CODES - Coalition for Digital Environmental Sustainability

Action Plan for an Environmentally Sustainable Planet in the Digital Age

**ABSTRACT**

The digital revolution has resulted in big data collection infrastructures able to collect and organize structured and unstructured data; artificial intelligence, machine learning and other analytical tools; and an array of powerful digital devices including portable computers and cellular phones. The digital realm extends across all scales of observation, is planetary in reach, and is continually transforming itself to process more information at higher speeds, improve efficiency, boost productivity, and disrupt existing models in every sector of human activity. It is changing societies more rapidly than any previous new technology, and unleashing an unprecedented era of collaboration, innovation and diffusion with profound implications for a sustainable future ~~human futures~~

The need for data has risen exponentially in recent years on account of the intercommunication needs of both people and systems. Communication speed requirements have also increased, which has triggered constant technological changes in society.

Data processing centers process all information that travels over the internet and require a cutting-edge technology platform.

The threat of destruction quickens with scientific progress. As increasingly more resources are needed to cover existing demands, the world needs to consume more energy that it is often not capable of generating. This threatens environmental sustainability.

While digitalisation has enormous potential to support progress towards sustainability, the negative environmental impacts of digitalization have to addressed. The challenge is how to reverse these negative trends and utilize the potential of digitalisation as a vital tool in developing low carbon sustainability transitions. What needs to be done? We need to move the focus of application of digitalisation away from the search for short-term, environmentally unsustainable gains to the search for long-term sustainability and resilience. Three fundamental shifts are needed:

* Shift 1: aligning vision, values and objectives of the digital age with the main objectives of sustainable development; (sustainable policymaking)
* Shift 2: committing to digitalisation that mitigates the negative environmental impacts of digital technologies (sustainable digitalization);
* Shift 3: directing efforts and investments toward digital innovation that contributes to environmental and social sustainability (digital sustainability)

Within each shift, this report identifies six strategic priorities that must be addressed during 2022-2025. CODES will contribute to these fundamental shifts in four main ways:

1. Convene and connect a global community of common purpose to advance these shifts;
2. Catalyze collective action, enabling policies and systemic transformations towards all strategic priorities;
3. Use the opportunities from digital technologies and platforms to accelerate and scale zero and low carbon sustainable solutionsCoordinate and promote activities to ensure that the impact initiatives are progressed concurrently;
4. Foster and demonstrate political leadership in advocating and realizing actions

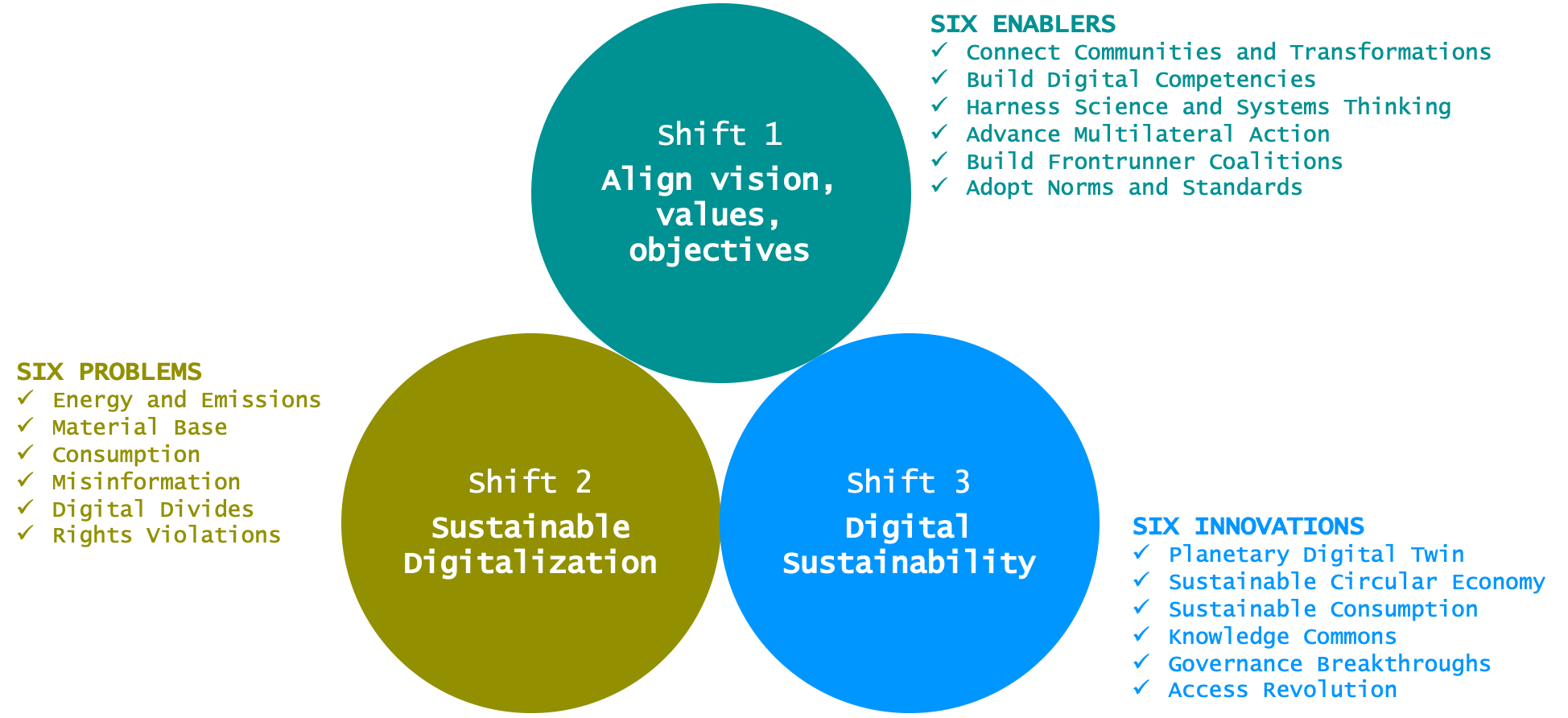
**EXECUTIVE SUMMARY**

Digital innovations have the potential to help mitigate some of the world’s most pressing environmental and societal challenges, such as climate change, biodiversity loss, pollution,waste, food insecurity, public health risks, and inequity. The transformational capabilities of these innovations are a crucial tool to achieve the implementation of the United Nations2030 Agenda for Development and its 17 Sustainable Development Goals (SDGs) by 2030 with a particular view to urgency of the climate change challenge that requires urgent action within the next few years. An assessment in 2020 found that digital technologies will have a high impact across at least 10 of the United Nations SDGs[[1]](#footnote-1). The report estimates that 70 per cent of 169 targets baselining the world’s sustainability goals can be positively influenced using digital technology applications. Other assessments have come to similar conclusions.[[2]](#footnote-2) However, achieving sustainable development globally is not an inevitable or obvious outcome of the digital revolution. Indeed, digital technologies 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.[[3]](#footnote-3) Digital technologies could dramatically increase energy use, render important local and contextual factors invisible, create globe spanning piles of digital debris, deepen suspicion about digitally situated information, be vulnerable to misuse, and fail. But the digital revolution has incredible potential to help transform society and business models to more environmentally sustainable, inclusive, agile, adaptive and equitable form–if there is a conscious and deliberate effort to steer it in that direction. Otherwise, the likely default outcome of the digital revolution is an acceleration of prevailing unsustainable production and consumption patterns, and an exacerbation of environmental and social challenges..

The [Coalition for Digital Environmental Sustainability (CODES](https://docs.google.com/document/d/12Re8fSzmTrMc_PGmKUkyB-4f-TAA8c7iaoSwlMKXFkk/edit)), is an international multi-stakeholder and multi-strategic alliance created in March 2021 in response to the UN Secretary-General’s Roadmap for Digital Cooperation, to steer the use of digital technologies towards accelerated environmental and social sustainable development. CODES strives to reorient and prioritize the application of digital technologies to meet the 2030 Agenda for Sustainable Development and to achieve the internationally agreed environmental goals (IAEG) that have been adopted as the outcomes of multilateral processes and years of consensus building across all UN Member States.

The emergence of the CODES Action Plan marks the 50th anniversary of the establishment of the United Nations Environment Programme (UNEP) set-up to promote environmental sustainability. The goal of the Action Plan is to offer a vision and set of priorities and targets that have been co-created by the CODES community in line with the SDGs. This Action Plan is a follow-up to the UN Secretary-General’s Digital Cooperation Roadmap and 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”, as well as the Stockholm+50 conference. It will also contribute to on-going deliberations in the UN Environment Assembly and in the UN Human Rights Council linked to digital transformation and the recently recognized human right to a clean, healthy and sustainable environment.[[4]](#footnote-5)

Asa result of the consultative process over the past 12 months, this Action Plan describes three shifts each with six strategic priorities that are needed to harness digital transformation to become a positive and exponential force for progressing environmentally and socially sustainable development.



**Figure i: The** Three Shifts with each six designated strategic priorities to achieve an environmentally sustainable planet in the digital age.

The main aim of this Action Plan is to catalyze collective action by the international community and the members of CODES towards the implementation of the three shifts and the associated 18 strategic priorities and outcomes during the 2022-2025 timeframe. It recommends 10 priority initiatives that can be undertaken to consolidate and coordinate existing efforts, as well as to address key gaps.

Target audiences include national and local governments, policy makers, international organizations, private sector companies, civil society, and the scientific community. The CODES Action Plan has been drafted in the spirit of the Charter of the United Nations, with its covenant to “*promote social progress and better standards of life in greater freedom,*” and “*to employ international machinery for the promotion of the economic and social advancement of all peoples*”. These are reflected in our Action Plan’s comprehensive commitment to the UN SDGs as well as different Multilateral Environmental Agreements (MEAs).

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## **1. Overview: A Sustainable Planet in the Digital Age**

### **1.1 What’s at Stake**

1. Our ability to deliver the SDGs  
   **In 2015 the international community set itself 17 ambitious Sustainable Development Goals (SDGs)** to serve as a guideline for all countries until the year 2030. They are intended to promote human dignity, the protection of the planet, peace and prosperity for all, and promote global partnerships. However, the 2020 Progress Report on SDGs shows that the world is not on track to achieve the goals by 2030.[[5]](#footnote-6) The current trajectory of three planetary crises of climate change, biodiversity loss and pollution and waste, are already taking us beyond the limits of the earth’s capacity to sustain human health and society at near to present levels of social or individual wellbeing and planetary health.[[6]](#footnote-7) The resulting environmental crises are already being felt across the world. No group is more vulnerable to this damage than children and youth. Climate change and the loss of biodiversity threaten to cause long-term effects that will impact children’s lives for years to come. Yet climate policies and responses to date do not sufficiently address children’s rights. We now have less than ten years to achieve the implementation of the SDGs, and the reality is that we will not achieve these goals by 2030 without transformation of major systems such as energy, food and waste. While we grapple with this understanding, digital technologies and capacities are rapidly accelerating, with the potential both to hinder our ability to achieve the SDGs and facilitate the scale of change needed.
2. Our ability to embrace technology for public good  
   **There is a foundational sustainability question about the possibility of directing digital change for a civilizational shift towards shared prosperity.** Are we able to footerrealize 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 enquiry that compels broad consultations. What are the implications for emerging 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 important questions which are imprinted in every step we take in further developing our digital environment - how we generate, integrate and operate data, how we move toward environmentally sustainable lifestyles, how we build transparent supply chains with safeguards, how we share or exclude knowledge, how we provide access to basic services and breakthrough technologies, how carefully we combine democracy with automation-techniques or how we, as human beings, (re)define ourselves as part of, or external to, nature. The global community needs to invest in inclusive fora and frameworks to deliberate on, assess and govern these issues. Scientifically driven and socially embedded anticipatory assessment processes should support this endeavor.
3. Our ability to make this for everyone  
   **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 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.[[7]](#footnote-8) 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 offline, 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 Box 1).[[8]](#footnote-9) If digital capacities are to be leveraged for global environmental and social sustainability, the digital divide needs to be closed in a sustainable, inclusive, and equitable manner.

