happening within a few countries; thus, an active, progressive vision is needed working in parallel to Our Common Agenda to reverse the trends of innovation inequality. The global community should actively and comprehensively promote access to a broad scope of digital innovations for the “whole-of-society”. This is needed to empower local digital ecosystems to take part in technology development, promote open source or Digital Public Good approaches and capacity development, build investments and public funding to foster local digital innovation ecosystems, and establish multi-faceted partnerships. All these approaches must ensure truly inclusive bottom up perspectives that are locally driven and target improving livelihoods of the most marginalized. Women and youth literacy and capacity to benefit from these digital innovations will ensure technological uptake that is both sustainable and builds the social and human capital of those often left behind.



Impact Initiatives for a Sustainable Planet in the Digital Age



Key Messages

This CODES Action Plan is an initial step forward to address these collective challenges and to catalyse collective action. It has identified **3 Systemic Shifts** essential to accelerating environmentally and socially sustainable development in the Digital Age: 1) Enabling Alignment: Aligning the digital age with sustainable development; 2) Mitigating Negative Impacts: Ensuring sustainable digitalization to mitigate negative environmental and social impacts; and 3) Accelerating Innovation: Directing innovation efforts and incentives toward digitalization for sustainability.

Based on our collaborative work on this Action Plan, the CODES community stresses some emerging overarching messages that are important to move into action together:

- **Scalable Action Now:** We now urgently need to catalyse all three shifts in concert and scale our efforts on our path towards a sustainable planet in the digital age. The world needs significant intellectual, financial, political and practical involvement as soon and as boldly as possible to provide the enabling foundations for a sustainable digital age.
- **Strong Movement with Common Commitment:** We need awareness, convergence and cooperation of existing initiatives and networks of actors already undertaking ambitious digital sustainability initiatives in different sectors. This network is already growing quickly, but we need to support, connect and strengthen these aims, ambitions and achievements together.

- **Diverse Leadership to Harness the Political Window of Opportunity:** We need to harness the political leadership of governments, academia, the private sector, and civil society to ensure that digitalization is used to promote a sustainable planet. Digitalization is not a single sector, but rather a process, and shaping it sustainably and equitably requires collective action, deep collaboration, and truly inclusive and globally representative leadership. As the digitalization process unfolds around the globe, we need to ensure that groups typically underrepresented in both the digital innovation space and the global environmental governance discourse are involved in shaping and influencing the outcomes.
- **Integration of digital sustainability needs within key international processes:** The vision outlined in this Action Plan should be systematically reflected within the preparatory process for the Summit of the Future and within the resulting Global Digital Compact in 2023. Other global fora and governance frameworks for digital transformation, sustainability, and environmental management should also engage with the tasks laid out in this Action Plan, including the Rio Conventions, the International Telecommunications Union and the Internet Governance Forum.

Impact Initiatives

The CODES community has collectively identified 9 Impact Initiatives as a starting point to catalyse the 3 shifts and progress the 6 strategic priorities within each shift. Engagement with these initiatives provides numerous benefits and competitive advantages as the “whole-of-society” shifts towards recognizing the need and importance of growth that is sustainable, just and inclusive, to ensure long-term development and prosperity. The unique, global and multi-stakeholder alliance across public and private sectors facilitated through CODES creates a platform that is ideally positioned to galvanize critical progress towards digital sustainability.

The set of Impact Initiatives emerging from this Action Plan are defined according to the following criteria:

- **Multi-stakeholder:** Multi-stakeholder in nature, meaning either a consortium of private or public sector entities, or public-private partnerships with opportunities for engagement by international actors and civil society
- **Catalytic:** Aims to catalyse systems-level or sector-level transformations and impact at a global or regional scale
- **Sustained Attention:** Initiative requires sustained political attention and financial support (at least 3-6 years) to trigger systems-level or sector-level transformations
- **Leadership:** Clearly identified leadership, measurable goals, and multi-stakeholder governance model
- **Accountable:** Progress reported against key performance indicators (KPIs) and milestones in a format and frequency co-designed and determined in consultations with related stakeholders and CODES co-champions
- **Intersecting:** Are intersecting in nature and seek to enable approaches, policies, standards, regulations, infrastructure, and governance frameworks that are necessary to catalyse digital sustainability.

The 9 Impact Initiatives here are developed to inspire and to provoke further concrete action by different pioneering coalitions. Neither the CODES co-champions nor the whole CODES network could drive and implement these initiatives alone. We now need even bigger coalitions, we need new partners, agile pioneers as well as capable established organizations; we need broader collaboration and truly global collective action.

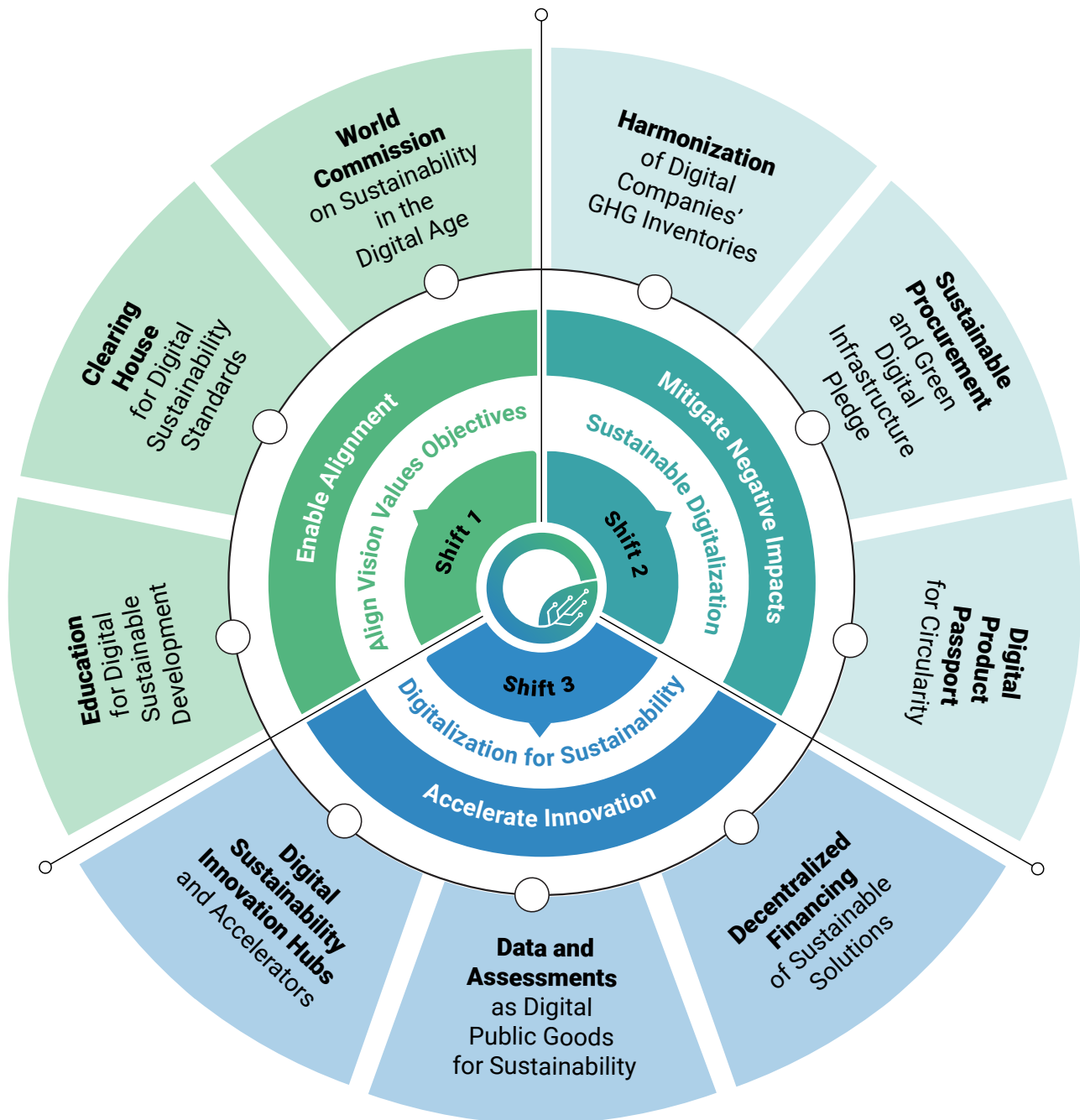


Figure 7: **Nine Impact Initiatives of the CODES Action Plan for a Sustainable Planet in the Digital Age.** All the listed impact initiatives are intersecting in nature and to varying capacities, seek to enable approaches, policies, standards, regulations, infrastructure, and governance frameworks that are necessary to catalyze digital sustainability.

Shift 1: Enable Alignment

Create the enabling conditions to align the vision, values and objectives of the digital age with sustainable development

Impact Initiative	Suggested Outcomes	Potential Timeline and Suggested KPIs	Entities Active in this Area (*)
1. World Commission on Sustainability in the Digital Age: A science-based, globally represented commission supported by the UN, that in analogy to the famous World Commission on Environment and Development in the 1980s ('Brundtland Commission') identifies key guidelines and recommendations for Our Common Future in the Digital Age. The commission's interactive work programme and outcome can inform institutional updates within the UN, (inter)national policies, reporting standards, research agendas, and legislative frameworks at local, regional, and global levels.	A science-based report on "Our Common Future in the Digital Age" to streamline the permanent and close alignment of digital transformation with sustainable development in the UN agenda and beyond.	2022 Start the process to define the scope and terms of reference 2023 Establish World Commission in the context of the Global Digital Compact 2024 Report "Our Common Future in the Digital Age" +UN/UNEA resolution	Digitalization for Sustainability GPAI International Resource Panel (**) ISC ITU OECD UBA World Bank
2. Clearing House for Digital Sustainability Standards: A new, multi-stakeholder and globally representative platform to co-define key standards for digital sustainability and economic circularity (taking into account the recommendations put forward by the World Commission). This clearing house would create an up-to-date, authoritative overview on global digital standards, to address key gaps, and conduct outreach to enable effective implementation across all concerned parties.	A global platform to act as a clearing house and facilitate the exchange of digital sustainability standards and related legal frameworks with a focus on: • Trustworthiness • Inclusiveness • Sustainability • Interoperability • Safety and security • Data privacy • International collaboration	2022 Clearing house platform for existing standards 2023 Consolidate standards and procedural capacity to enable implementation in specific sustainability area (e.g. circular economy) 2024 Widening to include other sustainability areas; including capacity building programmes in partnership with stakeholders	IEEE IETF ISO ITU (**) OECD