### **1.2 The Challenge and the Opportunity**

1. The opportunity is to embrace the power of digital technology for good  
   **The UN Secretary-Generals’ Digital Cooperation Roadmap** makes a number of key observations about the challenges and opportunities between digital technology and the evolution of society as captured by the following statement:

“*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 footerconsequences and malicious use*.” - António Guterres, UN Secretary-General

1. The challenge is how to create equitable value and reduce environmental impact  
   **We are witnessing fundamental shifts in how sectors define, generate, and distribute value.** Digital capabilities are disrupting various economic sectors including agriculture, energy, transport, cities and buildings (see Boxes 2-8). New trans-sectoral and trans-national business models and marketplaces are emerging with often unforeseen or opaque social and environmental consequences, sometimes threatening social cohesion.[[9]](#footnote-10) Indeed, digitalization of almost every sector of the global economy and their associated business models is enabled by new dimensions of cost optimizations, operational efficiencies, and fast and cheap expansions of products and services, incentivised by profit growth while accelerating environmentally unsustainable production and consumption patterns. An increasing number of people, governments and businesses are both participating in and shaping the emerging digital economy. At least 1.5 billion people consume products and services through e-commerce platforms[[10]](#footnote-11), and 60 per cent of the global population is anticipated to engage with social media by mid-2022[[11]](#footnote-12). The transition to a digital economy under the current “business as usual” paradigm will increasingly enable operating models that may not be in line with the SDGs. This motivates the need to think about alternative models for equitable value creation and sustainable resources management
2. **The digital sector is energy and materials-intensive.** According to the ITU estimate, the share of the global carbon footprint of our digital devices, is 1.4 per cent and 4 per cent of electricity consumption.[[12]](#footnote-13) Further, enterprises’ digital carbon footprint is expected to grow significantly to 2129 MtCO2e in 2025 from the level of c1129 MtCO2e in 2021. As the world prepares for increasingly decentralized internet models like Web 3.0, the reliance on energy-intensive technologies like blockchain and AI computing could also increase[[13]](#footnote-14). In terms of material demands , the world generated 53.6 million metric tons of e-waste in 2019, which is estimated to have a raw material value of $US57 billion.[[14]](#footnote-15) Only 17.4 per cent percent of this e-waste is formally collected and recycled.[[15]](#footnote-16) In order to meet the high demand for hardware, the extraction of rare earth elements and other precious metals like cobalt and lithium is increasing steadily.
3. **Addressing these challenges is feasible.** We can collectively choose to build a future in which digital technologies accelerate and scale environmental and social sustainability. Used in this way, digital technologies have the power to underpin sustainable societies and economies, and educate and empower citizens and local communities.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 systemiclevel barriers and perverse incentives that have inhibited sustainable markets, behaviors and lifestyles.
4. **The Coalition for Digital Environmental Sustainability (CODES)** **was formed as a multi-stakeholder and multi-strategic alliance, and follow-up to the UN Secretary-General’s Digital Cooperation Roadmap.** The core goal is to engage our collective intelligence in designing and developing global governance and deployment frameworks that allow for the harnessing of the transformative capabilities of digital technologies to help drive environment and social footersustainability, while mitigating their risks and unintended consequences . The CODES Action Plan, generated through a consultative process with the CODES community over the past 12 months, presents a set of key strategic priorities and targets that will enable the acceleration of environmental and social sustainability through digital technologies. To achieve this, a massive, coordinated effort is essential to ensure the needed shifts in mindsets across digital value chains, services, platforms and most importantly within business models,thus redefining the social and economic objectives that are necessary for an environmentally sustainable planet in the digital age.

8a In the coming digital era marked by stable digital finance and creation of ethically-based prosperity, CODES can consider enlisting a cadre of youth to support issues of health, clean environment and water through entrepreneurship, empowerment and philanthropy. This concept could be tested in specific circumstances to support voluntary initiatives in climate change and the UNEP Programme of Work through the issuance of Non-fungible tokens (NFTs) as a new source of supplementing voluntary contributions. The impetus could be initiated through World Interfaith Harmony Week worldwide (A/RES/65/5).

### **1.3 The Action Plan - Seizing the Opportunity**

1. **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 Digital Cooperation Roadmap[[16]](#footnote-17), Our Common Agenda[[17]](#footnote-18), and the planned Global Digital Compact. A clear agenda and set of priorities for advancing environmentally and socially sustainable development within a renewed social contract for the digital age must be reflected in the outcomes of such initiatives and that would point toward the 2nd WorldSummit on Social Development in 2025 (See Box 3). Clear entry points for realizing the promise of digital technologies in responding to the triple planetary crises: climate change, nature and biodiversity loss, and pollution and waste must be included. This will require embracing an increased level of agility in the governance, execution, and monitoring/evaluation 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.
2. **The vision for this Action Plan is therefore to establish a set of priorities, goals, and timeline that will enable environmental and social sustainability to be included in the digital revolution.** The CODES community has collectively identified three major shifts that must be addressed if this vision is to be realized. Priorities to catalyze these three shifts are described in detail in Section 2 of this Action Plan along with selected entry points for concrete action. Important overarching messages and flagship initiatives to address the strategic priorities of the Action Plan are summarized in Section 3.
3. **The first shift that is needed is to align the visions, values and objectives of digital capabilities with those of environmental and social sustainable development.** Greater commitments to environmental and social sustainability require shifts in values and norms that drive a transition beyond profit away from solely growth oriented economic measures towards positive social and environmental outcomes. The mindset of maximizing shareholder value must evolve to a new set of values focusing on transparency, accountability, inclusive stakeholder ownership and footerengagement, and internalization of environmental and social impacts. 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 across a diverse set of stakeholders, harnessing science and systems thinking, advancing multilateral action, building frontrunner coalitions, and creating and/or adopting norms and standards.
4. **The second shift is to ensure environmental and social sustainable digitalization.** We must confront the paradox that increased reliance on digital technologies for economic and social sustainability comes at an environmental cost. Indeed, digitalization without environmental and social sustainability can run counter to overall sustainability goals, by encouraging increased extraction of virgin materials, unsustainable consumption, causing environmental impacts across hardware lifecycles, directly consuming energy and resources, entrenching social divides, amplifying misinformation, dislocating labour markets, exacerbating inequality within and between societies, or consolidating the power of the few over the many (see Box 1).[[18]](#footnote-19)  This shift requires a focus on six problem areas entrenched in digitalization. These are energy and emissions, materials extraction, consumption behaviors, misinformation, digital divides and human rights violations.
5. **The third shift is to direct and incentivise innovations towards digital sustainability.** We see the need to harness actively the power and reach of digital technology for exponential improvements in environmental management, governance, green financing, and sustainable production and consumption within a net zero and circular economy, while empowering more people with the knowledge and the agency to adopt sustainable lifestyles and livelihoods.Digital technology and innovation, if directed with intention, can empower government, businesses, communities and individuals to make decisions and take action that align with their values. To achieve planetary sustainability and equitable human development, the digital transformation process in every sector must be actively guided through conscious choices and values – collective and individual. This shift suggests six areas of innovation that we must intentionally incentivise to support digital 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 accessible technologies for the whole of society.
6. **The contents of this Action Plan are based on a series of open dialogues and collective intelligence processes undertaken with over 800 stakeholders that voluntarily participated in CODES.** This process involved structured round tables, a global conference and online consultations. The process captured a diverse range of views, experiences and priorities from stakeholders in over 100 countries and from across major stakeholder groups. These inputs have been synthesized by the co-champions of CODES, including UNEP, United Nations Development Programme (UNDP), the International Science Council, Future Earth, the German Environment Agency, and the Kenyan Environment Ministry. This has been conducted in close collaboration with the Office of the UN Secretary-General’s Envoy on Technology within the framework of the Digital Cooperation Roadmap.
7. **The key goal of this Action Plan is to catalyze collective action by the international community and the members of CODES towards the implementation of the three shifts and the footerassociated strategic priorities during the 2022-2025 timeframe.** The aim is to encourage the expansion of existing efforts, intersecting and coordinating parallel initiatives and catalyzing new efforts. This also includes integration of these 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. Actions should be adopted across all age groups in an inclusive and gender balanced way. It forms an important baseline on where we currently stand that will be used for measuring progress going forward.The outcome documents of the six International Day of Women and Girls in Science Assembly would be a North Star in regard to science and gender.
8. **As the digital age unfolds, it must become the responsibility of governments at all levels to ensure the availability of digital infrastructure and to catalyze and incentivize the use of digital products & 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.[[19]](#footnote-20) This action must go hand in hand with paying due attention to trust building, transparency and the protection of human, civil and child rights as part of the digital governance framework. It is essential that there is some degree of 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, open technology communities, all levels of government, civil society, the private sector and digital-native companies.

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| Figure 1 ***Timeline for the CODES Action Plan*** |

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| BOX 1 ***Digital power concentrations***  Increasing reliance on digital technologies for our purchasing, education and social interactions has led to an increasing shift of economic power to digital companies. According to one estimate by Forbes, less than 20 companies own or control 80 per cent of our essential global digital infrastructure in terms of cloud storage and compute.[[20]](#footnote-21)  In terms of capacity to engage in and benefit from the data-driven digital economy, two countries stand out: the United States and China.  Together, they account for half the world’s hyperscale data centres, the highest rates of 5G adoption in the world, 94 per cent of all funding of AI start-ups in the past five years, 70 per cent of the world’s top AI researchers, and almost 90 per cent of the market capitalization of the world’s largest digital platforms.[[21]](#footnote-22)  The largest such platforms – Apple, Microsoft, Amazon, Alphabet (Google), Meta (Facebook), Tencent and Alibaba – are increasingly investing in all parts of the global data value chain: data collection through the user-facing platform services; data transmissions through submarine cables and satellites; data storage (data centres); and data analysis, processing and use, for instance through AI. These companies have a competitive data advantage resulting from their platform component, but they are no longer just digital platforms. They have become global digital corporations with planetary reach; huge financial, market and technology power; and control over large swathes of data about their users.[[22]](#footnote-23)  The combined value of the seven largest digital “super platforms” is estimated in January 2022 at nearly $10 trillion. This comprises Apple ($2.64 trillion), Microsoft ($2.23 trillion), Google ($1.73 trillion), Amazon ($1.47 trillion), Facebook ($858.76 billion), Tencent ($572.85 billion) and Alibaba ($328.52 billion). The US and China host 90 per cent of the market capitalization value of the world’s largest digital platforms.[[23]](#footnote-24) [[24]](#footnote-25) [[25]](#footnote-26) This means seven companies represent approximately 8 per cent of the $120.4 trillion global equity market capitalization.[[26]](#footnote-27) Digital power concentrations of that extent can pose huge challenges for a whole-of-society approach, e.g. regarding growing private-public capacity divide or growing inequalities within and between societies. |

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| BOX 2 ***Digital disruption can help tackle the triple planetary crisis***  Preliminary estimates suggest that digital technologies can make significant contributions to tackling the triple planetary crisis by 2030 aiming to stabilize the Earth system to stay within the planetary boundaries.[[27]](#footnote-28) While assessment methods are still in their infancy, some early estimates on the positive impact have been calculated:  **Decarbonization for Climate Action:** For example, in 2015, the Global e-Sustainability Initiative and Accenture Strategy estimated that digital information and communication technologies (ICT) can enable a 20 per cent reduction of global CO2 emissions when applied to five sectors: mobility, manufacturing, agriculture, energy, and buildings. ICT solutions can help cut nearly 10 times more CO2e than they emit.[[28]](#footnote-29) A similar assessment was conducted by GSMA, looking at the impact of mobile communications technologies on carbon emission reductions.[[29]](#footnote-30) This study concluded that mobile technologies had a 10:1 enablement ratio compared to the footprint of the industry. However, these studies do not fully account for rebound effects. Changes in production and consumption behavior might limit digital technologies’ mitigation effect and entail additional negative environmental effects (“digital rebound effect”). Such counterproductive effects need to be taken into account when designing policy interventions.  **Dematerialization to Protect Nature:** The “Rethinking humanity” series estimated that digital technologies and improved design can help reduce natural resources and other materials used in products by 90 per cent[[30]](#footnote-31) - through efficiency, tracking and tracing as well as by turning products into services in a circular economy. This can help reduce the impact of material extraction on nature and the environment.  **Detoxification to Prevent Pollution:** The “Rethinking humanity” series also estimated that digital technologies can help reduce waste & detoxify supply chains by a factor of 10-100 times through improved design, resource substitution and circularity.[[31]](#footnote-32) |

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| BOX 3 ***Digital transformation in the water sector***  Despite the fact that about 71 per cent of the earth’s surface is covered with water, less than 3 per cent is fresh water and about 1 per cent is readily accessible for human use.[[32]](#footnote-33) [[33]](#footnote-34) Population growth, geopolitics, economic development, industrialization and climate change are some of the factors that have intensified the pressure on the already scarce resource. Global water demand is projected to rise by 55 per cent from 2000 to 2050[[34]](#footnote-35) and therefore there is a need to promote and advance the use of technology in the water sector not only to meet future human water demand but also for the attainment of SDG 14.[[35]](#footnote-36) Following are major applications where digital technologies are currently transforming the water sector:  **Water Management:** Remote sensing services and technologies can facilitate mapping, assessing and monitoring of water resources both fresh, marine and coastal resources. These technologies can also be used to monitor and track illegal, unregulated and unreported wildlife and marine product exploitation; controlling water hyacinth; flood and drought management; surface and ground water monitoring and sustainable wetlands management just to mention but a few of the space-based technology capabilities.[[36]](#footnote-37)  **Payment for Ecosystem Services:** A new type of financial technology (FinTech) – ‘mobile money’ – could offer a novel and available solution to Payments for Ecosystem Services (PES) frameworks. Mobile payments have been used successfully in development projects related to micro-credit, micro-insurance, and humanitarian relief. In certain circumstances, benefit distribution via FinTech may lower transaction costs, enable higher frequency payments, and provide new socioeconomic benefits. It could also improve the privacy, transparency, traceability, and security of disbursements, contributing to more efficient and equitable PES schemes.[[37]](#footnote-38)  **Digital Water Diplomacy:** Developments made in the use of social media – Twitter, Facebook, Instagram, blogs, YouTube – have led to a shift of diplomats[[38]](#footnote-39), Ministries of Foreign Affairs (MFAs) and embassies to these platforms so as to engage the public[[39]](#footnote-40) [[40]](#footnote-41), advance national interests and policies, while at the same time enhance strategic communication for transboundary water cooperation. The use of technology in diplomacy fosters water peace and cooperation in hydro-diplomacy[[41]](#footnote-42) through data sharing, minimising misinformation, and enhancing transparency and trust among riparian states.[[42]](#footnote-43) |