3. Education for Digital Sustainable Development: A new decentralized approach to develop literacy and education programmes on digital sustainability with a focus on understanding and critically analyzing the benefits and harms of digitalization. These must be needs based, localized and contextualized. The focus must be on leveraging research and building skill sets needed to advance digital sustainability. This also entails the applied use of data and analytics as well as the build up of strategic multilateral partnerships and open source materials.	A decentralized network of regional “education hubs” collaborating on developing joint contextualized curriculum on digital sustainability An open source learning platform to host consolidated learning content from across the decentralized hubs	2022 Initiation of education hubs. Adoption of curriculum outline 2023 Development of open-source modules 2024 Integration across relevant training and research programmes	CODATA Digitalization for Sustainability EO4GEO Alliance Future Earth (**) GIZ ISC ITU SDA UNEP UNESCO World Bank
---	--	--	--

* Preliminary list based on stakeholder mapping and on initial discussions with partners subject to expansion

** Entity has expressed interest in taking on a catalytic leadership role in the impact initiative



Shift 2: Mitigate Negative Impact

A commitment to sustainable digitalization that mitigates the negative environmental and social impacts of digital technologies

Impact Initiative	Suggested Outcomes	Potential Timeline and Suggested KPIs	Entities Active in this Area (*)
4. Harmonization of Digital companies' GHG inventories: New international platform(s) to facilitate harmonization, interoperability and adoption of GHG inventories and reporting standards for digital companies, products and services. This must be progressed by aligning reporting entities and regulators on adopting these standards while consolidating underlying data definitions and validation rules for similar environmental sustainability data elements and metrics.	Creation and roll-out of 2-3 global platforms allowing corporations to compare, combine, and share reliable net zero and sustainability data Participation from 70% of fortune 200 and S&P 500 companies	2022 Setup funding, programme and partners 2023 Co-create focused products and processes with clear directionality on CC mitigation across all sectors 2024 Expansion and implementation	Carbon Call (**) Climateworks Foundation Climate Change AI Digital With Purpose (**) GPAI ITU Playing for the Planet UBA UN expert group on net-zero emissions commitments of non-state entities UNEP UNFCCC Climate Champions UNFCCC Global Innovation Hub
5. Sustainable Procurement and Green Digital Infrastructure Pledge: A new international framework to enable standardization and harmonization of sustainable procurement principles for digital infrastructure and services across governments and corporations. This must be advanced in parallel with a new framework for both public and private sectors to support planning, designing, financing and development of green digital infrastructure.	An international framework detailing sustainable procurement principles for green digital infrastructure and related digital services	2022 Development of sustainable procurement principles for digital infrastructure and services 2023 Sustainable procurement operational framework & infrastructure framework 2024 Sustainable procurement and infrastructures compliance and reporting framework	Digital Nations (**) ITU (**) IFC EU OECD Global Electronics Council / Green Electronics Council Sustainable Digital Infrastructure Alliance (**) UBA UNDP UNEP World Bank (**)

6. Digital product passport for circularity: Initiate the design and development of standards and pilot testing for digital product passports as an enabler of the circular economy. Digital product passports should help companies, consumers and regulators, to keep track of a product's climate, environmental, social and other impacts throughout the value chain. The standards must be sector/industry specific and must be accessible in a decentralized manner through a unique identifier, with the vision to enable transparency and circularity.	Global inclusive process is established to co-develop digital product passport standards by governments, industry and civil society.	2022 Series of global and regional dialogues conducted on a digital product passport framework 2023 Initiation of digital product passport standards in at least 10 product categories with a high circularity potential 2024 Pilot test digital product passport standards for at least 10 product categories.	European Commission (**) GS1 ITU (**) UBA UNEP
--	---	---	---

* Preliminary list based on stakeholder mapping and on initial discussions with partners subject to expansion

** Entity has expressed interest in taking on a catalytic leadership role in the impact initiative



Shift 3: Accelerate Innovation

Directing efforts and investments toward digital innovation that accelerates environmental and social sustainability

Impact Initiative	Suggested Outcomes	Potential Timeline and Suggested KPIs	Entities Active in this Area (*)
7. Digital Sustainability Innovation Hubs and Accelerators: Launch of a global network of connected, and collaborative Innovation Hubs to accelerate the development and scale up of digital tools and just solutions for national climate mitigation and adaptation goals and other environmental commitments. The hubs would build and scale opportunities for rural and urban climate action with a focus on supporting sustainable livelihoods, resilience and human wellbeing. This must be catalysed by international and national funds and private-public partnerships which provide the financial backing and incentives to stimulate green digital solutions and transformation innovations of key economic sectors, including the informal economy.	Increase public digital innovation support with focus on climate and nature impact by 30% by 2025 Network of 50 interconnected regional and national hubs	2022 Initial network of Innovation Hubs and Accelerators created 2023 Mapping of digital innovation funding opportunities to establish baseline 2024 10% Increase in public digital innovation support targeted to climate and nature impact in developing countries	BMZ/GIZ CGIAR Research Centers D4D Hubs (**) GCF GEF GIZ (**) G-STIC I-CoDI ITU New Bauhaus OECD Public Innovation Observatory SIDA (**) UNDP (**) UNEP UNFCCC Global Innovation Hub UNICEF USAID World Bank
8. Data and Assessments as Digital Public Goods for Sustainability: Development and launch of open global standards and governance frameworks for high value environment and climate data needed as digital public goods to drive sustainability assessments, (planetary) digital twins, global stocktaking, foresight analysis and decision-making. This must be accompanied by the development of open interoperable APIs to allow sharing and quality control of data between entities.	A series of high-value global data sets needed to enable digital sustainability decision-making are published as digital public goods.	2022 Initiation of a global dialogue on data infrastructure and standards 2023 Prototype platform and publication of high-value digital public good data sets 2024 Application of digital public good data to conduct a global stocktake on environmental sustainability	CoData Data4Development Data4SDGs DIAL Digital Public Good Alliance Global Environmental Outlook (**) ISC UBA UNDP UNEP UN High-Level Committee on Programmes (HLCP) World Bank World Environment Situation Room (**)

9. Decentralized Financing of Sustainable Solutions: Facilitate new transparent decentralized financing and matchmaking for sustainability solutions. These include crowdfunding, payment for ecosystem services, microfinancing, recommendation algorithms and other channels. The goal is to increase decentralized sources of financing for the discovery, development and adoption of applied sustainable solutions, products and services in formal and informal markets.	Digital platforms, NTFs and fintech include new algorithms, filters and mechanism that promote decentralizing financing for sustainability solutions that reach 1 billion people	2022 Build coalition of fintech, e-commerce and digital companies 2023 Share lessons learned and identify successful influence pathways 2024 Continue to scale initiatives	Consumers International / Green Commerce Initiative Dialogue on Global Digital Finance Governance Every Action Counts Coalition (**) Green Digital Finance Alliance UNCDF UNDP
--	---	--	--

* Preliminary list based on stakeholder mapping and on initial discussions with partners subject to expansion

** Entity has expressed interest in taking on a catalytic leadership role in the impact initiative



Pathways to engage in the CODES Action Plan

The CODES co-champions will initiate and engage in multi-stakeholder processes to pool excellence and application-oriented knowledge on digital sustainability - the CODES Action Plan is an indicative example.

The co-champions will act as high-level stewards of the Impact Initiatives highlighted within the Action Plan. They will convene relevant stakeholder groups to identify leadership organizations to advance the initiatives and monitor progress. The co-champions will work with stakeholders and the CODES community to identify, solicit and publicly promote emerging Impact Initiative opportunities on a rolling basis. CODES co-champions will further promote this Action Plan and will contribute to catalyse its key messages and Impact Initiatives in four main ways:

- Convene and connect a global community of common purpose to advance these 3 shifts;
- Identify enabling policies and map stakeholders for each strategic priority;
- Suggest impact initiatives as actionable items to concurrently progress strategic priorities;
- Foster and demonstrate political leadership in advocating for, and realizing the Impact Initiatives.

Stakeholders can be public and private entities, including members from academia and civil society. They are invited to join and collaborate with CODES through 3, intersecting engagement pathways:

Tier 1 **Catalyser of Impact Initiatives**

Stakeholders that are seeking to act in a leadership and catalysing capacity and/or as supporting entities to progress the advancement of Impact Initiatives highlighted within or emerging from the Action Plan. This will also include a willingness to participate in monitoring and transparent reporting to measure progress of the Impact Initiatives against key performance indicators. These accountability measures can be self-governed and/or leverage an adaptive learning framework to create regular opportunities for constructive reflection and analysis to make progress towards achieving their missions. The measurement metrics can be co-drafted with the organizations engaged in the impact initiative. The Catalysers will also have an opportunity to join the CODES external advisory board to provide ongoing guidance and strategic direction to the co-champions.

Tier 2 **Action Network**

Stakeholders that are developing or implementing digital transformation and sustainability projects who are actively participating in the implementation of the 3 shifts outlined in the CODES Action Plan. This includes being listed as a formal CODES stakeholder in the online network map.

Tier 3 **Advocates**

Stakeholders that are engaging with the CODES network by sharing best practices and technological expertise as well as acting as advocates to support the CODES Action Plan. They actively promote the adoption of the shifts and related impact initiatives highlighted within the Action Plan within their own constituencies and networks. This includes contributing to and receiving the monthly CODES newsletter and the community of practice on www.sparkblue.org/CODES



Annexures

Action Plan for a
Sustainable Planet
in the Digital Age

Annex I: Stakeholder Mapping

Table 1: **Mapping of key Stakeholders and Initiatives Addressing Shift 1**

Type of actor / Initiative	Title	Strategic Priorities
Digital Innovation and Acceleration Initiatives or Funding	• Climate Technology Centre and Network (CTCN) • UNDP Accelerator Labs • OECD Mission Oriented Innovation Lab • Digital4Development Hub • United 4 Smart Sustainable Cities (U4SSC) • BMZ Digital Transformation Centers	• 4 • 4 • 4 • 4 • 4 • 4
Agenda Setting and Stakeholder Dialogue	• Secretary General's Digital Cooperation Roadmap • Coalition for Digital Environmental Sustainability (CODES) • The Dialogue on Global Digital Finance Governance	• 1, 4 • 1, 4, 6 • 4, 6
Data, Analytics and Tools	• Secretary General's Data Strategy • Global Partnership for Sustainable Development Data • UN Global Pulse • Digital Public Goods Alliance	• 6 • 6 • 4 • 5, 6
Policies, Norms and Standards	• The UN Environmental Assembly (UNEA) • The International Telecommunications Union (ITU), Standardization Sector (ITU-T) • UN Environmental Management Group (EMG) • The Internet Governance Forum (IGF): Policy Network on the Environment • The Global Partnership on AI (GPAI) • OECD AI Policy Observatory • European Council Conclusions on Digitalization for the Benefit of the Environment • Principles for Digital Development • Corporate Digital Responsibility • The International Sustainability Standards Board (ISSB) • Global Agreement on the Ethics of Artificial Intelligence	• 1, 6 • 1, 6 • 1 • 1, 6 • 4, 6 • 4 • 4 • 6 • 6 • 6 • 6