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| BOX 4 ***Digital transformation of the energy sector***  The energy sector today accounts for 40 per cent of carbon emissions worldwide, or 13.6 GtCO2e, and is expected to rise further as the global population grows and demand increases, including from digitalization.[[43]](#footnote-44) Three key renewable energy technologies are critical for realizing a net zero carbon future and powering the digital economy over this century: wind, solar, & energy storage.[[44]](#footnote-45) A range of digital technologies are being used for managing the transition to renewable and low-carbon energy.  **Coordination, Balancing and Monitoring:** coordinating localized energy grids involving various distributed and variable renewable power generation sources. This is combined with smart monitoring of supply and demand to optimize loads for grids to work properly. Moreover, by allowing energy prices to respond to market signals in real-time, smart monitoring has the potential to optimize electricity consumption by not just key sectors but also households and governments.[[45]](#footnote-46) [[46]](#footnote-47) Together with other technologies such as high-speed connectivity and IoT, blockchain technologies have been proposed to help address this challenge by managing, in a decentralized way, the distributed energy value chain, from the generation of electricity, to distribution, to final consumption. It can serve as an enabling technology for scaling energy systems powered by distributed energy resources that lack a central grid operator, enabling participation in collective, local energy structures.[[47]](#footnote-48)  **Energy Access:** Digital technologies enable exciting new ways of connecting to the electrical grid in rural areas. At present one billion people still lack access to electricity, 85 per cent of whom reside in rural areas.[[48]](#footnote-49) In areas distant from the main grid, innovative new technology and processes have increased the potential for previously unfeasible off-grid electrification projects and investments. These include mobile phone-enabled payment options, fintech solutions such as end-user credit assessments, and new business models such as pay-as-you-go.[[49]](#footnote-50) These have opened up new options to rural and indigenous communities for reaching universal energy access.  **Modeling and Prediction:** Digital twins – virtual representations of physical assets – will also be an important digital tool to optimize the use of renewable energy and increase predictive accuracy. They have already helped increase the yield of some wind farms by up to 20 per cent.[[50]](#footnote-51) |

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| BOX 5 ***Digital transformation of the agricultural and food commodities sector***  Agriculture currently accounts for around 20-30 per cent of global carbon emissions[[51]](#footnote-52) and 70 per cent of all freshwater withdrawals. By 2030, around 8.3 billion people will require water, food and shelter, placing increasing strains on a finite amount of land, freshwater reserves, and other natural resources.[[52]](#footnote-53) As agriculture becomes more knowledge-intensive, access to accurate and timely data relevant to specific conditions and locations is becoming increasingly critical to improve agriculture efficiency. A range of digital technologies are contributing to the transformation of the agricultural sector.  **Vertical Farming:** This practice involves the practice of producing food in vertically stacked layers commonly integrated into other structures like a skyscraper, shipping container or repurposed warehouse. This approach uses Controlled Environment Agriculture (CEA) technology to optimize the control of temperature, light, humidity, gas exchange, and nutrition. Vertical farming supports increased crop production from the same square footage of growing area with fewer inputs and can be conducted all year round. For example, vertical farming uses 70 per cent to 97 per cent less water than required for normal cultivation due to high levels of retention and recycling.[[53]](#footnote-54)  **Precision Agriculture:** This concept involves the use of real-time data, analysis and automated application technologies to optimize the use of inputs such as fertilizer, pesticides and water enabling farmers to produce more and waste less.[[54]](#footnote-55) The term is referred to as “precision” because it is possible to perform the right intervention, in the right place, at the right time, responding to the specific demands of individual crops and individual areas of land with superior levels of precision. Digitalization of food production could potentially increase agricultural crop yields by 30%, or close to 900 kg per hectare per year – also helping to save 250 trillion liters of water and significantly reduce pesticide use.[[55]](#footnote-56)  **Transparency and incentives:** Consumer behavior and market incentives play a big role in reducing deforestation and unsustainable agriculture practices of commodities. Remote sensing or mobile-enabled ground detection of illegal activities, cost-effective value chain transparency powered by distributed ledger technology combined with standards, ESG and nudging can help incentivise sustainable agriculture upstream.  **Reduction of Food Waste:** About 30 per cent of all food is wasted each year,[[56]](#footnote-57) costing the world around $750 billion a year and reducing the global food supply.[[57]](#footnote-58) Digital technologies could help avoid 20% of food waste across the supply chain by making food chains more transparent and providing real-time information on individual products and waste streams.[[58]](#footnote-59) Food wastage worldwide could be reduced by an estimated 50 per cent by 2030, if food and produce supply chains can be outfitted with IoT sensor labels.[[59]](#footnote-60) |

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| BOX 6 ***Digital transformation of the buildings sector***  The construction and operation of buildings remains highly resource and energy intensive, with buildings accounting for around 40 per cent of global energy consumption.[[60]](#footnote-61) A range of digital technologies are transforming the buildings sector.  **Smart Buildings:** One of the most important applications of digital technologies is often described as “smart buildings” or “intelligent buildings”. This concept refers to any structures that use data collection, integrated processes, smart engineering or creative design to self-regulate and optimize the building's environment and operations. Every sensor, automation and monitor used in smart buildings is integrated into a main building management system which can capture changes within the building and enable the building to self-learn and automatically modify or customize its settings. The global emissions abatement potential from Smart Buildings is approximately 2.0Gt CO2e or around 3.4 per cent of GHG emissions by 2030. Smart buildings could also save up to 5 billion MWh of energy and 300 billion liters of water. [[61]](#footnote-62)  **Digital Building Passports:** adopt a range of technologies in order to encourage the production, collection, and maintenance of digitized records for each building. Rather than a single dataset, the digital building passport links multiple different datasets about the building throughout its lifecycle - offering full transparency and accountability. They would also allow city planners to link performance data to planning data, so that they can validate assumptions and better monitor the performance of planning policies.  **3D Printing of Buildings and Components:** While 3D printing of buildings and their components has not yet reached commercial scale, the technology has achieved a number of important milestones. Dubai recently announced the completion of the world’s first 3D-printed office building. It is a full-scale, commercial office building that is fully operational. The printer used to create the structure was 20-feet-high, 120-feet-long and 40-feet-wide. It took 17 days to build and assemble — a near record timing for a structure of its size.[[62]](#footnote-63) If 3D printing technologies can be made commercially viable, they could disrupt nearly every facet of the building sector, including commercial and residential. |

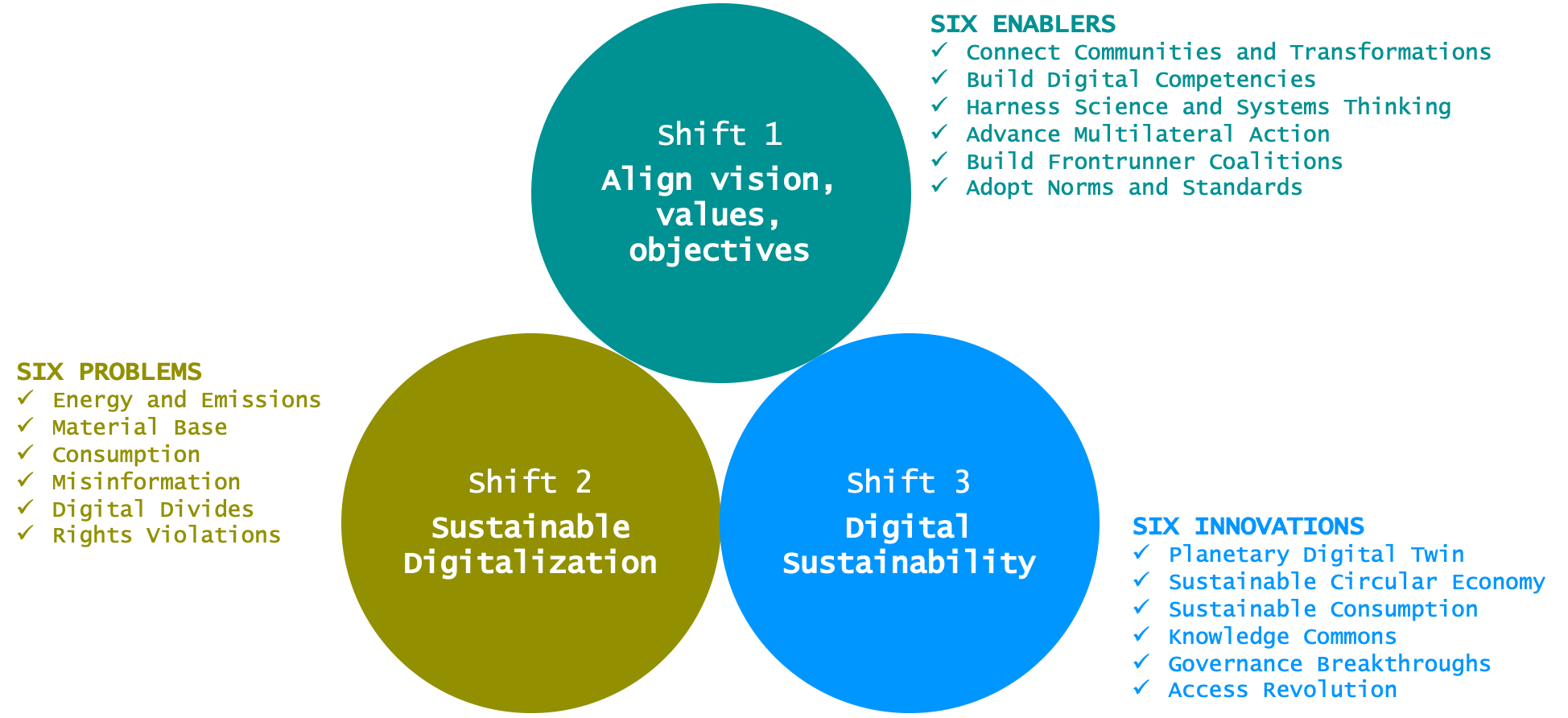
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| BOX 7 ***Digital transformation of cities***  While cities occupy just 3 per cent of the Earth’s land, they account for 60-80 per cent of global energy consumption and 75 per cent of global carbon emissions.[[63]](#footnote-64) Rapid urbanization also imposes challenges to waste management, land use, water and consumption patterns. A range of digital technologies are contributing to improved city management.  **Smart Urban Management:** Combining IoT, sensors and AI enables “smart” urban management. This involves- including smart traffic lights and street lights, smart waste disposal, smart utilities and smart buildings – all of which optimise energy usage and reduce the environmental impact of cities.  **Collaborative urban governance**: Cities are a mix of formal and informal economies, dwellings, waste streams and intellectual activities. Urban planning and governance could be improved with the use of augmented reality, mobile-based citizen science or inclusion of the informal economy and tracking of waste and pollution.  **Smart Sustainable Cities:** Sitting one layer above this is the concept of a Smart Sustainable City, a digitally-enabled amalgamation of all or some of the above digital services, where all relevant data is collected and controlled from a “digital command centre”.[[64]](#footnote-65) According to the ITU, ​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​​"A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects”.[[65]](#footnote-66)  **Urban Digital Twins:** Urban digital twins are a virtual representation of a city's physical assets, using data, analytics and machine learning to develop simulation models that can be updated and changed (real-time) as their physical equivalents change. This allows the users of the digital twin to manipulate it and see how those changes would be expected to play out in the real world.[[66]](#footnote-67) City digital twins can improve planning activities such as public engagement, scenario planning, and zoning and development. They have the potential to assist planners in reaching local climate resilience, economic development, and housing goals. |

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| BOX 8 ***Digital transformation of the transport sector***  Across the globe today, there are one billion vehicles on the road. As a result of globalization and of a rapidly rising middle class this number is expected to double by 2035.[[67]](#footnote-68) The transportation sector accounts for nearly 15 percent of current emissions worldwide.[[68]](#footnote-69) There are three major applications where digital technologies are currently transforming the transport sector:  **Traffic Control and Optimization:** Digital solutions can significantly support the controlling and optimization of traffic. Connectivity between cars, roads, lights and control systems allows for the gathering of real-time information on traffic conditions. Traffic control and optimization platforms can use this data to generate insights for drivers, such as the optimal driving speed to avoid congestion and the best route to avoid a traffic jam. They can contribute to safety and convenience through, for example, collision alarms and lane-keeping-systems.  **Shared Mobility:** connecting people and vehicles that have similar origins or destinations. While not all smart or shared mobility options are sustainable, smartphone enabled bike- and car-sharing, demand-responsive public transport systems or pooling platforms can help create modern mobility systems that maximize convenience while reducing the footprint of individual transport.[[69]](#footnote-70)  **Smart Logistics and Fleet Management:** connecting vehicles, products and load units, thereby improving route and load optimization and reducing the amount of waste in the system.  A combination of real-time traffic information, smart logistics and fleet management, and other ICT enabled solutions could abate 3.6 Gt CO2e, or around 6 per cent of GHG emissions by 2030.[[70]](#footnote-71) |

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## **2. Three Shifts for a Sustainable Planet in the Digital Age**

The goal of the consultation and co-design process with the CODES community was to jointly identify the three most important shifts needed to catalyze **a digital transformation of society and economy to enable an environmentally sustainable and equitable future for all.** The following sections identify and describe each strategic shift, including six global-scale strategic priorities for each shift.