	• Open Collaboration for Next Generation Digital Solutions for MRV • Certified B-Corporation • Science-based Targets Initiative	• 5, 6 • 6 • 6
Advocacy	• Digital Goes Green	• 3, 5
Training	• Atingi Digital4Sustainability Learning Programme • Principles for Digital Development Training Programme • IEEE's Course on Digital Transformation: Moving Toward a Digital Society • Open SAP: Sustainability Through Digital Transformation • ITU and UNDP's digital capacity database	• 2 • 2 • 2 • 2 • 2
Research and Knowledge	• Future Earth Sustainability in the Digital Age • Digitalization for Sustainability – Science in Dialogue (D4S) • International Society for Digital Earth • Research Group on Digitalization and Sustainability Transformations, IASS Potsdam • UNEP's Global Environmental Outlook	• 3 • 3 • 3 • 3 • 3
Collective Action Networks and Coalitions	• Digital With Purpose Movement • Every Actions Counts Coalition • Green Digital Finance Alliance • Global Enabling Sustainability Initiative • Digital Future Society • Greentech Alliance • The Future Society • UN Innovation Network	• 5, 6 • 5 • 5 • 5 • 5 • 5 • 5 • 5

Table 2: **Mapping of Key Stakeholders and Initiatives Addressing Shift 2**

Type of actor / Initiative	Title	Strategic Priorities
Digital Innovation and Acceleration Initiatives or Funding	• ITU's International Centre of Digital Innovation (I-CoDI) • ITU Partner Connect Digital Coalition	• 5 • 5
Agenda Setting and Stakeholder Dialogue	• ITU-T Focus Group on Environmental Efficiency for Artificial Intelligence and other Emerging Technologies • UN E-waste coalition • Roundtable on Global Connectivity within the Secretary General's Digital Cooperation Roadmap • Roundtable on Ensuring the Protection of Human Rights in the Digital Era within the Secretary General's Digital Cooperation Roadmap	• 1 • 2 • 5 • 6
Data, Analytics and Tools	• CodeCarbon • Carbon Mark • Global E-waste Statistics Partnership	• 1 • 1 • 2
Policies, Norms and Standards	• ITU-T SG5: Environment Climate Change and Circular Economy, standards on: • ITU-T L.1000-series: E-waste and circular economy • ITU-T L.1200 series: Power feeding and energy storage • ITU-T L.1300-series Energy efficiency, smart energy and green data centers • ITU-T L.1400-series: Assessment methodologies of ICTs and CO2 trajectories (for goods, networks, services, organizations, cities and sector levels) • ITU-T L.1500 series: Adaptation to climate change • ITU-T L.1700 series: Low cost sustainable infrastructure standards • ITU-D E-waste Policy Development • Digital Nations - Sustainable Government Information Technology • One Planet Programme on Sustainable Public Procurement (SPP) • EU Green Public Procurement guidebook • OECD green ICT assessments	• 2 • 1 • 1 • 1, 2 • 1 • 1, 2 • 2 • 1, 2 • 1, 2 • 1, 2 • 1, 2

Policies, Norms and Standards	• OECD.AI Policy Observatory (Task Force on AI Compute & Environment) • OECD Recommendations on Information and Communication Technologies (ICTs) and the Environment • Principles for Green Software Engineering • European Committee for Standardization (CEN) Materials efficiency • European Committee for Electrotechnical Standardization (CENELEC) Materials efficiency • European Telecommunications Standardization Institute (ETSI) Materials Efficiency and Life Cycle Assessment • Internet Engineering Task Force (IETF) • Institute of Electrical and Electronics Engineers Standard Association (IEEE SA) • Sustainable IT Pledge by the Canadian CIO Strategy Council • Basel Convention on controlling transboundary movements of hazardous wastes and their disposal • EU Ethics Guidelines for Trustworthy AI • Guidelines for sustainability information on e-commerce platforms • Global Agreement on the Ethics of Artificial Intelligence • World Wide Web Foundation REACT policy framework on Digital Inclusion • Principles for Digital Development • UN Declaration on the Rights of Indigenous Peoples (UNDRIP) • Audit AI • UNICEF Policy Guidance on AI for Children • Responsible Data for Children • OHCHR's work on privacy in the digital age • GESI Good Practice Guide on Remedy Human Right Impacts • UN Guiding Principles on Business and Human Rights • Children's Rights and Business Principles • UNICEF: The Case for Better Governance of Children's Data: A Manifesto	• 1 • 1, 2 • 1, 2 • 1, 2 • 2, 2 • 1, 2 • 1, 2 • 1, 2 • 2 • 3, 4 • 3 • 3, 4 • 5 • 5 • 6 • 6 • 6 • 6 • 6 • 6 • 6 • 6
Advocacy	• Center for Humane Technology • International Campaign for Responsible Technology • Center for Countering Digital Hate • Alliance for Affordable Internet • Amnesty International • Global Witness	• 3, 4, 6 • 3, 4, 6 • 4 • 5 • 6 • 6

Training	• Open SAP: Clean-IT: Towards Sustainable Digital Technologies • Open SAP: Sustainable Software Engineering • Principles for Digital Development	• 1, 2 • 1 • 4
Research and Knowledge	• UNFCCC Climate Action Pathways - ICT & Mobile • Digital Goes Green • ICT4S Research Community • Digitalization for Sustainability – Science in Dialogue (D4S) • Network for Digital Economy and Environment (nDEE) • C-SERVES • EFUTURES - Electronics for Sustainable Societies • PARIS DE • Global E-waste Statistics Partnership Global E-waste Monitors Regional E-waste Monitors • FacProSUM Urban Mine Platformebook Climate Science Center • Facebook Climate Science Center • Google initiative on verified climate science • Twitter initiative on authoritative climate info • ITU-T Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF)	• 1 • 1, 2, 3 • 1, 2, 3 • 1, 2, 3 • 1, 2, 3 • 1, 2 • 1, 2 • 1 • 2 • 2 • 4 • 4 • 4 • 5, 6
Collective Action Networks and Coalitions	• UNFCCC Race to Zero Climate Champions team • Exponential Roadmap Initiative • WBCSD Carbon Transparency Partnership • United 4 Smart Sustainable Cities (U4SSC) • Sustainable Digital Infrastructure Alliance • Playing for the Planet Alliance • Digital With Purpose Movement • Green Software Foundation • Global Enabling Sustainability Initiative • Green 500 • Greentech Alliance • ICT Pact • Icebreaker One • Carbon Call • RE100 • GSMA • Internet Governance Forum - Policy Network on Environment • Science-based Targets Network (SBTN) • E-waste Coalition • Circular Electronics Partnership • WEEE Forum • International POPs Elimination Network (IPEN) • Partner Connect Digital Coalition	• 1 • 1, 2 • 1 • 1 • 1, 2 • 1, 2, 3 • 1, 2, 3 • 1, 2, 3 • 1, 2, 3 • 1, 2 • 1, 2 • 1, 2 • 1 • 1 • 1 • 1, 2, 5 • 1, 2, 3 • 1, 2 • 2 • 2 • 2 • 2 • 5

Collective Action Networks and Coalitions	• Digital Poverty Alliance • ITU / UNESCO Broadband Commission • Alliance for Affordable Internet • Responsible Business Alliance • Global Electronics Council	• 5 • 5 • 5 • 6 • 1, 2
--	--	--

Table 3: **Mapping of Key Stakeholders and Initiatives Addressing Shift 3**

Type of actor / Initiative	Title	Strategic Priorities
Digital Innovation and Acceleration Initiatives or Funding	• UNDP's Digital Transformation Initiative • UNEP's Digital Transformation Programme • GIZ's Innovation Challenge • Ellen Macarthur Foundation • Digital Public Goods Alliance • United for Smart Sustainable Cities (U4SSC) • UNFCCC Global Innovation Hub • SITRA Sustainable Lifestyles	• 1, 4, 5, 6 • 1, 2, 3, 5 • 2, 3, 5, 6 • 2, 3, 5 • 2, 5, 6 • 2, 3, 5, 6 • 2, 3, 5, 6 • 3, 5
Agenda Setting and Stakeholder Dialogue	• Global Partnership on Artificial Intelligence (GPAI) • Coalition for Digital Environmental Sustainability (CODES)	• 1, 2, 3 • 2, 3, 5
Data, Analytics and Tools	• Destination Earth - Digital Twin of the Planet • System for Earth Observation, Data Access, Processing and Analysis (SEPAL) • Big Earth Data Science Engineering Program (CASEarth) • UNEP's World Environment Situation Room • Various applications of open data cube technology including Digital Earth Africa, Digital Earth Pacific • Group on Earth Observations (GEO) work on Digital Earth • Computational Sustainability • International Society for Digital Earth • Sustainability in the Digital Age • Joint Centre for Excellence in Environmental Intelligence • Alan Turing Institute Environment and Sustainability Interest Group • UNDP Data Futures Platform, Green Recovery Data Hub • UN Secretary General's Future Labs	• 1 • 1 • 1 • 1 • 1 • 1 • 1, 2, 3 • 1 • 4, 5, 6 • 1, 4, 5 • 1, 2, 3 • 1, 6 • 1

	• Global Initiative on AI and Data Commons • Artificial Intelligence for Environment & Sustainability (ARIES) to support the System of Environmental Economic Accounting (SEEA) • Microsoft Planetary Computer • Google Earth Engine • Nvidia Omniverse platform for digital twinning and 3D simulations • Amazon Sustainability Data Initiative • Salesforce Sustainability Cloud • Global Open Science Cloud Initiative • Future of Sustainable Data Alliance (FoSDA) • Global Data Access Framework (GDAF) • United Nations Satellite Centre UNOSAT • Copernicus Open Access Hub • Trase Earth On Climate Change • Camda Data 2.0 working group • Climate TRACE • Climate Chain Coalition • Climate Change AI • Centre for AI & Climate • Climate Informatics • Icebreaker One • Data Driven Lab • Digital Public Goods Alliance - Climate Change Adaptation Community of Practice On Nature and Biodiversity • Framework on Ecosystem Restoration (FERM) • UN Biodiversity Lab • IPBES • Restor • The Life Map • e-shape • Coordinadora de las Organizaciones Indígenas de la Cuenca Amazonica (COICA) • Indigenia Mundus On Chemicals and Pollution • Global Partnership on Marine Litter (GPML)	• 1, 2, 3, 5 • 1, 5 • 1, 2, 4 • 1, 2, 4 • 1, 2, 4 • 1, 2 • 1, 2 • 1, 2 • 1 • 1 • 1 • 1 • 2, 3 • 1 • 1 • 1 • 1, 3, 4 • 1, 3, 4 • 1 • 1, 2, 3 • 1 • 1, 4, 5 • 1 • 1, 4 • 1, 4 • 1 • 1 • 1 • 4, 6 • 4, 6 • 1, 5
Policies, Norms and Standards	• Global Partnership for Sustainable Development Data • Global Environmental Data Strategy requested by UNEA 4/23 • FAIR Principles for Scientific Data • CARE Principles for Indigenous Data Governance	• 1, 2 • 1, 2, 5 • 1, 2, 5 • 1, 2, 5, 6

Policies, Norms and Standards	• First Nations Principles of Ownership, Control, Access, and Possession (OCAP)	• 1, 2, 5, 6
	• ISC-CODATA's Decadal Programme 'Data for the Planet: making data work for cross-domain grand challenges'	• 1, 2
	• International Open Data Charter	• 1
	• Data Interoperability Collaborative	• 1
	• GS1 Digital Link	• 2, 3, 5
	• ITU-T Study Group 5: Environment, Climate Change and Circular Economy • ITU-T L.1000-L.1199 standards: set of standards that can form the basis for circular economy	• 2
	• ITU-T L.1470 series to achieve net zero in the ICT sector	• 2
	• ITU Sustainability passport for digital products	• 2, 3
	• ITU standards and guidelines on Green Procurement	• 2
	• ITU-T Study Group 20: Internet of things (IoT) and smart cities and communities (SC&C) • ITU-T Y.4900 series: Evaluation and assessment of smart cities	• 2, 3
	• ITU-T Y.4903: Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals	• 2, 3
	• ITU-T Y.4904: Smart Sustainable cities maturity model	• 2, 3
	• Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A)	• 3, 6
	• Green Fintech Taxonomy	• 2, 3
	• Planet Mark	• 3
	• Guidelines for Sustainability Information on E-commerce Platforms	• 3
	• Consumers International - Digital Trust	• 3
	• EU Digital Services Act	• 2, 3, 5
	• EU Digital Markets Act	• 2, 3, 5
	• UNEP Finance Initiative	• 2, 3, 5
	• Responsible AI Strategy for the Environment (RAISE)	• 2, 3, 5
	• EU Corporate Sustainability Reporting - Directive 2014/95/EU Non-Financial Reporting	• 2, 3, 5
	• EU Proposal for a Corporate Sustainability Reporting Directive (CSRD)	• 2, 3, 5
	• UNESCO Recommendations on Open Science	• 4
	• Open Science guidelines	• 4

	• European Financial Reporting Advisory Group (EFRAG)/ Sustainability Reporting Board • Digital Nations - Leading Digital Governments • The GovLab • Open Government Partnership: workstream on digital governance • Open North • Principles and Recommendations to align BigFintech governance with the SDGs • ITU and Digital Impact Alliance GovStack • ITU GreenGovStack • Digital Investment Toolkit • Gender Equality in Digitalization (UNDP)	• 5 • 5 • 4, 5 • 5 • 4, 5 • 3.5 • 5, 6 • 5 • 6 • 6
Advocacy	• Digital Goes Green	• 2, 3, 5
Training	• EO4GEO Alliance • Open SAP: Helping Business Thrive in a Circular Economy • ICLEI Europe: AI4 Cities • ITU Centres of Excellence programme	• 1 • 2 • 2 • 4, 6
Research and Knowledge	• ICT4S Research Community • UNESCO International Research Centre in Artificial Intelligence • Digitalization for Sustainability – Science in Dialogue (D4S) • International Resource Panel’s workstream on “Sustainable Trade in Resources: Global Material Flows, Circularity and Trade” • Stockholm Environment Institute (SEI) • Alan Turing Institute Environment and Sustainability Interest Group • ITU E-agriculture • Climate Change AI • ITU-T Study Group 5: Environment, Climate Change and Circular Economy • International Resource Panel’s workstream on “Sustainable Trade in Resources: Global Material Flows, Circularity and Trade” • Green Digital Finance Alliance • EU’s Regulations on Sustainable Finance • E-mobility Toolbox • Accelerating Access to Low Carbon Urban Mobility Solutions (ACCESS) through Digitalization • UNDP Digital Readiness Assessment • OECD International Programme for Action on Climate (IPAC) • UNFCCC Resilience Frontiers	• 1, 2, 3 • 4, 6 • 1, 2, 3 • 3.2 • 2, 3, 4 • 2, 4, 6 • 3, 4, 6 • 2, 3, 4, 5 • 2, 4, 6 • 2, 5 • 2, 5 • 2, 5 • 3, 6 • 3, 6 • 4, 5 • 2, 5 • 2, 5

Research and Knowledge	• UK Center for Greening Finance and Investment • ITU and UNDP's Digital Capacity Database • AI Commons • World Benchmarking Alliance • EU Blockchain Observatory and Forum • Ubuntu - Environmental Solutions Platform • The GovLab • Focus Group on AI for Natural Disaster Management (FG-AI4NDM) • Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A) • Latin American Institute of Terraforming	• 2, 5 • 2, 4, 5, 6 • 5, 6 • 2, 5 • 4, 6 • 4, 6 • 2, 5 • 3, 5, 6 • 3, 5, 6 • 6
Collective Action Networks and Coalitions	• Working towards a Digital Twin on Earth • Greentech Alliance • European Green Digital Coalition • WEF 2030 Vision • Platform for Accelerating a Circular Economy (PACE) • Circular Electronics Partnership (CEP) • Digital With Purpose • Icebreaker One • Playing for the Planet Alliance • Google Sustainability Choices - Green Apps • Amazon Climate Pledge Friendly Products • Every Action Counts Coalition • United 4 Smart Sustainable Cities (U4SSC) • ITU and UNICEF Giga Connectivity • Science-based Targets Initiative • Climate Chain Coalition • United Citizens Organization for Action for Climate Empowerment • High-Speed Access for All: Canada's Connectivity Strategy • Digital Connectivity and Cybersecurity Partnership (DCCP) • Technology for Development • Digital Impact Alliance • Digital Poverty Alliance	• 1 • 2, 3, 4, 6 • 2, 3, 5 • 2, 5, 6 • 2 • 2 • 2, 3, 5 • 2, 3, 5 • 2, 3 • 3 • 3 • 2, 3 • 2, 3, 5 • 4, 6 • 2, 3, 5 • 2, 3 • 5 • 6 • 6 • 6 • 6

Annex II: Summary of Digital Transformation needs

Identified by the Stockholm+50 regional and national consultation process



Stockholm +50 Regional Consultation Outcomes on Digital Transformation

Asia and the Pacific	
Regional Consultation Date	4-5 April 2022
Shifting Markets and Consumer Behaviours	Develop key standards and use tracking software to ensure that supply chains are sustainable, and markets and producers are connected
Towards Sustainable Food and Agriculture	- Leverage new data technologies, such as machine learning and digital mapping systems, in order to tackle key environmental issues, including food waste and plastic pollution - Improve infrastructure to reduce food loss, and harness digital technologies for smarter food production and transport
Innovation-enabling Policy- and Regulatory Framework	- Take into account the digital gap persistent in the region and note that digitalization needs to be carried out with clear rules on ownership and use of the data and knowledge - Increase digital access, especially among those located in remote and isolated communities - Develop best practices for using emerging technologies like blockchain for data logs - Focus on the better or more regulated use of information and communication technology and digital platforms “at the nexus of sectors,” including water systems, agriculture, and supply chains
Accelerating and Scaling Environmental Sustainability	- Use “internet of things” and digital dashboards to simultaneously manage energy- and water-related challenges - Recognize that dependence on digital technologies comes with environmental and social costs, including those associated with the extraction of minerals and rare earths to produce digital gadgets and infrastructure, and the massive use of energy by blockchains
Digital Literacy, Capacity Building and Inclusiveness	- Increase digital access, especially among those located in remote and isolated communities - Leverage new data technologies, such as machine learning and digital mapping systems, in order to tackle key environmental issues, including food waste and plastic pollution - Widen access to digital technologies as a means of complementing conventional classroom-based learning - Introduce data centers and digital monitoring solutions to raise public awareness about key health and environmental challenges - Promotion of digitalization in agriculture should take into account those who are left behind – “the bottom billion” without access to digital infrastructure or basic services, such as electricity and education

Latin America and the Caribbean	
Regional Consultation Date	5-6 April 2022
Shifting Markets and Consumer Behaviours	Electronic waste problems must be addressed using circular economy principles
Innovation-enabling Policy- and Regulatory Framework	- Analysis and regulate the risks that digital technology can pose by facilitating environmentally harmful development and financing - Introduce technology that bridges gaps between people and sectors and helps communities - All types of technology, including local and traditional science and technology, must be used - Implement better resource management through the deployment of technology
Digital Literacy, Capacity Building and Inclusiveness	- Support small and medium-sized enterprises (SMEs) using more formal business practices such as digitalization and banking. Technology that provides sustainable benefits for communities - Recognition of technology and knowledge that can help people live harmoniously with nature, and active listening to Indigenous Peoples - To address limited space and human capacity to face challenges and the gap between proposed solutions for issues such as climate change, and the availability of technology needed to tackle these
Africa	
Regional Consultation Date	12-13 April 2022
Innovation-enabling Policy- and Regulatory Framework	- Spur enterprise by supporting rural communities access to digitalization and information technologies leveraging mobile tech platforms; - Use digitalization to innovate advancements in key growth sectors e.g., agriculture, manufacturing, and construction to protect ecosystems and support livelihoods
Accelerating and Scaling Environmental Sustainability	Leverage digitalization to establish robust participatory monitoring and evaluation of sustainable development interventions
Europe and North America	
Regional Consultation Date	5 May 2022
Shifting Markets and Consumer Behaviours	A globally fair and sustainable product liability insurance regime to accelerate dissemination of relevant technologies
Innovation-enabling Policy- and Regulatory Framework	- Introduce better holistic scientific assessments, integrating both social and natural sciences, for planetary boundaries to better inform global governance; - Deploy green digital solutions - Funding and awards to promote and enhance innovation and innovative solutions
Accelerating and Scaling Environmental Sustainability	Use technology for the protection of the environment
Digital Literacy, Capacity Building and Inclusiveness	- Promote the use of innovation and technology, including to increase transparency, traceability, and accountability along supply chains in order to support better engagement of stakeholders - Capacity and technology must be aligned with local needs and priorities, not donor countries' priorities

West Asia	
Regional Consultation Date	11-12 May 2022
Shifting Markets and Consumer Behaviours	Step up climate and environmental protection ambition by accelerating action, such as by measuring, reporting, and verifying the objectives of the project to map 1000+ green buildings, neighbourhoods, and cities with technology promoting the “green buildings” concept
Towards Sustainable Food and Agriculture	- Invest in access to energy-efficient and climate-smart technologies for small producers in agri-food value chains - Promote recycling and digital transformation initiatives
Innovation-enabling Policy- and Regulatory Framework	- Promote e-recycling, which “makes business sense,” and can lead to the formation of new enterprises - Harness innovations and technologies, including digital technologies for transparency and disclosure
Accelerating and Scaling Environmental Sustainability	To scale up digitization to accelerate implementation of the environmental dimension of sustainable development in the context of the Decade of Action

Preliminary Synthesis on Digital Needs Emerging from National Consultation Processes

Methodology

UNDP provided direct support on the Stockholm +50 national consultation processes in 57 countries, out of which, 33 countries have submitted a preliminary draft consultation report by 23 May prior to Stockholm +50 meeting through UNDP country offices. The report template asked for broad challenges, opportunities, pathways and solutions for Green Recovery and transition into a green and inclusive future without any specific question on digitalization needs to avoid preempting solutions. This paper was prepared by UNDP as annex to the CODES Action Plan, and a final synthesis report will be prepared post-Stockholm +50 with a full analysis on digitalization needs.