**Figure 2:** Three Shifts and 18 strategic priorities to achieve a sustainable planet in the digital age

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### **2.1 First Shift - Aligning vision, values, and objectives of the digital age with sustainable development**

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**Figure 3.** Shift 1 Aligning vision, values, and objectives of the digital age with sustainable development

The first shift concerns changing ourapproach to digital transformation and sustainability transformation.It is key to reorient the purpose of digital change, develop footercommon visions, values and renewed objectives for sustainable development in the Digital Age. The application of digital innovations needs to focus on achieving 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).

The SDGs and MEA global frameworks hold a measure of legitimacy as our “north star” for environmentally sustainable human development as they represent the outcomes of multilateral processes and years of consensus building across all UN Member States. They reflect our collective effort towards a shared paradigm of shared objectives. Digital technologies and related infrastructure and standards must be designed, developed and applied as useful and powerful means towards accelerating the achievement of these goals.

To implement this first shift systemically in all sectors, strong coalitions of citizens, governments, scientists and private sector actors must proactively shape the digital age towards sustainable futures. Connecting communities, building adequate competencies and understanding systemic complexity are important preconditions that empower agile frontrunner coalitions, new culture and mechanisms of global collective action and joint principles and standards.

CODES stakeholders identify **six strategic priorities** that are globally applicableto achieve the kind of systems-level change needed for this first shift. Examples of initiatives that are already addressing this shift are contained in Table 1.

1. **Enabler 1.1 - “Connect Communities and Transformations”: Mutually connect digital and sustainability communities to catalyze the twin transformation.** All actors should prioritize systematically intersecting the digital with the sustainability transformation by maximizing opportunities for promoting environmental sustainability through existing and emerging digital technologies, innovations and governance frameworks (Box 9). Similarly, sustainability commitments and agreements must consistently consider how they can be enabled through digital transformation. Should the strategic dialogue and mutual learning between these two communities materialize, it will unite policy makers, scientists, engineers, entrepreneurs, organizational leaders, and activists under a shared vision and mindset. Digital transformation must be used as an opportunity to solve systemic barriers to environmental and social sustainability or it will continue to accelerate perverse and unsustainable incentives of capitalism and business as usual. 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 must end in order to systematically address digitization and sustainability as closely interlinked cross-cutting tasks.
2. **Enabler 1.2 - “Develop Digital Competencies”: Build interdisciplinary digital sustainability skill sets.** Many of the key actors with the ability to influence the trajectory of digital transformation for environmental sustainability lack a number of essential digital competencies and skills needed to catalyze 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 footerSoftware 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 circularity. Academic curricula, vocational training, professional associations all need an upgrade to reflect digital sustainability needs and outcomes. Moreover, to overcome the digital divide, digital and sustainability literacy has to be an integrated effort.Many students are willing to share their expertise in defining, e.g., characteristics of digital finance, while exploring the opportunities and challenges that co-exist, including demonstrating how to regulate digital currencies and describing the characteristics of digital currency.
3. **Enabler 1.3 - “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 of achieving planetary sustainability is one of the biggest challenges facing modern science. It is essential to use the best available science to monitor our current trajectory and change it in the direction of sustainability by intentionally transforming key economic, social and environmental systems simultaneously (see Box 10). 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. The growing tidal wave of tens of thousands of projects developed by women and girls in science should be seen as part of this “systems thinking” and holistic approach. This entails the earth system as such, including its large variety of complex and interlinked dynamics, the economic system and the societal realm, but also many applied research fields such as mobility or energy systems. The question of how different feedback loops operate to either reinforce or shift system behaviors is also key. 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.
4. **Enabler 1.4 - “Advance Multilateral Action”: Develop new multilateralism for digital sustainability and a culture of multi-stakeholder collaboration.** The digital ecosystems of data, analytics and applications are not confined to national boundaries, nor yet handled by the international community effectively. Instead, a handful of companies now have the ability to influence human attitudes and behaviors at a planetary scale with more money, power and reach than most national governments. These kinds of global systemic challenges can only be effectively tackled through systemic solutions and effective collective action. To safeguard our knowledge commons as an influencing tool for driving global sustainability, a new kind of digital translateralism and multilateralism is needed. Collaborative policy making of international organizations, national governments, civil society and the private sector should define, implement and apply global standards and safeguards towards a global, inclusive, and sustainable digital ecosystem of data, analytics and applications. It should be strictly premised on accelerating sustainability outcomes for the planet and its people while being respectful of the sovereignty of the countries on their national data. 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 should be founded on the development and use of inter-operable digital public goods based on a set of “sustainability by design” principles. We need to avoid the mentality of “one platform to rule them all” and allow multiple solutions to flourish and interconnect. We must promote good data footergovernance and stewardship that ensures the availability of relevant data in a timely and user-friendly, accessible-for-all-abilities, portable, machine-readable and actionable format.
5. **Enabler 1.5 - “Build Frontrunner Coalitions”: Foster innovation ecosystems and solutions that support agile and collaborative governance.** While new forms of 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 catalyze transformational investments in digital innovation ecosystems, infrastructure and emerging standards that are premised on planetary sustainability. Committed communities with a shared sense of common purpose and practice can build trust and conduct experiments that serve as testing grounds for better standards and governance solutions. Exploring agile approaches to define and test reflexive and iterative governance frameworks for digital technologies through adaptive, forward looking and innovation-friendly regulation is also needed together with tiered and principle-based approaches to collective governance.[[71]](#footnote-72)
6. **Enabler 1.6 - “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[[72]](#footnote-73), there are only a few nascent normative and ethical frameworks in place to guide its direction. The majority of these frameworks lack clear principles and norms linked to environmental and social sustainability or climate action. Moreover, current ethical frameworks are mainly targeting AI only. In this context, it is critical to develop a global set of international standards and guidelines for the sustainable production, use and adoption of digital technologies[[73]](#footnote-74) 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 technologies 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 standards and integrate with ongoing standardization processes (See 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, labor and capital.
7. **Next steps:** The CODES community has identified four critical next steps to advance each of these strategic priorities and further connect ongoing initiatives:
   1. **World Commission on Sustainability in the Digital Age:** Under the aegis of the United Nations, convene a high-level multistakeholder and multistrategic Global Commission on Sustainability in the Digital Age. The commission would explore the key enabling policies, standards, infrastructure and governance frameworks needed to harness digital technologies to accelerate sustainability. The commission would provide a set of recommendations that could inform a UN or United Nations Environment Assembly Declaration on Digital Sustainability as well as the planned Global Digital Compact or new international convention.
   2. **Digital Public Good Data for Sustainability:** A coalition of public and private sector organizations as well as academic and civil society entities is needed to enable the development of a global system of interoperable environment and climate data using best available digital technologies. Cross-Industry and sector data partnerships to be established for joint initiatives that advance access and governance to sustainability data as digital public goods through APIs and global standards. Such a network of data will be the base of green financing mechanisms, risk management, decision making and digital nudging. Multilevel frameworks and standards will be needed
   3. **Increase coordination, investment and adoption of global standards and data for digital sustainability:** A digital platform and “clearing house” is needed to aggregate and coordinate key standards and data sets for digital sustainability developed by a range of actors to foster a culture of well-founded, transparent assessment practices and associated data sets regarding the impact of the sector as a basis for informed decision making. This would help build awareness on existing standards, improve coordination, identify gaps and improve implementation and complianceKey gaps should be identified and work on standards to underpin a circular economy, including the use of digital product passports should be accelerated.
   4. **Education for Sustainable Development in the Digital Age Initiative:** A new international programme is needed to enhance digital sustainability skill sets and actively interconnect digital and sustainability communities among all stakeholder groups. To build up a common curriculum, global science initiative and research agenda, exchange among policy makers is also needed. Women and girls should have the opportunity, through a mechanism designed by women and girls, to articulate such a common curriculum. An initial focus could include modules on how digital technologies can support decarbonization, dematerialization, detoxification goals within a sustainable circular economy. The initial target audience should include public sector actors, civil society and entrepreneurs.

**Table 1.** Key stakeholders and initiatives addressing shift 1

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| **Type of actor / Initiative** | **Title** |
| Digital Innovation and Acceleration Initiatives or Funding | * [Climate Technology Centre and Network (CTCN)](https://www.ctc-n.org/) * [UNDP Accelerator Labs](https://acceleratorlabs.undp.org/) * [OECD Mission Oriented Innovation Lab](https://oecd-opsi.org/projects/mission-oriented-innovation/) * [Digital4Development Hub](https://toolkit-digitalisierung.de/en/partners/multilateral/d4d-hub/) * [United 4 Smart Sustainable Cities (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) * [The GovLab](https://thegovlab.org/) * Royal Academy of Science Intl. Trust (RASIT) * [ITU’s International Centre of Digital Innovation (I-CoDI)](https://www.itu.int/en/ITU-D/Pages/I-CoDI.aspx) * [ITU Connect2Recover](https://www.itu.int/en/ITU-D/Pages/connect-2-recover.aspx) * [ITU Partner2Connect Digital Coalition](https://www.itu.int/itu-d/sites/partner2connect/) |
| Agenda Setting and Stakeholder Dialogue | * [Secretary General’s Digital Cooperation Roadmap](https://www.un.org/techenvoy/content/roadmap-digital-cooperation) * [Coalition for Digital Environmental Sustainability (CODES)](http://www.sparkblue.org/CODES) * [The Dialogue on Global Digital Finance Governance](https://sdgfinance.undp.org/digital-finance) |
| Data, Analytics and Tools | * [Secretary General’s Data Strategy](https://www.un.org/en/content/datastrategy/index.shtml) * [Global Partnership for Sustainable Development Data](https://www.data4sdgs.org/) * [UN Global Pulse](https://www.unglobalpulse.org/) * [Digital Public Goods Alliance](https://digitalpublicgoods.net/) |
| Policies, Norms and Standards | * [The UN Environmental Assembly (UNEA)](https://www.unep.org/environmentassembly/) * [The International Telecommunications Union (ITU), Standardization Sector (ITU-T)](https://www.itu.int/en/ITU-T/Pages/default.aspx) * [UN Environmental Management Group (EMG)](https://unemg.org/) * [European Council Conclusions on Digitalization for the Benefit of the Environment](https://www.consilium.europa.eu/en/press/press-releases/2020/12/17/digitalisation-for-the-benefit-of-the-environment-council-approves-conclusions/) * [EU Corporate Sustainability Reporting - Directive 2014/95/EU Non-Financial Reporting](https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en) * [EU Proposal for a Corporate Sustainability Reporting Directive (CSRD)](https://ec.europa.eu/info/publications/210421-sustainable-finance-communication_en#csrd) * [The Internet Governance Forum (IGF)](https://www.intgovforum.org/multilingual/) * [Principles for Digital Development](https://digitalprinciples.org/) * [Corporate Digital Responsibility](https://corporatedigitalresponsibility.net/) * [Principles for Green Software Engineering](https://principles.green/) * [The International Sustainability Standards Board (ISSB)](https://www.iasplus.com/en/news/2021/11/issb) * European Financial Reporting Advisory Group (EFRAG)/Sustainability Reporting Board * [FAIR Data Principles](https://www.go-fair.org/fair-principles/) * [CARE Principles for Indigenous Data Governance](https://www.gida-global.org/care) * [Global Agreement on the Ethics of Artificial Intelligence](https://news.un.org/en/story/2021/11/1106612) * [Open Collaboration for Next Generation Digital Solutions for MRV](http://www.climate-check.com/open-collaboration) * [The Global Partnership on AI (GPAI)](https://gpai.ai) * [OECD AI Policy Observatory](https://oecd.ai/en/) |
| Advocacy | * [Digital Goes Green](https://www.digitalgoes.green/) * World Harmony Foundation |
| Research and Knowledge | * [Future Earth](https://futureearth.org/) / [Sustainability in the Digital Age](https://sustainabilitydigitalage.org/) * [Digitalization for Sustainability – Science in Dialogue” (D4S)](https://digitalization-for-sustainability.com/) * [International Society for Digital Earth](http://www.digitalearth-isde.org/) * [Ubunt](https://explore.ubuntoo.com/)oo [- environmental solutions platform](https://explore.ubuntoo.com/) * [Focus Group on Environmental Efficiency of AI and other Emerging Technologies (ITU - FG-AI4EE)](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx) * [Focus Group on AI for Natural Disaster Management (FG-AI4NDM)](https://www.itu.int/en/ITU-T/focusgroups/ai4ndm/Pages/default.aspx) * [Focus Group on Artificial Intelligence (AI) and Internet of Things (IoT) for Digital Agriculture (FG-AI4A)](https://www.itu.int/en/ITU-T/focusgroups/ai4a/Pages/default.aspx) * Research Group on Digitalization and Sustainability Transformations, IASS Potsdam * [ITU Centres of Excellence programme](https://academy.itu.int/itu-d/projects-activities/centres-excellence/coe-overview) * [ITU E-agriculture](https://www.itu.int/en/ITU-D/ICT-Applications/Pages/e-agriculture.aspx) * [Climate Change AI](https://www.climatechange.ai/) |
| Collective Action Networks / Operationalization | * [Digital Public Goods Alliance](https://digitalpublicgoods.net/) * [Digital With Purpose Movement](https://digitalwithpurpose.org) * [Every Actions Counts Coalition](https://greendigitalfinancealliance.org/initiatives-publications/eac-coalition/) * [Green Digital Finance Alliance](https://greendigitalfinancealliance.org/) * [Sustainable Digital Infrastructure Alliance](https://sdialliance.org/) * [Green Software Foundation](https://greensoftware.foundation/) * [Global Enabling Sustainability Initiative](https://gesi.org/) * [Digital Future Society](https://digitalfuturesociety.com/about-us/) * [Greentech Allliance](http://greentech.earth) * [Science-based Targets Initiative](https://sciencebasedtargets.org/) * [Certified B-Corporation](https://bcorporation.net/certification/meet-the-requirements) * [The Future Society](https://thefuturesociety.org/) * [Climate Chain Coalition](https://www.climatechaincoalition.io/) * [UN Innovation Network](https://www.uninnovation.network/) * [UN Global Pulse](https://www.unglobalpulse.org/) * [Giga Connectivity](https://gigaconnect.org/) * [Future of Sustainable Data Alliance](https://futureofsustainabledata.com/) (FoSDA) * [Icebreaker One](http://icebreakerone.org/) * Utah-China F.I.S.H D.&C. |