Initial Findings

- Over 90% (30 countries) had one or more direct mention of digital technology and data needs, often across multiple sections of the draft report.
- Digital was rarely mentioned in the context of a challenge. Rather, it frequently appeared in questions asking for opportunities and solutions for scale up.
- Countries noted how lack of digital access and e-literacy amplified inequality and vulnerability during the Covid-19 pandemic.
- The most frequently mentioned digital need is digital / data management systems to monitor key environmental indicators including MRV systems. There is an overarching need to upgrade or modernize the existing systems as new data sources and more advanced analytics become available.

- Countries note that data-driven studies and data disaggregation are key for policy making processes to ensure vulnerable or marginalized populations inclusivity.
- Many countries list digital technology needs coupled with needs for data and digital capacity development, not only in the public sector but also within communities and youth for ownership. Digital and data skills also frequently appeared in green jobs opportunities.
- Digital and transparency were key recommendations for improving sustainable supply chains (food, fashion, etc.). Other sectors with strong digital needs are agriculture and energy.
- Countries such as Mauritius and Rwanda, which are known for whole-of-society digital transformation efforts, have aligned policy recommendations, solutions and investment needs around digital technology for nature and climate. Countries may benefit from approaching digital transformation with a whole-of-society and foresight lens to get the most of its benefits.
- Only one country mentioned e-waste as an issue for international cooperation. The potential negative environmental impact of digital technologies may require further awareness raising.

Country needs (opportunities, solutions, recommendations) on digital for nature and climate

Sustainable digital economy and green jobs

- Youth to drive the digital economy with understanding of nature and environmental challenges, with market-ready IT skills. (Mauritius)
- Transforming the productive matrix of the country, from an extractive model to a model with more value (more sustainable, inclusive, diverse, digitalized, e.g.). (Chile)
- It is important to readjust economic policies towards “greener and more digital” economies and not to come back to pre-pandemic levels. (Kazakhstan)

Environmental data monitoring systems

- Publicize relevant, timely and disaggregated data for evidence-based decision making, analysis and monitoring and evaluation as well as inclusive hearing and evaluation systems for public feedback on environmental legislation, planning, policies and projects. Leverage AI and digital tools to support actions against climate change and biodiversity conservation. (China)
- Baseline data development and administration allow to make visible the state of resources and their management, subsequently enhancing a more informed decision making with accurate data considering natural resource regeneration. (Mexico)
- Strengthening land cadaster to generate data must aid decision makers. (Liberia)
- This requires better data and information management ahead of time. (Viet Nam)
- Enhance the management of environmental and climate data and/or information of the country. (Somalia)
- Government should develop a single database platform for monitoring and effective monitoring purposes. In order to ensure observation, control and management of the condition and changes in the environment and its resources, a system of state environmental monitoring should be implemented. (Upgrade current system). (Kyrgyzstan)
- The establishment of a centralized transparency mechanism based on measurable monitoring indicators. (Algeria)
- MRV system based on user friendly IT system. (Ethiopia)

Advanced analytics, modeling and forecasting for decision making

- The importation of essential equipment, such as supercomputers, which are essential for modeling the impacts of various environmental crises (climate change, loss of biological diversity, desertification, water stress, land degradation, etc.). The importance of equitable access to technical tools (software, applications, etc.), which are essential for the achievement of the environmental dimension of sustainable development. This concerns, for example, software for calculating greenhouse gas emissions, modelling tools, super calculators, systematic observation tools, etc. (Algeria)
- Data analytics and GIS to improve our capacity to analyze and project climate trends. (Philippines)
- Leverage Technology & Data Collection tools to adopt data-driven approaches and inform Covid-19 containment strategies and economic recovery. (Rwanda)

Digital application in key sectors

- Digital transformation is a key enabler. (Sri Lanka)
- Application of appropriate digital technology in key livelihood sectors including agriculture and tourism. (Thailand)
- SMART transport alternatives. (Philippines)
- Develop the E-commerce (food, clothing, materials, etc.) and digital marketing. (Cote d'Ivoire)
- Digitalization of various systems (such as supply chains). (Georgia)
- Driving the adoption of ICT for all businesses and citizens by scaling up existing e-government and private sector digitization efforts including E-Commerce Platforms and Digital Payments. Improve public transportation systems including increased number and efficiency of buses, linkage with payment system and better IT platform (application) for fleet management. (Rwanda)
- Emergence of new business opportunities: mobile vending, online businesses, etc. The recovery practices could be scaled up through development of ICT infrastructure. (Sri Lanka)
- Vulgarization of agro-technology (digital innovation for agriculture). (Cote d'Ivoire)
- Transition agriculture and waste management to a digital inclusivity and decentralized strategy. (Liberia)
- Accelerate transition to sustainable energy practices and digital transformation. (Mauritius)

Digital media, communication and engagement for a just transition

- Promote the role of digital media in disseminating and promoting biodiversity conservation and climate change concepts. (China)
- At the ages of digitalization, children and students would be more aware of environmental changes in the nature and how it is important to conserve the environment and biodiversity for future generations. (Kazakhstan)
- Vulgarise opportunities for benefit of all, using digital platforms and mass media to eliminate communication barriers. (Mauritius)
- The development of digital media to increase the active involvement of the population in public policy and practical measures for disseminating information were also highlighted. (Ecuador)

Inclusivity of marginalized or vulnerable populations

- Generate public policies that have a focus on the whole of society, and are governed by the data and information available. A good example of this is the UNDP study “A green recovery from Covid19 in Costa Rica”, which shows how the implementation of the National Decarbonization Plan is a great opportunity to reduce the inequality gaps exacerbated by the COVID-19 pandemic. This study shows that with greater investments in decarbonization, people with medium and low job qualifications, as well as women, are the most benefited. (Costa Rica)
- Transition to youth, digital inclusivity and decentralization of NRM activities to facilitate ownership. (Liberia)
- Assessments, evaluations, studies, and other data collection efforts will be required to report gender and social inclusion progress to inform gender policy and planning. (Papua New Guinea)
- Empower the youth, the women, the marginalized and the general public to be more involved through citizen science; Digitalization of G2P interventions. (Philippines)
- Improve internet access for all, especially in rural areas. (Cote d ‘ Ivoire)

Digital and transparency of supply chain

- Digital transformation. (Sri Lanka)
- Local industries should decarbonise their supply chains and use ICT to modernize their operations, supported by IT skills development, capacity building, technology diffusion to create more decent work and quality jobs while digital networks and access continue to be upgraded. (Mauritius)
- Reduce the cost of the digital divide and promote access to affordable clean energy. (Mali)
- In order to achieve and create a better performing industry and supply chain, it is important to adopt visibility and traceability of the supply chain. (Kazakhstan)
- The digitalization of supply chain systems. (Georgia)
- Digital technology should be deployed to manage carbon emissions across the supply chain. (China)

Capacity needs

- Access to the latest technologies should be ensured through the sharing of best practices, but also through open access mechanisms the benefit of developing countries. (Algeria)
- Strengthen capacity through communication and training, including the establishment of data coordination and monitoring, for more evidence-based informed decisions. (China)
- Governments, educational institutions, and industry need to start implementing policies and programmes that increase the level of digital competence in countries. Core to developing such policies and programmes is the identification of national skills supply, skills demand, and skills gaps, which is required to develop targeted and effective action. Angola needs to first solve the basic problems of internet access and connectivity to then start implement more complex technologies. (Angola)
- Information and communication technologies (ICTs) are identified as being necessary to reduce transaction costs, both physical (e.g., transportation) and non-physical (information asymmetries, decision-making, etc.). (Argentina)
- Low access to the internet and digitalization which also affect their life conditions. Access to education and digital information, especially to women and people in rural areas are needed to be improved for future generations. (Kazakhstan)

- Information, communication and digital technologies in the field of environment and climate change. (Mali)
- Lack of data is a significant country-wide problem that hinders data-driven decision making for sustainable development. Therefore, an effective information management system is an essential technological capacity needed to strengthen all dimensions of SD. / Capacity. (Sri Lanka)
- Capacity building of environmental and climate activists on digital technology are needed. In addition, Somalia needs technologies to measure air, water, soil and marine pollution, state of art technologies to support multi-hazards early warning system. (Somalia)
- Assistive technology and devices are not available locally / in communities that hinder PWD capacity to engage in the implementation of initiatives. Need to develop incentives for manufacturers of these technology and make these devices more affordable for PWDs. Just transition could also focus on increasing skills of the communities, esp indigenous peoples (e.g. digital inclusion). (Philippines)

E-waste and negative impact of digital

- Disposal of used e-material and e-wastes. (Mauritius)