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| BOX 9 ***European Green Digital Coalitions and Political Declarations***  The European Union’s (EU) Green Deal is the EU’s main new growth strategy to transition the EU economy to a sustainable economic model. It is the first regional strategy that is aiming to unify the twin transformations of digitalization and sustainability.  Presented in December 2019, the overarching objective of the EU Green Deal is for the EU to become the first climate neutral continent by 2050, resulting in a cleaner environment, more affordable energy, smarter transport, new jobs and an overall better quality of life. There are a number of funding mechanisms in place to facilitate the EU Green Deal, totalling over €1 trillion. This investment will fund the delivery of the policy reform needed for the EU’s economic growth and climate neutrality. Two political declarations have recently been adopted to further the goals of the EU Green Deal.  [**European Green Digital Coalition:**](https://digital-strategy.ec.europa.eu/en/policies/european-green-digital-coalition) In March 2021, 26 CEOs of companies have joined a Green Digital Coalition committing on behalf of their companies to significantly reduce their carbon footprint by 2030, and to become climate neutral by 2040. Solutions include investing in the development of more energy and material efficient digital technologies, working with relevant NGOs and expert organizations to measure and monitor the net environmental impact of green digital solutions and many more. Finally, they commit to co-create deployment guidelines of green digital solutions together with other industry leaders, in order to accelerate the transition to sustainability of sectors such as energy, transport, building and agriculture.  [**Declaration on 'A Green and Digital Transformation of the EU'**:](https://digital-strategy.ec.europa.eu/en/news/eu-countries-commit-leading-green-digital-transformation) Twenty-seven EU countries plus 2 additional member states signed an EU declaration committing them to leading the green digital transformation. Member States will work together to speed up the deployment and development of advanced digital technologies, such as 5G and 6G, fibre optics, high-performance computing and Internet of Things, as key solutions to achieve climate neutrality and drive the green and digital transitions in priority sectors, such as energy, transport, manufacturing, agri-food and construction. Other areas of action include the promotion of green cloud, Artificial Intelligence (AI) and blockchain technologies, as well as sustainable hardware, green public procurement, support for green tech start-ups and SMEs. |

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| BOX 10 ***Digitalization for Sustainability – Science in Dialogue (D4S)***  The European research network “Digitalization for Sustainability – Science in Dialogue” (D4S) is dedicated to develop a progressive vision for a digitalization that fosters environmental and social sustainability using systems thinking.  The project aims at enhancing the science-policy discourse by: delivering a comprehensive analysis of opportunities, risks and governance options regarding digitalization and sustainability. It will also develop guidelines, design principles, policies and new institutions to shape digitalization towards deep sustainability transformations outlining an inter- and transdisciplinary research agenda.  At the very core of the research network stands a group of 15 renowned experts, consisting of European researchers as well as practitioners representing a variety of institutions and schools of thought. The Expert Panel consisting of researchers from European academia, think tanks, and civil society organizations includes different scientific disciplines and reflects diverse thematic and national backgrounds.  The dialogue aims at integrating various topics regarding digitalization/ICT (e.g., data governance, platform economics, surveillance/privacy, AI) with topics regarding sustainability transformations (inter- and intranational justice, sectoral transitions in energy, mobility and agriculture, sustainable production & consumption) in order to synthesize these into an integrated, comprehensive analysis of prospects, risks, governance options and policy solutions for a sustainable digitalization. |

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| BOX 11 ***Sustainable digitalization standards by the ITU***  ITU-T Study Group 5 ([Environment, climate change and circular economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx)) developed the standard Recommendation ITU-T L.1470, which provides operators of mobile networks, fixed networks and data centres with guidance to set science-based targets (SBTs), approved by the science-based target initiative (SBTi), to reduce GHG emissions at a rate that is in line with climate targets set in the 1.5°C scenario of the Paris Agreement and the subsequent standard ITU-T L.1471 giving guidelines for setting and reporting net zero targets. Recommendation ITU-T L.1050 provides a guide to different network architectures, while ITU L.1410 provide guidance for assessing the environmental impacts of goods, networks and services while L.1420 focus on organizational footprits. In addition, recommendation ITU-T L.1023 provides an assessment method for circular scoring, which allows ICT designers to determine the multiple facets of circularity such as durability, reparability, ability to refurbish, recycle material or critical raw material content by using a single scoring method. Together, these ITU standards are providing authoritative guidance to put the ICT sector on a decarbonization pathway towards net zero emissions based on circular economy principles, ensuring environmental sustainability in digital transformation.  New standards are also targeting methodologies for estimating GHG emissions of induced effects and virtual meetings, for estimating biodiversity related impacts, and for best practices to achieve net-zero using ICTs, energy efficiency and smart energy solutions, among other related topics.  Looking ahead, ITU will continue to support the ICT sector’s circular economy transition. For example, the ITU-T Study Group 5 is developing a new standard that will define the requirements of a global digital sustainable product passport for a circular economy. The concept of a digital product passport has recently generated significant attention, particularly at the European level. ITU will also be organizing a series of global dialogues to promote a sustainable digital transformation, in addition to supporting key initiatives that focus on connecting digital technologies with environmental sustainability. |

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| BOX 12 ***EU Taxonomy for Sustainable Activities***  In order to meet the EU’s climate and energy targets for 2030 and reach the objectives of the European Green Deal, it is vital that investments are directed towards sustainable projects and activities. To achieve this, a common language and a clear definition of what is ‘sustainable’ is needed. This is why the EU’s Action Plan on Financing Sustainable Growth[[74]](#footnote-75) called for the creation of a common classification system for sustainable economic activities, or an “EU taxonomy”.  The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. It could play an important role helping the EU scale up sustainable investment and implement the European Green Deal, including various digital transformation objectives. The EU taxonomy is built to provide companies, investors and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable. In this way, it aims to create security for investors, protect private investors from greenwashing, help companies to become more climate-friendly, mitigate market fragmentation and help shift investments where they are most needed.  The EU Taxonomy Regulation establishes six environmental objectives:   1. Climate change mitigation 2. Climate change adaptation 3. The sustainable use and protection of water and marine resources 4. The transition to a circular economy 5. Pollution prevention and control 6. The protection and restoration of biodiversity and ecosystems   Different means can be required for an activity to make a substantial contribution to each objective. Under the Taxonomy Regulation, the Commission had to come up with the actual list of environmentally sustainable activities by defining technical screening criteria for each environmental objective through delegated acts.  The Taxonomy will play an important role in standardizing a common classification system that can then be deployed by different digital platforms and algorithms. |

### **2.2 Second Shift - Ensure sustainable digitalization to mitigate negative environmental and social impacts**

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**footerFigure 4.** Shift 2 Ensure sustainable digitalization to mitigate negative environmental and social impacts

Digital technologies exact a significant ecological impact linked to energy and material consumption as well as a social impact from problems linked to accelerated unsustainable consumption patterns, unequal access to digital technologies, discrimination in the provisioning of digital skills and capabilities, or targeted human rights violations.

CODES stakeholders identified **six global-scale strategic priorities** that must be addressed to ensure the sustainability, inclusiveness and scalability of our underlying digital backbone. Examples of initiatives are in Table 2:

1. **Problem 2.1 - “Energy and Emissions”: Minimize energy consumption and CO2 emissions**. One of the biggest challenges to address are the energy requirements needed to power the digital society and economy. According to the ITU, ICT’s share of global electricity consumption in 2020 reached 3.8 per cent**.**[[75]](#footnote-76).[[76]](#footnote-77) Various studies estimate a GHG emissions share of 1.4-6 per cent in 2020.[[77]](#footnote-78) [[78]](#footnote-79) The explosion of digital cryptocurrencies is also accelerating energy consumption. With 37 million tons of carbon dioxide emissions, Bitcoin would rank between New Zealand and Ireland.[[79]](#footnote-80) Closing the digital divide will need to be paired with investments in sustainable decentralized renewable energy infrastructure and green data centers (See Box 13). This will require the use of available and enhanced standards 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 of companies.Enabling policies and incentivization mechanisms such as sustainable public procurement can thus ensure compliance with such global standards.
2. **Problem 2.2 - “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 2050.[[80]](#footnote-81) The materials footprint of the ICT is quite small in terms of overall materials usage - however looking at its effect from the perspective of some specific and often rare materials, resource depletion and toxicity perspectives the sector has a substantial impact. There are at least twenty-four elements that are considered important for the digital future, including a range of rare earth elements (REEs).[[81]](#footnote-82) Each of these generate different environmental, social and political impacts during their extraction, transformation and disposal, often depending on the level of national governance capacity to monitor and mitigate those impacts. In 2019 a record 53.6 million metric tons of e-waste was produced globally,[[82]](#footnote-83) the equivalent weight of 125,000 Boeing 747 jumbo jets – more than all of the commercial aircraft ever created.[[83]](#footnote-84) This makes e-waste the fastest-growing domestic waste stream. Only 17.4 per cent of e-waste was documented as formally collected and recycled. Only 78 countries have e-waste legislation.[[84]](#footnote-85) This means footerdigitalization 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 (e.g. through the extended producer responsibility approach) for the environmental impact associated with the production of their ICT products and services and legislation should enforce stricter sustainability requirements. Minimum standards for the procurement of green digital infrastructure, digital services and ICT products should support a circular economy.
3. **Problem 2.3 - “Consumption”: Restrain persuasive technologies and practices that accelerate consumption**. Despite an opportunity to drive sustainable behaviors and lifestyles through "prosumption" - the sharing and reselling of used goods on digital platforms - digitalization is inducing new demand and accelerating consumption. Current marketplace and social media and ad based business models often permit a one-way flow of user data and preferences to the 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 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”, by placing a downward pressure on the prices of goods and services, thereby enabling increased production and consumption. All of these catalyzing 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 system 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.
4. **Problem 2.4 - “Misinformation”: Prevent the amplification of misinformation and disinformation about sustainability and related themes.** As the digital revolution spreads around the world, we are conducting an unprecedented social experiment in which 4.5 billion people are now connected and exchanging ideas through social media, gaming (over 2.5 billion people)[[85]](#footnote-86), and chat apps. 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 percent 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.[[86]](#footnote-87) The spread of misinformation about planetary sustainability topics such as climate change, biodiversity loss or pollution and climate solutions has real world consequences. It can undermine collective action, impactful solutions and trust in institutions as well as magnify polarization and mistrust between divided groups. We have become less likely to find common ground on existential threats such as climate footerchange[[87]](#footnote-88) or COVID-19[[88]](#footnote-89) as we cannot agree on a basic set of scientific facts. The amplification of misinformation about sustainability themes such as climate change, nature protection and pollution is a major problem that must be addressed by social media platforms. Trusted sources of information must be more systematically identified and articles containing misinformation flagged or taken down (See Box 15).
5. **Problem 2.5 - “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 also beyond inequalities in access to the internet, and includes differential access to the tools, information, technologies, skills, capacities, and agency in driving the directions of digitalization.[[89]](#footnote-90) There are also important facets embedded within this divide that include gender, age, income and culture that must be considered. As such, efforts to close the digital divide must include a number of parallel investments. First, addressing pervasive biases in STEM that have ripple effects throughout the digital ecosystem (ie algorithmic bias). Second, shifting finance incentives and resources and talent funnels towards Equity, Diversity, and Inclusivity (EDI). 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.
6. **Problem 2.6 - “Rights Violations”: Protect human, child, civil and environmental rights**. In a digitally connected world, the question of how to respect, protect and implement human rights 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. Children under 18 make up [one-third of all internet users](https://www.unicef-irc.org/publications/pdf/idp_2016_01.pdf), and youth (15-24 year olds) are the [leading internet usage cohort](https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2021.pdf) (globally, 71 per cent use the internet, compared with 57 per cent of the other age groups). Considering both human and child rights, as enshrined in the Convention on the Rights of the Child, is thus essential to creating an inclusive and right-based digital environment for all. Human rights such as freedom of expression, privacy, free assembly, 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. First, human right 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.[[90]](#footnote-91) Second, human rights violations in the form of digital surveillance and digital reprisals against environmental human rights defenders, whistle blowers, journalists, and political dissidents. Women environmental defenders are particularly more likely to be harassed and victimized online. Third, violations of online data privacy by independent actors, private organizations and state governments. Human rights need to be safeguarded in the development, implementation, law, and governance of digital technologies. They need to be accounted for and realized at every step of the value-chain of digital technologies and herein 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. Priority needs to be made for a new generation of rights protection mechanisms in the digital age, as enabled by digital technology solutions such as secure multi-party computation as well as personal data control through Web 3.0 infrastructure, which manage the value of personal data without compromising the fundamental rights of users. Special consideration must be given to Indigenous data sovereignty principles-- where regulations around data are not just limited to usage but considered to include (but not limited to) environmental, social, economic, footerhistorical and cultural, and resource data. Such principles should center the rights and protection of non-human entities and require engaging Indigenous experts to inform policies and standards.
7. **Next steps:** The CODES community has identified three critical next steps to advance each of these missions and further connect ongoing initiatives:
   1. **Sustainable Procurement Pledge for Digital Services and ICT:** All governments, civil society organizations and large private sector companies should adopt sustainable procurement policies when buying and deploying digital services as well as Information and Communications Technologies (ICT).
   2. **Sustainable Digital Infrastructure Initiative:** Governments and digital infrastructure companies should adopt and implement sustainable digital infrastructure targets and policies to decarbonize, dematerialize and detoxify the digital backbone, including net-zero data centers and ICT supply chains. Governments need also consider the availability of such infrastructure when composing an integrated part of climate transitions.
   3. **Sustainable Smart Livelihoods Initiative:** International organizations, national and regional governments, scientists, civil society and private actors should implement role model real-world laboratories for inclusive and sustainable urban and rural smart livelihoods that favors a whole-of-society approach. Applied regional solutions should be developed, e.g. for education; construction and housing; regionally embedded circular economy, infrastructures for mobility, transport and energy supply, that close divides.