References

1. Future Earth. Sustainability in the Digital Age. <https://futureearth.org/initiatives/other-initiatives/sustainability-in-the-digital-age/> (Accessed: 14 February 2022).
2. Mondejar, M. E., Avtar, R., Diaz, H., Dubey, R. K., Esteban, J., Gómez-Morales, A., Hallam, B., Mbungu, N. T., Okolo, C. C., Prasad, K. A., She, Q., & Garcia-Segura, S. (2021). Digitalization to achieve sustainable development goals: Steps towards a Smart Green Planet. *The Science of the total environment*, 794, 148539. <https://doi.org/10.1016/j.scitotenv.2021.148539>.
3. PwC (2020). Over two-thirds of Sustainable Development Goals could be bolstered by emerging tech, including AI and blockchain. <https://www.pwc.com/gx/en/news-room/press-releases/2020/blockchain-sdgs-wef.html> (Accessed: 14 February 2022).
4. Other assessments have come to similar conclusions for example, the GESI Digital With Purpose Report (2019) found that 103 of the 169 SDG targets are directly influenced by seven digital technologies: digital access, faster internet, cloud, the internet of things (IoT), cognitive, digital reality, and blockchain. See also <https://www.sciencedirect.com/science/article/pii/S0048969721036111>; <https://www.nature.com/articles/s41467-019-14108-y>; https://eo4society.esa.int/wp-content/uploads/2021/01/EO_Compendium-for-SDGs.pdf.
5. General Assembly resolution 48/13, The human right to a clean, healthy and sustainable environment, A/HRC/RES/48/13 (8 October 2021), available from undocs.org/A/HRC/RES/48/13.
6. UN General Assembly (2015). Transforming our World: the 2030 Agenda for Sustainable Development. A/RES/70/1.
7. United Nations (2020). The Sustainable Development Goals Report 2020. <https://unstats.un.org/sdgs/report/2020/>
8. United Nations Environmental Programme (2021). Making Peace With Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies. <https://www.unep.org/resources/making-peace-nature>
9. International Telecommunication Union (2021). Facts and Figures Report 2021. <https://www.itu.int/itu-d/reports/statistics/facts-figures-2021/>
10. World Economic Forum (2021). The Global Risks Report 2021. http://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2021.pdf
11. United Nations Development Programme, United Nations Capital Development Fund (2021). Towards an Inclusive, SDG-Aligned Governance of BigFintech. <https://sdgfinance.undp.org/digital-finance/towards-inclusive#summary>
12. United Nations Capital Development Fund (2021). Estimates of Global E-Commerce 2019 And Preliminary Assessment of Covid-19 Impact on Online Retail 2020. https://unctad.org/system/files/official-document/tn_unctad_ict4d18_en.pdf
13. Kepios Analysis (2021). Digital 2022 April Global Statshot Report. <https://datareportal.com/reports/digital-2022-april-global-statshot>
14. Magna (2021). Global Advertising Market Reaches New Heights and Exceeds Pre-Covid Levels. <https://magnaglobal.com/global-advertising-market-reaches-new-heights-and-exceeds-pre-covid-levels/> (Accessed: 17 May 2022).
15. GeSI (2015). #SMARTer2030 report: ICT Solutions for 21st Century Challenges. https://smarter2030.gesi.org/downloads/Full_report.pdf
16. Graver, B., Zhang, K. and Dan Rutherford (2018). CO₂ Emissions from Commercial Aviation, 2018. The International Council on Clean Transportation. <https://theicct.org/publication/co2-emissions-from-commercial-aviation-2018/>

17. Forti V., Baldé C.P., Kuehr R., and G. Bel (2020) The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential. United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/ Rotterdam.
18. Deloitte (2021). What is digital economy? Unicorns, transformation and the internet of things. <https://www2.deloitte.com/mt/en/pages/technology/articles/mt-what-is-digital-economy.html>. (Accessed: 17 May 2022).
19. United Nations Conference on Trade and Development (2021). Digital Economy Report 2021: Cross-border data flows and development: For whom the data flow. Overview. https://unctad.org/system/files/official-document/der2021_overview_en_0.pdf.
20. Digital Tech ITP. Defining the Digital Sector. <https://digitaltechitp.nz/defining-the-digital-sector/> (Accessed: 17 May 2022).
21. Government of Canada (2021). Digital Technologies/ICT. <https://ised-isde.canada.ca/site/digital-technologies-ict/en>
22. OECD (2019). Going Digital: Shaping Policies, Improving Lives, OECD Publishing, Paris, <https://doi.org/10.1787/9789264312012-en>.
23. Based on the definition provided in: Gather. Information Technology Glossary: Digitalisation. <https://www.gartner.com/en/information-technology/glossary/digitalization> (Accessed: 17 May 2022).
24. OECD (2019). Going Digital: Shaping Policies, Improving Lives, OECD Publishing, Paris, <https://doi.org/10.1787/9789264312012-en>.
25. Mondejar, M. E., Avtar, R., Diaz, H., Dubey, R. K., Esteban, J., Gómez-Morales, A., Hallam, B., Mbungu, N. T., Okolo, C. C., Prasad, K. A., She, Q., & S. Garcia-Segura (2021). Digitalization to achieve sustainable development goals: Steps towards a Smart Green Planet. The Science of the total environment, 794, 148539. <https://doi.org/10.1016/j.scitotenv.2021.148539>.
26. Ashutosh Gupta (2021). What is Digital Sustainability and How Does It Drive SDG Goals? Gartner. <https://www.gartner.com/en/articles/what-is-digital-sustainability-and-how-does-it-drive-esg-goals>.
27. Wut, T.M., Lee, D., Ip, W.M., & S.W. Lee (2021). Digital Sustainability in the Organization: Scale Development and Validation. Sustainability 2021, 13, 3530. <https://doi.org/10.3390/su13063530>.
28. KPMG (2021). Digitalization can give direction to your sustainability transformation. <https://home.kpmg/be/en/home/insights/2021/07/sus-digitalization-can-give-direction-to-your-sustainability-transformation.html> (Accessed: 17 May 2022).
29. Based on the definition provided in: <https://www.sdp.digital/> (Accessed: 17 May 2022).
30. Dominik Piétron, Philipp Staab, Florian Hofmann (2022). Sustainable digital market design: a data-based approach to the Circular Economy. ECDf Working Paper Series #001, Policy Paper for the D4S-Network, 28th January 2022, Berlin. <http://dx.doi.org/10.14279/depositonce-15014>.
31. Based on the definition provided in: <https://arbor.bfh.ch/16649/1/IGF%202021%20PNE%20Output%20Document.pdf> (Accessed: 17 May 2022).
32. Based on materials on <https://digitalization-for-sustainability.com/> (Accessed: 17 May 2022).
33. Corporate Digital Responsibility (2021). The International CDR Manifesto. <https://corporatedigitalresponsibility.net/>.
34. United Nations (2020). Roadmap for Digital Cooperation. Report of the Secretary-General. https://www.un.org/en/content/digital-cooperation-roadmap/assets/pdf/Roadmap_for_Digital_Cooperation_EN.pdf.
35. United Nations (2021). Our Common Agenda. Report of the Secretary-General. https://www.un.org/en/content/common-agenda-report/assets/pdf/Common_Agenda_Report_English.pdf.
36. German Advisory Council on Global Change (2019). Towards Our Common Digital Future. Flagship Report. https://issuu.com/wbgu/docs/wbgu_hg2019_en?fr=sM2QyYzU1OTI4OA.

37. United Nations Development Programme, United Nations Capital Development Fund (2021). Principles and Recommendations to align BigFintech governance with the SDGs. <https://sdgfinance.undp.org/digital-finance/principles>.
38. ITU. Study Group 5 at a glance. <https://www.itu.int/en/ITU-T/about/groups/Pages/sg05.aspx> (Accessed:18 May 2022)
39. Stuermer, M., Abu-Tayeh, G. & T. Myrach (2017). Digital sustainability: basic conditions for sustainable digital artifacts and their ecosystems. *Sustain Sci* 12, 247–262. <https://doi.org/10.1007/s11625-016-0412-2>
40. ITU-T (2020). Recommendation L.1470. Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement. <https://www.itu.int/rec/T-REC-L.1470-202001-I/en>.
41. Andrae, A.S.G. (2020). New perspectives on internet electricity use in 2030. <https://pisrt.org/psrpress/j/easl/2020/2/3/new-perspectives-on-internet-electricity-use-in-2030.pdf>.
42. Freitag, C., Berners-Lee, M., Widdicks, K., Knowles, B., Blair, G., & A. Friday (2021). The real climate and transformative impact of ICT: A critique of estimates, trends, and regulations. *Patterns*. 2. 100340. <https://doi.org/10.1016/j.patter.2021.100340>.
43. Digiconomist (2020). Bitcoin Energy Consumption Index. <https://digiconomist.net/bitcoin-energy-consumption/> (Accessed: 15 February 2022).
44. World Bank (2020). Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition. <http://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf>.
45. United Nations Conference on Trade and Development (2020). Digital economy growth and mineral resources: implications for developing countries. https://unctad.org/system/files/official-document/tn_unctad_ict4d16_en.pdf.
46. Forti V., Baldé C.P., Kuehr R., and G. Bel (2020) The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential. United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/ Rotterdam.
47. World Economic Forum (2019). A New Circular Vision for Electronics, Time for a Global Reboot. <https://www.weforum.org/reports/a-new-circular-vision-for-electronics-time-for-a-global-reboot>
48. Forti V., Baldé C.P., Kuehr R., and G. Bel (2020) The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential. United Nations University (UNU)/United Nations Institute for Training and Research (UNITAR) – co-hosted SCYCLE Programme, International Telecommunication Union (ITU) & International Solid Waste Association (ISWA), Bonn/Geneva/ Rotterdam.
49. Kunkel, S., & D. Tyfield (2021). Digitalisation, sustainable industrialisation and digital rebound – Asking the right questions for a strategic research agenda. *Energy Research & Social Science*, Volume 82, 2021, 102295, ISSN 2214-6296, <https://doi.org/10.1016/j.erss.2021.102295>.
50. Coroama, V., & F. Mattern (2019). Digital Rebound - Why Digitalization Will not Redeem us our Environmental Sins. In "Proceedings of the 6th International Conference on ICT for Sustainability (ICT4S 2019) (Editor Wolff, Annika). CEUR Workshop Proceedings Volume 2382. <http://ceur-ws.org/Vol-2382/>.
51. Kepios Analysis (2021). Digital 2022 April/October Global Statshot Report. <https://datareportal.com/reports/digital-2022-april-global-statshot>. <https://datareportal.com/reports/digital-2021-october-global-statshot>.

52. Vosoughi, S., Roy, D., and S. Aral (2018). The spread of true and false news online. *Science* 359(6380), 1146–1151 (2018)
53. Stop Funding Heat (2021). In Denial - Facebook's growing friendship with climate misinformation report. <https://stopfundingheat.info/wp-content/uploads/2021/11/in-denial-v2.pdf>.
54. Gigler, B-S. (2011). Informational Capabilities : The Missing Link for the Impact of ICT on Development. E-Transform knowledge platform working paper; no. 1. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/19011> License: CC BY 3.0 IGO
55. Church, C., and A. Crawford(2018). Green Conflict Minerals: The fuels of conflict in the transition to a low-carbon economy. International Institute for Sustainable Development.
56. Here due diligence requirements as outlined by the UN Guiding Principles on Business and Human Rights, the OECD Guidelines for Multinational Enterprises and the EU Directive on human rights due diligence, among others, can be instructive.
57. Livingstone, S., Carr, J. and J. Byrne. (2016). One inThree: Internet Governance and Children's Rights. Innocenti Discussion Paper No.2016-01, UNICEF Office of Research, Florence.
58. International Telecommunication Union (2021). Facts and Figures Report 2021. <https://www.itu.int/itu-d/reports/statistics/facts-figures-2021/>.
59. CARE Principles for Indigenous Data Governance. <https://www.gida-global.org/care>.
60. FAIR Guiding Principles for Scientific Data Management (Findability, Accessibility, Interoperability, Reusability). <https://www.go-fair.org/fair-principles/>.
61. CARE Principles for Indigenous Data Governance (Collective benefit, Authority to control, Responsibility and Ethics). <https://www.gida-global.org/care>.
62. The SNA provides an overview of economic processes, recording how production is distributed among consumers, businesses, government and foreign nations. It shows how income originating in production, modified by taxes and transfers, flows to these groups and how they allocate these flows to consumption, saving and investment. Consequently, the national accounts are one of the building blocks of macroeconomic statistics forming a basis for economic analysis and policy formulation.
63. Kloppenburg, S., Gupta, A., Kruk, S. R. L., Makris, S., Bergsvik, R., Korenhof, P., Solman, H., & Toonen, H. M. (2022). Scrutinizing environmental governance in a Digital age: New ways of seeing, participating, and intervening. *One Earth*, 5(3), 232–241. <https://doi.org/10.1016/j.oneear.2022.02.004>.

Contributors

This Action Plan was co-created by an incredible network of passionate people wanting to collaborate to shape a sustainable and green digital future. While the Action Plan co-creation process was opened to 1,000 stakeholders from the CODES community, the following individuals deserve specific acknowledgement for their contributions, engagement and commitment to collective action.

“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it’s the only thing that ever has.”

Margaret Mead

CODES Action Plan Coordination Team

David Jensen, United Nations Environment Programme (UNEP)
Shivam Kishore, United Nations Environment Programme (UNEP)
Reina Otsuka, United Nations Development Programme (UNDP)
Marcel Dorsch, Umweltbundesamt/German Environment Agency (UBA)
Nilufar Sabet-Kassouf, Future Earth and Sustainability in the Digital Age
Megha Sud, International Science Council (ISC)

CODES Secretariat Contributors

Robert Opp, Chief Digital Officer, United Nations Development Programme (UNDP)
Dirk Messner, President, Umweltbundesamt/German Environment Agency (UBA)
Philip Thigo, Senior Advisor, Innovations and Open Government - Presidency - Kenya
Éliane Ubalijoro, Executive Director of Sustainability in the Digital Age and Global Hub Director, Canada, Future Earth
David Jensen, Digital transformation coordinator, United Nations Environment Programme (UNEP)
Reina Otsuka, United Nations Development Programme (UNDP)
Marcel Dorsch, Umweltbundesamt/German Environment Agency (UBA)
Megha Sud, International Science Council (ISC)
Shivam Kishore, Digital Transformation Advisor, United Nations Environment Programme (UNEP)
Nilufar Sabet-Kassouf, Future Earth & Sustainability in the Digital Age
Nilushi Kumarasinghe, Future Earth and Sustainability in the Digital Age
Geoffrey Boulton, International Science Council (ISC) and University of Edinburgh
Heide Hackmann, CEO, International Science Council (ISC)
Ben Larroquette, United Nations Development Programme (UNDP)
Christian Löwe, Umweltbundesamt/German Environment Agency (UBA)
Catherine P. McMullen, independent expert
Dirk Osiek, Umweltbundesamt/German Environment Agency (UBA)
Stephanie d’Arc Taylor, United Nations Development Programme (UNDP)
Jason Jabbour, United Nations Environment Programme (UNEP)
Polina Koroleva, Digital Transformation Junior Professional Officer, United Nations Environment Programme (UNEP)

Technical Contributors

Adriana Miranda Castillo, Techno Psychology, Humane Technology & Lean Agile Transformation Coach

Afi Edoh, Student, Dakar Institute of Technology (DIT)

Aiaze Mitha, Digital Finance and SDG Expert, Environmental Digital Innovations Expert, Emerging Markets Fintech Entrepreneur

Aidin Niamir, Scientist, Senckenberg Biodiversity and Climate Research Institute, Germany

Alan Kaydul, Technical Advisor, Digitalization Division, Swiss Foreign Ministry of Federal Affairs

Alexandrine Fayet Boggiano, Programme Manager, Operations Digital Transformation (ICRC)

Alison B. Lowndes, Senior Scientist, Global AI, NVIDIA

Almut Nagel, Green Digital Transformation Policy Advisor, DG CONNECT, European Commission

Amanda Miner, Geospatial Innovation Expert, GIS Services Manager, Envicom Corporation

Amy Luers, Global Lead, Sustainability Science, Microsoft

Anders Sul Thuesen Schmidt, Head of Corporate Citizenship & Responsible Business DK, Accenture

Andrea Hinwood, Chief Scientist, United Nations Environment Programme (UNEP)

Andre Uhl, Chair, IEEE Earth Lab

Andrew Zolli, Chief Impact Officer, Planet

Andy Middleton, Chief Exploration Officer, TYF Group, a Certified B Corporation

Ashbindu Singh, Environmental Pulse Institute

Asim Hussain, Chairperson, Green Software Foundation

Athur Mabiso, Senior Economist, International Fund for Agricultural Development (IFAD)

Babatunde Abidoye, Global Policy Advisor, United Nations Development Programme (UNDP)

Bahtiyar Kurt, Regional Technical Support Specialist, Energy, United Nations Development Programme (UNDP)

Benjamin Larroquette, Regional Technical Advisor for CCA, Nature, Climate and Energy team, United Nations Development Programme (UNDP)

Bjorn-Soren Gigler, PhD, Head of Data Economy and Blockchain Programs, GIZ and Adjunct Professor, Georgetown University

Brennan Van Dyke, Chief, Capacity Development and Innovation Branch, United Nations Environment Programme (UNEP)

Btissam Benkerroum, Economist, African Development Bank

Carly Gilbert Patrick, Team Leader, Active Mobility, Digitalization & Mode Integration, United Nations Environment Programme (UNEP)

Carolyn Frankenhauser, Digital Analyst, Chief Digital Office, United Nations Development Programme (UNDP)

Cheikh Tidjane N'dongo, Acting Head of Food Security Unit, African Union Development Agency (AUDA-NEPAD)

Chibulu Luo, Programme Manager, Energy, United Nations Development Programme (UNDP)

Christian Jølck, Co-founder and Partner, 2150, Climate Tech Investor

Christina Bowen, Co-founder, product research and public engagement, Socialroots

Cristina Buetti, Counsellor, International Telecommunication Union (ITU)

Cyril Caminade, Research Associate, Abdus Salam International Centre for Theoretical Physics

Dagim Terefe, Freelance journalist

Dario Piselli, Graduate Institute of International and Development Studies

Dave Thau, Data and Technology Global Lead Scientist, World Wildlife Fund (WWF)

David Rolnick, Assistant Professor, McGill University and Co-Founder, Climate Change AI

Dr. Indranil Nath, Chartered Fellow, BCS, The Chartered Institute for IT

Dr. Karen Bakker, Author, Professor & Researcher of Environmental Governance & Innovation, University of British Columbia

Dr. Odilia Coi, Director of Innovation, MKAI, Author on Digital Trust, Guest Lecturer, University of Cagliari

Dr. Shivam Gupta, Bonn Alliance for Sustainability Research, University of Bonn, Germany

Edward Darling, The Life Map, Redlist Revival

Enrico Panai, Data and AI Ethicist

Eric Hansel, Founder, Esgdao and The Scubaverse

Ervin Pfeifer, International Research Centre in Artificial Intelligence under the auspices of UNESCO

Eun Joo Lee, Business Analyst, United Nations Population Fund (UNFPA)

Felipe Gusmao, Professor, Federal University of Sao Paulo, Brazil

Felix Creutzig, Groupleader MCC, Berlin; Chair Sustainability Economics of Human Settlements, TU Berlin

Femi David Ogunnigbo, Field Operations Officer/Environmental Consultant, Going Green International Consults Limited

Ferdinando Villa, Ikerbasque Research Professor, Basque Centre for Climate Change

Flurina Wäspi, Institute for Public Sector Transformation, University of Bern

Francesco Gaetani, Regional Science Policy Coordinator, United Nations Environment Programme (UNEP)

Franco Donati, Postdoctoral Researcher, Institute of Environmental Science (CML), Department of Industrial Ecology, Leiden University and Member of Science for Democracy

Gandhar Desai, Analyst, Sustainable and Digital Agriculture, United Nations Development Programme (UNDP)

Gavin Starks, CEO, Icebreaker One

Georg Kell, Chairman of the Board at Arabesque, Founding Director of the United Nations Global Compact

Gertjan van Stam, Independent Consultant

Graham Gannon, Head of Engineering, Global Sales/Marketing Platforms, Google

Guillaume Soto-Gomez, IT Consultant for NGO, Shauri-CC / Well Grounded

Hannah Kromminga, GIFTD, Greentech Alliance

Hannah Mueller, Sustainable Digital Development, GIZ

Héctor Tuy, Organismo Indígena Naleb', Guatemala

Himanshu Shekhar, United Nations University - Institute for Environment and Human Security (UNU-EHS), Bonn, Germany

Ilias Iakovidis, Green Digital Advisor, DG CONNECT, European Commission

Isabelle Albert, Author Tech IT Green, COO Satgana Climate VB & fund

Jacob Baraza, Expert in Water Governance, Transboundary Water Conflicts and Cooperation

Jake Reynolds, Executive Director, Sustainable Economy, Cambridge Institute for Sustainability Leadership

James Castillo, Filmmaker, Flowerman productions

Jan Kennis, Digital For Development Lead Expert, Enabel

Jasmin Nussbaumer, Institute for Public Sector Transformation, University of Bern

Jean-Noé Landry, Obama Scholar, Obama Foundation and Columbia University in New York City and Former Executive Director, Open North

Jim Fruchterman, Founder/CEO Tech Matters, responsible for the Terraso Integrated Landscape Management Platform of the 1000 Landscapes for 1 Billion People Initiative

Johannes Leon Kirnberger, AI & Sustainability Consultant at OECD.AI and Research Associate, Global Partnership on Artificial Intelligence (GPAI)

Karine Perset, Head, OECD.AI Policy Observatory and Network of Experts

Karl Burkart, Co-Founder and Deputy Director, One Earth

Katherine A. Foster, Open Earth Foundation and Social Alpha Foundation

Kathryn Sforcina, Global Head of Strategy at IV.AI

Kathleen Buckingham, Director, Sustainability, Tentree & Veritree

Katie Gibson, Vice President, Strategy and Partnerships, CIO Strategy Council, Canada

Kavinda Gunasekara, Associate Director, Geoinformatics Center at Asian Institute of Technology

Kay Poh Gek Vasey, CEO, MeshMinds

Kenyatta Mirindi, Digital Business Analyst

Laure Berti-Equille, Researcher, Institute of Research for Development, France

Laurent Durieux, SDG Coordinator, Group on Earth Observations (GEO)

Leah Bunce Karrer, Senior Environmental Officer, Global Environment Facility (GEF)

Ligia Noronha, United Nations Assistant Secretary-General and Head of the New York Office of the United Nations Environment Programme (UNEP)

Loïc Modoux, Political Advisor, Digitalization Division, Swiss Foreign Ministry of Federal Affairs