**Table 2.** Key stakeholders and initiatives addressing shift 2

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| **Type of actor / Initiative** | **Title** |
| Digital Innovation and Acceleration Initiatives or Funding | * ITU and DigitalImpact Alliance [GovStack](https://www.govstack.global/) and ITU [GreenGovStack](https://www.itu.int/net4/ITU-D/CDS/projects/display.asp?ProjectNo=2RER20008-02) * [ITU and UNICEF GIGA](https://gigaconnect.org/) |
| Agenda Setting and Stakeholder Dialogue | * [ITU-T Focus Group on "Environmental Efficiency for Artificial Intelligence and other Emerging Technologies](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx) |
| Data, Analytics and Tools | * [United Nations Satellite Centre UNOSAT](https://www.unitar.org/sustainable-development-goals/united-nations-satellite-centre-UNOSAT) * [Mapx](https://www.mapx.org/) * [Copernicus Open Access Hub](https://scihub.copernicus.eu/) * [Global E-waste Statistics Partnership](https://globalewaste.org/about-us/) * [CodeCarbon](https://codecarbon.io/) |
| Policies, Norms and Standards | * [ITU-T SG5: Environment, Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx), 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-T SG20: Internet of things (IoT) and smart cities and communities (SC&C)   + ITU-T Y.4900 series: Evaluation and assessment of smart cities   + ITU-T Y.4903: Key performance indicators for smart sustainable cities to assess the achievement of sustainable development goals   + ITU-T Y.4904: Smart Sustainable cities maturity model * [Digital Nations - Sustainable Government Information Technology](https://www.leadingdigitalgovs.org/sustainable-government-it) * [One Planet Programme on Sustainable Public Procurement (SPP)](https://www.oneplanetnetwork.org/sustainable-public-procurement) * [EU Green Public Procurement guidebook](https://ec.europa.eu/environment/gpp/buying_handbook_en.htm) * [OECD green ICT assessments](https://www.oecd.org/sti/ieconomy/42825130.pdf) * [OECD.AI Policy Observatory (Task Force on AI Compute & Environment)](https://oecd.ai/en/network-of-experts/working-group/1136) * [Carbon Mark](http://carbonmark.org/) * [Greensoftware Foundation](https://greensoftware.foundation/) * [European Committee for Standardization (CEN)](https://www.cencenelec.eu/about-cen/) Materials efficiency * [European Committee for Electrotechnical Standardization (CENELEC)](https://www.cencenelec.eu/about-cenelec/) Materials efficiency * [European Telecommunications Standardization Institute (ETSI) Materials efficiency and Life Cycle Assessment](https://www.etsi.org/deliver/etsi_es/203100_203199/203199/01.03.01_60/es_203199v010301p.pdf) * [Internet Engineering Task Force (IETF)](https://www.ietf.org/) * [Audit AI](https://developer.nvidia.com/blog/nvidia-research-auditing-ai-models-for-verified-deployment-under-semantic-specifications/) * [Further development of comparative methods such as the Content Thematic Component Differentiation](https://www.mdpi.com/2071-1050/13/13/7215/pdf) * [EU Ethics guidelines for trustworthy AI](https://op.europa.eu/en/publication-detail/-/publication/d3988569-0434-11ea-8c1f-01aa75ed71a1) * [GESI Good Practice Guide on Remedy Human Right Impacts](https://www.gesi.org/research/gesi-good-practice-guide-on-remedy-human-rights-impacts) * [UN Guiding Principles on Business and Human Rights](https://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf) * [Global Agreement on the Ethics of Artificial Intelligence](https://news.un.org/en/story/2021/11/1106612) * [UNICEF Policy Guidance on AI for Children](https://www.unicef.org/globalinsight/reports/policy-guidance-ai-children) * [Responsible Data for Children](https://rd4c.org/) * [OHCHR’s work on privacy in the digital age](https://www.ohchr.org/en/issues/digitalage/pages/digitalageindex.aspx) * [World Wide Web Foundation REACT policy framework on Digital Inclusion](https://webfoundation.org/react/) * [Sustainable IT Pledge by the Canadian CIO](https://ciostrategycouncil.com/sustainable) Strategy Council * [Basel Convention on controlling transboundary movements of hazardous wastes and their disposal](http://www.basel.int/) * [ITU-D E-waste Policy Development](https://www.itu.int/en/ITU-D/Environment/Documents/Priority-Areas/WEEE-Policy-Development-Brochure-for-Member-States.pdf) |
| Advocacy | * [Amnesty International](https://www.amnesty.org/en/) * [Global Witness](https://www.globalwitness.org/en/) * [Center for Human Technology](https://www.humanetech.com/) * [Alliance for Affordable Internet](https://a4ai.org/) * [UNFCCC Race to Zero Climate Champions team](https://unfccc.int/climate-action/race-to-zero-campaign) * [Children's Rights and Business Principles](http://childrenandbusiness.org/) * [The Case for Better Governance of Children’s Data: A Manifesto (UNICEF)](https://www.unicef.org/globalinsight/reports/better-governance-childrens-data-manifesto) * International Campaign for Responsible Technology * World Harmony Foundation |
| Research and Knowledge | * [Digital Goes Green](https://www.digitalgoes.green/) * [ICT4S research community](https://conf.researchr.org/home/ict4s-2022) * [Network for Digital Economy and Environment (nDEE)](https://networkdee.org/) * [ITU/UNESCO Broadband Commission](https://www.broadbandcommission.org/) * [ITU-T Focus Group on Environmental Efficiency of AI and other emerging technologies](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx) * [ITU-T Joint Coordination Activity on Accessibility and Human Factors (JCA-AHF)](https://www.itu.int/en/ITU-T/jca/ahf/Pages/default.aspx) * [Global E-waste Statistics Partnership](https://globalewaste.org/about-us/) - [Global](https://ewastemonitor.info/global-e-waste-monitors/) and [Regional](https://ewastemonitor.info/regional-e-waste-monitors/) E-waste Monitors * [UNFCCC Climate Action Pathways - ICT & Mobile](https://unfccc.int/climate-action/marrakech-partnership/reporting-tracking/pathways/industry-climate-action-pathway) * [Digitalization for Sustainability – Science in Dialogue (D4S)](https://digitalization-for-sustainability.com/) * [Facebook Climate Science Center](https://www.facebook.com/climatescienceinfo) * [Google initiative on verified climate science](https://www.un.org/en/climatechange/google-search-information) * [Twitter initiative on authoritative climate information](https://www.washingtonpost.com/business/2021/11/01/twitter-climate-disinformation/) * Royal Academy of Science Intl. Trust (RASIT) * ProSUM Urban Mine Platform * C-SERVES * EFUTURES - Electronics for Sustainable Societies * PARIS-DE * Future of Sustainable Data Alliance (FoSDA) |
| Collective Action Networks / Operationalization | * [Exponential Roadmap Initiative](https://exponentialroadmap.org/) * WBCSD Carbon Transparency Partnership * United 4 Smart Sustainable Cities (U4SSC) * [Sustainable Digital Infrastructure Alliance](https://sdialliance.org/) * [Playing for the Planet Alliance](https://playing4theplanet.org/) * [Digital With Purpose Movement](https://digitalwithpurpose.org) * [Green Software Foundation](https://greensoftware.foundation/) * [Greentech Alliance](https://www.greentech.earth/) * [Global Enabling Sustainability Initiative](https://gesi.org/) * [Green 500](https://www.top500.org/lists/green500/2021/11/) * [ICT Pact](https://circularandfairictpact.com/) * Carbon Call * [RE100](https://www.there100.org/) * [GSMA](https://www.gsma.com/) * [Icebreaker One](https://icebreakerone.org/) * [EU Blockchain Observatory and Forum](https://www.eublockchainforum.eu/) * [E-waste coalition](https://www.itu.int/en/ITU-D/Environment/Pages/Priority-Areas/E-waste-Coalition.aspx) * [Science-based Targets Network (SBTN)](https://sciencebasedtargetsnetwork.org/) * [Responsible Business Alliance](http://www.responsiblebusiness.org/) * [Partner Connect Digital Coalition](https://www.itu.int/en/mediacentre/Pages/PR-09-2021-P2C-Bridging-Digital-Divide.aspx) * [Digital Poverty Alliance](https://digitalpovertyalliance.org/) * [ITU / UNESCO Broadband Commission](https://www.broadbandcommission.org/) * Utah-China F.I.S.H.D.&C. * [Circular Electronics Partnership](https://cep2030.org/) * [WEEE Forum](https://weee-forum.org/) * [Internet Governance Forum - Policy Network on Environment](https://www.intgovforum.org/multilingual/content/policy-network-on-environment-pne) |

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| BOX 13 ***The Roadmap to Sustainable Digital Infrastructure by 2030***  The Sustainable Digital Infrastructure Alliance is a network of stakeholders committed to sustainability working across the entire digital infrastructure value chain. The goal is to participate in key activities toward sustainable digital infrastructure and set the direction for the development of the sector. This is embodied in the Roadmap to Sustainable Digital Infrastructure by 2030 that has been adopted by the alliance. The roadmap includes a number of key targets on emissions, energy consumption, e-waste, resource consumption, pollution, and the cost of digital power. |

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| BOX 14 ***The risks of digital nudging powered by AI***  Nudge Theory, as popularized by the Nobel Memorial Prize laureates Richard Thaler and Cass Sunstein, is a concept involving indirect suggestions and positive reinforcement as means to influence decision-making behaviors. Today, this theory, also referred to as dark patterns, finds application in digital spheres where, through algorithmic nudging, organizations can collect, parse, and crunch their stakeholders’ data on a large scale, and use this data to train their algorithms and target users through personalized nudges, such as push-notifications and rewards. With advances in AI and machine learning, such algorithms can be adjusted in real-time based on user feedback and have proven to be very effective in triggering behavioral change.  A survey by Deloitte of 500 companies found that among all of the retailers that have adopted AI to personalize the consumer experience, 40% of them used AI with the specific purpose of tailoring pricing and promotions in real time based on digital intelligence of user preferences and predictive analytics.[[91]](#footnote-92)  This incredible opportunity for micro-targeting can potentially be harnessed to foster sustainable consumption and more climate-friendly lifestyles and behaviors. Conversely, this unprecedented access to user data also carries the risk of manipulating consumers to options that may not be the most beneficial, or interfere with human privacy and individual agency.  Therefore, it is essential that such algorithmic nudges be designed ethically taking into account regulatory provisions such as the EU’s General Data Protection Regulation (GDPR) and various AI regulations, such as the EU AI Act. Creators need to ensure they create a win-win situation and empower users to decide how they want to engage with sustainability nudges. Furthermore, creators should share information about data collection and storage and explain the algorithms’ logic and optimization goals. |

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| BOX 15 ***Verified sources of climate information***  Some social media companies and digital platforms are exploring how to address misinformation linked to climate change.  Meta has launched the Climate Science Center[[92]](#footnote-93) to help users find validated information on climate change from authoritative sources including UNEP, WMO and IPCC. This service is available to all users of Facebook, a social network owned and operated by Meta, to help mitigate the spread of misinformation about climate science.  Google is also teaming up with the UN[[93]](#footnote-94) to offer verified climate information. When users search for “climate change,” they will be able to find authoritative information from the United Nations. In addition to organic search results, Google will surface short and easy-to-understand text blurbs and visuals on the causes and effects of climate change as well as individual actions that people can take to help tackle the climate crisis.  Google and YouTube also announced a new policy that prohibits climate deniers from being able to monetize their content on its platforms via ads or creator payments.[[94]](#footnote-95)  Twitter rolled out a new program designed to “pre-bunk” climate misinformation, or get ahead of false narratives about climate by exposing people to more accurate information about the crisis on its platform.[[95]](#footnote-96)Twitter users will be directed to online hubs containing credible, authoritative information. These guides will appear in users’ “Explore” tabs, their Twitter search portals, and relevant trends lists.  Despite these efforts, misinformation in general and on climate change in particular remains a pervasive problem on social media. A recent study by the Center for Countering Digital Hate (CCDH) found that of 7,000 misleading Facebook posts describing climate change as "hysteria", "alarmism", a "scam", or other related terms, only 8% were marked as misinformation.[[96]](#footnote-97) Highly shared articles made false assertions that climate change was not confirmed by science or claimed to debunk it with data. Of these, 69% could be traced back to just 10 "super-polluter" publishers - dubbed the "toxic ten" - the campaign group found. |

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### **2.3 Third Shift - Directing innovation efforts toward digital sustainability**

**Figure 4.** Transform systems, incentives and business models through digital innovations for sustainability

The third shift calls 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 digital sustainability with intention.

footerThis translates into the commitment to a vigorous innovation decade for digital sustainability. The very process of digital transformation holds great promise in addressing some of the key environmental challenges and systemic barriers to planetary-scale sustainability that we face today. It provides new opportunities and useful means to change the ways in which we interact with and understand the natural environment, and organize, produce, and consume. However, digital technologies are general purpose technologies and as such brings both opportunities and risks. 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 digitalisation for systems level transformation is an important strategic priority for positive change towards a sustainable planet.

CODES stakeholders identified **six global-scale strategic priorities** where innovation can be proactively used to implement, accelerate and scale sustainability globally: building planetary digital twins and a sustainable circular economy, ensuring sustainable consumption and global knowledge commons, striving for governance breakthroughs and an access revolution. Examples of initiatives that are working on this shift are contained in Annex 3.

1. **Innovation 3.1 - ”Planetary Digital Twin”: Prioritize innovations to measure, monitor and model the health of the planet’s biosphere and interactions with economic and social systems**.Digitally driven advances in science, predictive data analytics, artificial intelligence and collective intelligence methods are already proving to be drivers for promoting sustainability transparency, accountability, and knowledge production and communication. 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 digital twins of the earth that can monitor and model complex relationships among environmental, social, governance, and economic systems using the best science and data available as well as robust data-protection rules. This is needed not only for national governments, but also for private sector companies, research institutions, non-profit organizations, and local communities and with consideration to leave no one behind (See Box 16). Such a system could also conduct automated monitoring of risks and threats to key natural or cultural areas under global protection frameworks, e.g. related to key biodiversity areas (KBAs)[[97]](#footnote-98), ecosystem services or protected species. Such a solution could also integrate geographic/geospatial information in temporal views that enables analysis and communication of development and impact over certain time periods. It could also help understand options and trade offs for achieving different SDGs and MEAs. Accomplishing this goal will require a number of investments. First, investments to improve the sensing, connectivity and compute requirements required to collect and process the vast volumes of data, especially for real-time data processing scenarios. Second, adoption of data standards and safeguards, open APIs and communication protocols that enable safety, privacy, interoperability, transferability, and quality control of key 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.
2. **Innovation 3.2 - “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 footerprocess itself should be used as an opportunity for companies to identify concrete pathways to advance decarbonization, dematerialization, detoxification and circularity goals across their production value chains and with their suppliers. This should include a transitioning away from the provision of products to offering services. *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 to consumers to inform their own decision making. *Finally*, aligning business models and finance and institutional procurement practices with sustainability goals, divesting away from unsustainable products and services towards products and services that are fully ESG compliant. Ultimately, one of the outcomes of digital transformation is that it should help identify opportunities to adopt 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 Boxes 17 and 18).
3. **Innovation 3.3 - “Sustainable Consumption”: Empower sustainable lifestyles, behaviors and collaboration :** Digital tools can empower consumers to make sustainable consumption choices (including non-consumption) which can collectively drive businesses to adopt sustainable practices. For example, digital applications embedded in e-commerce platforms such as product comparability, nudging, gamification, footprint calculations and green activations can support a shift in awareness and enable people to choose more environmentally sustainable products and services (see Box 19). Social media, gaming platforms and fintech can also help amplify proof of environmentally sustainable lifestyles, enabling people to receive social recognition from their choices thereby reinforcing green behaviors (See Box 20). 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. Digitalization also enables mass collaboration and mobilization of citizens through platforms enabling crowd-funding. Opportunities to use digital technologies to empower sustainable lifestyles, behaviors and collaboration should be designed into digital platforms by default. They must become essential channels to influence sustainable consumption drivers at a planetary scale.
4. **Innovation 3.4 - “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 co-production of knowledge (e.g. citizen and open science) and enable knowledge sharing across the globe for all kinds of educational, scientific or practical purposes (see Box 21). 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, infrastructure and supportive framework conditions or by large public-private-imbalances towards well-resourced private innovation hubs (especially in footertech-research and platform solutions). Innovations, political and financial investments are needed: operationalized FAIR principles for data (findability, accessibility, interoperability, reusability), public money and public data for public 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 groups, the creation of a global (environmental) awareness and empathy as well as breakthroughs in sustainability solutions.
5. **Innovation 3.5 “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 catalyze 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 Box 22). *Second*, increased automation of Systems of National Accounts (SNAs)[[98]](#footnote-99) used to measure national economic activity with sustainability criteria included (See Box 23). *Third*, transparent monitoring, reporting and verification (MRV) of legal compliance and progress towards national sustainability goals as part of new accountability frameworks. Fourth, decentralized and distributed governance solutions to trigger and incentivise collective sustainability actions and behaviors at scale through digital channels. *Finally*, new digital mechanisms to support public participation in decision-making to crowdsource governance priorities and solutions from citizens. All of these governance innovations must also prioritize the inclusion and ownership/agency of marginalized groups, support subsidiarity and self-governance in an increasingly polycentric setting and help overcome the harsh global-local divide e.g. by building inclusive fora connecting local interests with global decision-making. Sustainability policies, laws and regulations increasingly need to be written in digitally relevant and machine-readable formats that can interact with and inform algorithmic decision making, SMART systems and digital twins.
6. **Innovation 3.6 - “Access Revolution”: Prioritize actions to make digital innovations for the Whole of Society, broadly accessible for the many.** Several digital innovations pose systemic challenges to existing individual, economic and societal development models with the potential to exacerbate power imbalances, monopolistic competition, exclusion and societal conflict. More basically, still half of the world’s population suffer from the digital divide including lack of access to basic connectivity, opportunities and skills. As important as the technology coverage is the accessibility for all and digital literacy. Addressing these trends requires an active, global and radical vision along the 2030 Agenda. The global community should actively footerand comprehensively promote access to a broad scope of digital innovations for the whole of society, while empowering local digital ecosystems. This ‘access revolution’ must entail multiple domains to develop new sustainable development perspectives, support green jobs, unlock alternative green financing mechanisms or sustainable market incentives and sustainable livelihoods. Some illustrative priority domains for innovations in access include: the development of digital infrastructure and digital public goods to support low cost renewable mini and off grids, support for sustainable small-scale agriculture, support to access micro-finance, access to open education as well as local business models for green digital jobs, products and services. Promoting digital inclusion must be a top investment priority for companies and governments alike, and international actors can play a role to safeguard technology innovation and foster healthy digital ecosystems. Crowding in investments and public funding to foster local digital ecosystems, establishing multi-faceted partnerships that support open technology and adopfooterting frameworks for a whole-of society approach are needed.
7. **Next steps:** The CODES community has identified three critical next steps to advance each of these missions and further connect ongoing initiatives:footer
   1. **Sustainability cloud infrastructures to support science-based sustainability targets:** Governments to establish further incentives and regulations for businesses to adopt transparent science-based targets for their sustainability and net-zero goals. Governments should also begin to require sustainability cloud infrastructure that enables monitoring, reporting and verification (MRV) of their targets across their supply chains, including scopes 1,2, and 3. Cloud-infrastructure can drive data driven process optimizations with the view to drive decarbonization, dematerialization and detoxification across their value chains.
   2. **“Sustainability by design” standards and guidelines for digital platforms:** Governments and digital platforms to consider how they can collaborate to educate, enable and empower consumers and enterprises to adopt more sustainable practices and behaviors using various forms of behavioral science and green digital nudging on e-commerce platforms, social media and online gaming. In particular, how can these platforms be used to achieve national sustainability goals and reflect sustainability regulations in the user experiences and underlying algorithms? How can sustainability be incorporated by design into the user experiences of these platforms? Information on the environment and climate footprint of products and services should be based on international standards or third party certificates. Nudging frameworks should be based on international ethical principles with due consideration to individual data privacy.
   3. **Intergovernmental Platform on a Sustainable Digital Age:** Inclusive scientifically driven transnational assessment process that provides: i. transparency on the ecological and social footprint of digital goods across the value chain and ii. implements forward-looking impact assessment on environmental, societal, economic footerand human impact of digital change. Establish a governance framework based on lessons learned from similar initiatives such as IPBES and the IPCC benefitting from structures of established institutions and building on established research and knowledge.
   4. **Digital Sustainability Innovation Hubs and Accelerators:** Based on a Global Horizon Scanning Process, a regional network of Innovation Hubs would identify and help accelerate digital sustainability innovations in a co-creative manner. It would include entrepreneurs, engineers, scientists, policy makers and practitioners offering real-world laboratories for digital sustainability solutions on the ground.
   5. **Global and National Funds and Acceleration Programs on Digital Innovations for Sustainability:** Provide public finance and incentives to stimulate green digital solutions and transformation innovations that accelerate decarbonisation, dematerialization and detoxification of key economic sectors. Initial focus should be on using smart energy access and networks, food commodity transparency and precision farming, smart transport and buildings which contribute to green job creation.