Lubomila Jordanova, CEO & Co-Founder Plan A & Co-Founder Greentech Alliance

Ludgarde Coppens, Head of the SDG and Environment Statistics Unit, United Nations Environment Programme (UNEP)

Ludmilla Diniz, Energy and Climate Technical Specialist, United Nations Development Programme (UNDP)

Luis Neves, CEO, Global Enabling Sustainability Initiative (GESI)

Luisa Teixeira, Project Manager, Vizzuality

Maria de la O Laura del Carmen Cuevas Cancino Esteva, Tecnológico de Monterrey, Mexico

María Emilia Burgos, International Policy Analyst & Program manager for SDGs (The Kootneeti)

Marianne Haahr, Executive Director Green Digital Finance Alliance (GDFA)

Marija Pujo Tadic, International Institute for Climate Action (IICA) - founder & president - Croatia/EU

Markus Böhm, Digital transformation, Swiss Federal Office for the Environment

Marta Ottogalli, Knowledge Manager Consultant, United Nations Environment Programme (UNEP)

Martin Smith, Project Director, The Carbon Mark

Mateo Dugand, EMEA Sustainability Regional Lead, Amazon Web Services (AWS)

Mateo Salomon, Global Energy & Finance Advisor, United Nations Development Programme (UNDP)

Matt Greenspan, Telecommunications Management Group (TMG)

Matthias Stürmer, Professor, Bern University of Applied Sciences, Head of the Institute for Public Sector Transformation of BFH and Head of the Research Center for Digital Sustainability, University of Bern

Max Schulz, Executive Chairman, Sustainable Digital Infrastructure Alliance

Mélisande Teng, PhD Student, Mila

Michael J. Oghia, Independent, ICT sustainability advocate

Michael Stanley-Jones, United Nations Environment Programme (UNEP)

Miroslav Polzer, CEO, International Association for the Advancement of Innovative Approaches to Global Challenges IAAI GloCha & Founder, United Citizens Organization for Action for Climate Empowerment

Mónica Miguel-Lago, European Association of Remote Sensing Companies (EARSC)

Neil Davis, Software Engineer, Microsoft

Nicolas Mialhe, Co-Founder & President, The Future Society

Nigel P. Melville, Program Director, Design Science, Associate Professor of Information Systems,

Nikola Nikačević, Professor, University of Belgrade and Founder of Eon+ (Digital ESIA - Envigo)

Paz Peña O, Coordinator, Latin American Institute of Terraforming

Pernilla Bergmark, Principal Researcher ICT Sustainability Impacts, Ericsson

Pierre Boileau, Head of the Global Environment Outlook, United Nations Environment Programme (UNEP)

Pilar Fajarnes, Chief, Digital Economy Policy Research Section, United Nations Conference on Trade and Development (UNCTAD)

Pooja Muns, Head of Web, United Nations Environment Programme (UNEP)

Priya L. Donti, Ph.D. Candidate, Carnegie Mellon University and Co-Founder, Climate Change AI

Priynka Sharma, Assistant Lecturer, University of the South Pacific

Rajiv Garg, Climate Technology Center and Network (CTCN)

Rebaone Ferguson, Human Rights Officer, Office for the High Commissioner for Human Rights (OHCHR)

Régia Estevam Alves, Specialist Researcher in Land Degradation, YouthMappers Regional Ambassador

Reyna Ubeda, Project Officer, International Telecommunication Union (ITU)

Rianne C ten Veen, Independent Interdisciplinary Consultant

Richard Matthew, Associate Dean of Research and International Programs and Professor of Urban Planning and Public Policy in the School of Social Ecology, University of California, Irvine

Richard T. Jordan, Royal Academy of Science Intl. Trust, Chief of UN Operations

Rob Price, Co-founder of Corporate Digital Responsibility

Robert Amahirwe, BI and Data Analyst, United Nations Environment Programme (UNEP).

Rosie McDonald, E-waste Data Associate Officer, International Telecommunication Union (ITU) Ross School of Business, College of Engineering, University of Michigan

Ryan Boudinot, Founder, Chief Executive Officer, Machines & Dreamland

Rudradeb Mitra, CEO, Omdena

Sally M Solaymantash, Technology Consultant

Samuel Adunreke, Executive Director, Innovea Development Foundation

Sara Di Lonardo, Researcher, Italian National Research Council-Research Institute on Terrestrial Ecosystems (CNR-IRET)

Sary Qasim, MENA Region Lead, Government Blockchain Association GBA

Satya Das, Digital Economist

Severin Sindizera, Global Coordinator, Indigenous Peoples Global Forum for Sustainable Development, IPGFforSD

Sherwood Moore, Communication and Community Engagement at ICANN, Linux Hyperledger Climate Action and Accounting Special Interest Group Co-chair

Simon Gardner, Head of Digital Environment, Natural Environment Research Council (NERC)

Somya Joshi, Head of Division, Stockholm Environment Institute (SEI)

Sreekanth Venkataraman, Independent Digital Expert

Stefanie Kunkel, Research Group “Digitalization and Sustainability Transformations” at the Institute for Advanced Sustainability Studies (IASS), Potsdam, Germany

Stefano Balbi, Researcher, Basque Centre for Climate Change

Stephanie Race, Founder & CEO, Earth Labs Group

Steve Vosloo, Digital Learning, Innovation and Policy Specialist, United Nations Children’s Fund (UNICEF)

Steven Stone, Deputy Director, Economy Division, United Nations Environment Programme (UNEP)

Terry Gunning, Senior Managing Partner, Technology, DXC

Theresa Schwarz, UN Global Pulse, Finland

Tim Frick, Advocate for the Responsible, Equitable, and Sustainable Use of Design and Technology, Certified B Corp Owner

Tim Scott, Policy Advisor, Environment, United Nations Development Programme (UNDP)

Tom Baumann, Co-Founder and CEO of ClimateCHECK, Co-Chair of Climate Chain Coalition

Vanessa Gray, Head of the Division for Environment and Emergency Telecommunications, International Telecommunication Union (ITU)

Vasudev Bhandarkar, CEO ScoreData Corporation

Vlad Coroama, Lecturer in Smart Energy and Digitalization & Sustainability, ETH Zurich

Yaxuan Chen, United Nations Environment Programme (UNEP)

Zeinab El Maadawi, Professor, Cairo University and Digital Learning Expert at UN

CODES Communication Products

Alison Meston, International Science Council

Andrew Raven, Writer, Communication Division, United Nations Environment Programme (UNEP)

Beverley McDonald, Report and Graphic Design, Communication Division, United Nations Environment Programme (UNEP)

Daniel Cooney, Director, Communication Division, United Nations Environment Programme (UNEP)

David Cole, Head of Social Media, Communication Division, United Nations Environment Programme (UNEP)

Dylan Lowthian, Head of Media, United Nations Development Programme (UNDP)

Fan Zhang, Office of the UN Secretary-General's Envoy on Technology

Josie Raine, Communication Specialist, Nature Climate and Energy Team, United Nations Development Programme (UNDP)

Katie Elles, Head Writer, Communication Division, United Nations Environment Programme (UNEP)

Keishamaza Rukikaire, Head of News and Media, Communication Division, United Nations Environment Programme (UNEP)

Kelvin Memia, Web Developer and Digital Marketing support, Communication Division, United Nations Environment Programme (UNEP)

Maria Vittoria Galassi, Digital Transformation Account Manager, Communication Division, United Nations Environment Programme (UNEP)

Martin Ittershagen, German Environmental Agency

Mia Dee Foster, Senior Multimedia Producer, Communication Division, United Nations Environment Programme (UNEP)

Miranda Grant, Head of Multimedia, Communication Division, United Nations Environment Programme (UNEP)

Moses Osani, Public Information Officer, Communication Division, United Nations Environment Programme (UNEP)

Nancy Groves, Chief of Digital Strategy, Communication Division, United Nations Environment Programme (UNEP)

Neha Sud, Chief of Content, Communication Division, United Nations Environment Programme (UNEP)

Patrick Kihara, Writer, Communication Division, United Nations Environment Programme (UNEP)

Pooja Munshi, Head of Web, Communication Division, Digital Transformation Taskforce, United Nations Environment Programme (UNEP)

Rachelle Fox, Future Earth & Sustainability in the Digital Age

Sahya Haria, Social Media, Communication Division, United Nations Environment Programme (UNEP)

Tal Harris, Media Engagement, Communication Division, United Nations Environment Programme (UNEP)

Digitalization is one of the most important drivers of economic, social and environmental transformation. It has given rise to powerful general-purpose technologies such as artificial intelligence and cloud computing that offer revolutionary scale and potential. Digital transformation is globally pervasive, increasing productivity, disrupting pre-existing business models and leading to diverse innovations with profound implications for the human future. This transformation has enormous potential to support progress towards sustainability however in its current form, it continues to enable and/or encourage unsustainable practices that are degrading natural systems, entrenching inequality and undermining human wellbeing.

There is an urgent need to reverse these negative trends and to utilize the potential of digital transformation as a vital tool in developing globally sustainable economic and social behaviours. We need to move the focus away from the pursuit of short-term, unsustainable gains towards the achievement of long-term values-driven sustainable outcomes. Three systemic shifts are needed to harness digital transformation as a positive and exponential force for progressing environmentally and socially sustainable development.

- **Shift 1 Enable Alignment:** Create the enabling conditions to align the vision, values and objectives of the digital age with sustainable development;
- **Shift 2 Mitigate Negative Impacts:** A commitment to “sustainable digitalization” that mitigates the negative environmental and social impacts of digital technologies;
- **Shift 3 Accelerate Innovation:** Advancing investments in “digitalization for sustainability” to accelerate the development and deployment of sustainability-driven digital innovation.

Within each shift, this Action Plan identifies six strategic priorities that must be addressed during the 2022-2025 timeline together with 9 global Impact Initiatives to catalyse systemic transformations. The Coalition for Digital Environmental Sustainability (CODES) will contribute the implementation of this Action Plan in four ways:

- Convene and connect a global community of common purpose to advance these 3 shifts;
- Identify enabling policies and map stakeholders for each strategic priority;
- Suggest Impact Initiatives as actionable items to concurrently progress strategic priorities;
- Foster and demonstrate political leadership in advocating for and realizing the Impact Initiatives.

All stakeholders are invited to engage in the CODES Action Plan in one or more of the following channels:

- **Catalyser:** Stakeholders seeking to engage directly with one or more of the Impact Initiatives that are proposed in the Action Plan.
- **Action Network:** Stakeholders contributing to and leveraging the 3 shifts proposed in the Action Plan to support the progression of digital sustainability.
- **Advocates:** Stakeholders seeking to contribute their expertise to the CODES community and become an advocate for the CODES vision and values.



More information is available on
the CODES Community Page on
www.sparkblue.org/CODES