**Table 3.** Key stakeholders and initiatives addressing shift 3

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| **Type of actor / Initiative** | **Title** |
| Innovation and Acceleration Initiatives or Funding | * [UNDP’s digital transformation initiative](https://digital.undp.org/content/digital/en/home/stories/three-pathways-undp-is-leveraging-digital-technology-to-achieve-.html) * GIZ’s Innovation Challenge * [Ellen Macarthur Foundation](https://ellenmacarthurfoundation.org/) * [Digital Public Goods Alliance](https://digitalpublicgoods.net/) * [United for Smart Sustainable Cities (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) * [Global E-waste Statistics Partnership](https://globalewaste.org/) |
| Agenda Setting and Stakeholder Dialogue | * UN E-waste coalition * [Global Partnership on Artificial Intelligence (GAPI)](https://gpai.ai/) |
| Data, analytics and cloud | * [Destination Earth - Digital Twin of the Planet](https://digital-strategy.ec.europa.eu/en/policies/destination-earth) * System for Earth Observation, Data Access, Processing and Analysis (SEPAL) * [Big Earth Data Science Engineering Program (CASEarth)](http://english.casearth.com/) * [Global Environmental Data Strategy](https://wedocs.unep.org/bitstream/handle/20.500.11822/28486/K1901170.pdf?sequence=3&isAllowed=y) requested by UNEA 4/23 * UNEP’s [World Environment Situation Room](http://data.unep.org) * Various applications of open data cube technology including [Digital Earth Africa](https://www.digitalearthafrica.org/), [Digital Earth Pacific](https://www.spc.int/DigitalEarthPacific) * [Group on Earth Observations (GEO) work on Digital Earth](https://www.earthobservations.org/geo_blog_obs.php?id=329) * [Computational Sustainability](https://www.computational-sustainability.org/) * [International Society for Digital Earth](http://www.digitalearth-isde.org/) * [Sustainability in the Digital Age](https://sustainabilitydigitalage.org/) * [Joint Centre for Excellence in Environmental Intelligence](https://www.metoffice.gov.uk/research/approach/collaboration/joint-centre-for-excellence-in-environmental-intelligence) * [Alan Turing Institute Environment and Sustainability Interest Group](https://www.turing.ac.uk/research/interest-groups/environment-and-sustainability) * [UNDP Data Futures Platform](https://data.undp.org/greenrecovery/)[, Green Recovery Data Hub](https://www.turing.ac.uk/research/interest-groups/environment-and-sustainability) * [UN Secretary General's Future Labs](https://www.un.org/sg/en/node/260255) * [Global Initiative on AI and Data Commons](https://www.itu.int/en/ITU-T/extcoop/ai-data-commons/Pages/default.aspx) * [Artificial Intelligence for Environment & Sustainability (ARIES) to support the System of Environmental Economic Accounting (SEEA)](https://seea.un.org/content/aries-for-seea) * [Microsoft Planetary Computer](https://planetarycomputer.microsoft.com/) * [Google Earth Engine](https://earthengine.google.com/) * [Nvidia Omniverse platform for digital twinning and 3D simulations](https://developer.nvidia.com/nvidia-omniverse-platform) * [Amazon sustainability data initiative](https://sustainability.aboutamazon.com/environment/the-cloud/asdi) * [Salesforce sustainability cloud](https://www.salesforce.com/products/sustainability-cloud/overview/) * [Global Open Science Cloud Initiative](https://codata.org/initiatives/decadal-programme2/global-open-science-cloud/) * [Future of Sustainable Data Alliance](https://futureofsustainabledata.com/) (FoSDA)   On Climate Change   * [Camda Data 2.0 working group](https://camda.global/) * [Climate TRACE](https://www.climatetrace.org/) * [Climate Chain Coalition](https://www.climatechaincoalition.io/) * [Climate Change AI](https://www.climatechange.ai/) * [Centre for AI & Climate](https://www.c-ai-c.org/) * [Climate Informatics](http://www.climateinformatics.org/) * [Icebreaker One](https://icebreakerone.org/) * [Data Driven Lab](https://datadrivenlab.org/) * Digital Public Goods Alliance - [Climate Change Adaptation Community of Practice](https://digitalpublicgoods.net/DPGA-Climate_Change_Adaptation_Report.pdf)   On Nature and Biodiversity   * [Framework on Ecosystem Restoration (FERM)](https://www.fao.org/national-forest-monitoring/ferm/ru/) * [UN Biodiversity Lab](https://unbiodiversitylab.org/) * [IPBES](https://ipbes.net/) * [Restor](https://restor.eco/) * [The Life Map](https://redlistrevival.org/) * [Coordinadora de las Organizaciones Indígenas de la Cuenca Amazonica (COICA)](https://coicamazonia.org/) * [Indigenia Mundus](https://www.indigenia.org/)   On Chemicals and Pollution   * [Global Partnership on Marine Litter (GPML)](https://www.gpmarinelitter.org/what-we-do/gpml-digital-platform) * European Chemicals Agency (ECHA) * Stockholm Environment Institute (SEI) |
| Policies, Norms and Standards | * [UN Declaration on the Rights of Indigenous Peoples (UNDRIP)](https://www.un.org/development/desa/indigenouspeoples/declaration-on-the-rights-of-indigenous-peoples.html) * [FAIR principles for scientific data](https://www.go-fair.org/fair-principles/) * [CARE Principles for Indigenous Data Governance](https://www.gida-global.org/care) * [First Nations principles of ownership, control, access, and possession – (OCAP)](https://fnigc.ca/ocap-training/) * [ISC-CODATA’s Decadal Programme ‘Data for the Planet: making data work for cross-domain grand challenges’](https://codata.org/initiatives/decadal-programme2/) * [International Open Data Charter](https://opendatacharter.net/) * [Data Interoperability Collaborative](https://www.data4sdgs.org/initiatives/data-interoperability-collaborative) * [GS1 Digital Link](https://www.gs1.org/standards/gs1-digital-link) * [ITU-T Study Group 5: Environment, Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx)   + I[TU-T L.1000-L.1199 standards: set of standards that can form the basis for circular economy](https://www.itu.int/ITU-T/recommendations/index_sg.aspx?sg=5)   + ITU-T L.1470 series to achieve net zero in the ICT sector   + [ITU Sustainability passport for digital products](https://www.itu.int/hub/2021/07/new-itu-standards-project-to-define-a-sustainability-passport-for-digital-products/)   + [ITU standards and guidelines on Green Procurement](https://www.itu.int/fr/publications/Pages/publications.aspx?lang=en&media=electronic&parent=T-TUT-ICT-2012-19) * [ITU-T Study Group 20: IoT and Smart Cities and Communities](https://www.itu.int/en/ITU-T/studygroups/2017-2020/20/Pages/default.aspx)   + [ITU-T Y.4000 - Y.4999: Internet of things and smart cities and communities](https://www.itu.int/ITU-T/recommendations/index_sg.aspx?sg=20) * [Green fintech taxonomy](https://greendigitalfinancealliance.org/a-green-fintech-taxonomy-and-data-landscaping/) * [Planet Mark](https://www.planetmark.com/) * [Digital Nations - Leading Digital Governments](https://www.leadingdigitalgovs.org/) * [The GovLab](https://thegovlab.org/) * [Open Government Partnership: workstream on digital governance](https://www.opengovpartnership.org/policy-area/digital-governance/) * [Open North](https://opennorth.ca/) * [OECD Recommendations on Information and Communication Technologies (ICTs) and the Environment](https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0380) * [European EPA Network](https://epanet.eea.europa.eu/) * [Principles and Recommendations to align BigFintech governance with the SDGs](https://sdgfinance.undp.org/digital-finance/principles) * [Guidelines for sustainability information on e-commerce platforms](https://www.oneplanetnetwork.org/news-and-events/news/project-launch-guidelines-providing-product-sustainability-information-e) * [Consumers International - Digital Trust](https://www.consumersinternational.org/what-we-do/digital/) * [EU Digital Services Act](https://digital-strategy.ec.europa.eu/en/policies/digital-services-act-package) * [EU Digital Markets Act](https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-markets-act-ensuring-fair-and-open-digital-markets_en) * UNEP Finance Initiative * [ITU-D E-waste Policy Development](https://www.itu.int/en/ITU-D/Environment/Documents/Priority-Areas/WEEE-Policy-Development-Brochure-for-Member-States.pdf) |
| Advocacy | * [Digital Goes Green](https://www.digitalgoes.green/) |
| Research and Knowledge | * [ICT4S research community](https://conf.researchr.org/home/ict4s-2022) * [Digitalization for Sustainability – Science in Dialogue (D4S)](https://digitalization-for-sustainability.com/) * [Focus Group on Environmental Efficiency for Artificial Intelligence and other Emerging Technologies (FG-AI4EE)](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx) * [ITU-T Study Group 5: Environment, Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx) * [International Resource Panel’s workstream on “Sustainable Trade in Resources: Global Material Flows, Circularity and Trade”](https://www.unep.org/resources/publication/sustainable-trade-resources-global-material-flows-circularity-and-trade) * [Green Digital Finance Alliance](https://greendigitalfinancealliance.org/) * EU's regulations on sustainable finance * [OECD International Programme for Action on Climate (IPAC)](https://www.oecd.org/climate-action/ipac/) * [UK Center for Greening Finance and Investment](https://www.ox.ac.uk/news/2021-02-15-uk-launches-new-oxford-led-research-centre-accelerate-greening-global-financial) * [ITU and UNDP’s digital capacity database](https://digital-capacity.org/database) * [AI Commons](https://ai-commons.org/) * [UN Climate Change Innovation Network](https://www.uninnovation.network/climate-change-innovation) * [World Benchmarking Alliance](https://www.worldbenchmarkingalliance.org/) |
| Collective Action / Operationalization | * [Greentech Alliance](https://www.greentech.earth/) * [European Green Digital Coalition](https://digital-strategy.ec.europa.eu/en/policies/european-green-digital-coalition) * [WEF 2030 Vision](https://www.weforum.org/projects/frontier-2030) * [Platform for Accelerating a Circular Economy (PACE)](https://pacecircular.org/) * [Circular Electronics Partnership (CEP)](https://www.wbcsd.org/Programs/Circular-Economy/News/Circular-Electronics-Partnership-CEP-The-first-private-sector-alliance-for-circular-electronics) * [Digital With Purpose](https://digitalwithpurpose.org/) * Health and Environment Justice Support (https://hej-support.org/) * International POPS Elimination Network (IPEN) * Icebreaker One * [Playing for the Planet Alliance](https://playing4theplanet.org/) * [Google Sustainability Choices - Green Apps](https://blog.google/outreach-initiatives/sustainability/sustainability-2021/) * [Amazon Climate Pledge Friendly Products](https://www.amazon.com/b?ie=UTF8&node=21221607011) * [Every Action Counts Coalition](https://greendigitalfinancealliance.org/initiatives-publications/eac-coalition/) * [United 4 Smart Sustainable Cities (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) * [WEEE Forum](https://weee-forum.org/projects-campaigns-category/directory/) |

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| BOX 16 ***Destination Earth - a Digital Twin of the Planet***  Destination Earth aims to develop a high precision digital model of the Earth to model, monitor and simulate natural phenomena and related human activities. As part of the European Commission’s Green Deal and the Digital Strategy, Destination Earth (DestinE) will contribute to achieving the objectives of the twin transition, green and digital.  DestinE will unlock the potential of digital modeling of the Earth system. It will focus on the effects of climate change, water and marine environments, polar areas, cryosphere, biodiversity or extreme weather events, together with possible adaptation and mitigation strategies. It will help to predict major environmental degradation and disasters with unprecedented fidelity and reliability.  By opening up access to public datasets across Europe, DestinE represents also a key component of the European strategy for data. At the heart of DestinE will be a user-friendly and secure digital modeling and simulation platform. This platform will provide access to data, advanced computing infrastructure, software, AI applications and analytics. |

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| BOX 17 ***Digital With Purpose Movement***  The Digital with Purpose Movement (DWP) is establishing a series of metrics and a certification scheme that will help companies communicate how their digital products, services and business practices are contributing positively to SDGs and improving the sustainability of society as a whole. Member companies represent billions in market capitalization.  The DwP framework has three main components:  - **Purpose**: Principles and associated metrics to inform a company on becoming a purpose-led business, i.e., connecting core business models to address sustainable development goals, maximizing positive contributions, and minimizing negative effects.  - **Digitally Enabled Solutions**: Principles and associated metrics that reflect how a company contributes innovative digital solutions through its products, services, and core business practices in a way that improves the sustainability of society overall.  - **Responsible Business**: Principles and metrics covering how a responsible company operates with respect to climate change, digital trust and responsibility, the circular economy, digital inclusion, and supply chain. This covers the design, delivery and end-of-life management of products and services, as well as interactions with stakeholders, monitoring performance, and setting targets for improvement.  Equivalent weighting is given to the solution generation component and the component associated with more traditional ESG metrics covering responsible business practices.  Members of the Movement are required to make a public commitment to the “Digital With Purpose Movement” – to pledge to adhere to the four universal commitments that make up the ‘Digital with Purpose Framework’ (the Framework provides a rigorous and robust process for corporates to articulate their ambitions for SDG impact and to track their progress through impact measurement).  The four universal commitments are:  1. We commit to supporting the United Nations Sustainable Development Goals and to establish practical and incremental steps to become a purpose-led business;  2. We take and report concrete action on climate change;  3. We embrace the principles of impact transparency and report accordingly every year;  4. We develop and deploy digital technology with positive societal impact. |

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| BOX 18 ***Green fintech taxonomy***  The Green Digital Finance Alliance (GDFA) and the Swiss Green Fintech network launched the world’s first green fintech taxonomy. Through the report entitled “A Green Fintech Taxonomy and Data Landscaping”[[99]](#footnote-100), the taxonomy seeks to develop and stimulate the green fintech market by enabling a harmonized approach for policy makers, investors, and market actors to assess green fintechs. The report categorizes green fintech through the following lenses:   1. Green digital payment and account solutions 2. Green digital investment solutions 3. Digital ESG-data and -analytics solutions 4. Green digital crowdfunding and syndication platforms 5. Green digital risk analysis and insure-tech 6. Green digital deposit and lending solutions 7. Green digital asset solutions   A key value add of the report is the mapping of the main databases leveraged by each category of green fintech, and providing an overview of the datasets which, if made accessible, can catalyze an increased supply of green fintech innovation.  Innovations in fintech solutions that seek to better align behaviors of the financial system with green objectives, are critical to achieving sustainable outcomes and taxonomies like the GDFA’s are an essential catalyst for this wave of innovation. |

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| BOX 19 ***E-commerce platforms are offering green filters and procuring with purpose options***  Three of the largest digital platforms in the e-commerce space are aiming to support greener consumption and lifestyles using digital channels. Amazon has adopted the Climate Pledge Friendly initiative to help at least 100 million Americans find climate-friendly products that carry at least one of 32 different environmental certifications.  Google is now highlighting green products and services such as flights and transport routes within search results and navigation tools. These could help influence the behaviors of the billions of people who use Google services.  SAP’s Ariba platform is the largest digital business-to-business network on the planet. It has also fully embraced the idea of “procuring with purpose” offering a detailed look at corporate supply chains so potential partners can better assess the social, economic and environmental impact of transactions. |

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| BOX 20 ***The Green Digital Finance Alliance and the Every Action Counts Coalition***  The Green Digital Finance Alliance (GDFA), launched by Ant Group and the United Nations Environment Programme (UNEP), seeks to address the potential for digital finance, and fintech to reshape financial incentives in ways that better align it with the needs of green production and consumption.aims to enhance financing for sustainable development. Recently, the GDFA launched the Every Action Counts Coalition, a global network of digital, financial, retail investment, e-commerce, and consumer goods and services companies that have a shared interest in using digital platforms to accelerate green finance and consumption.  It identifies and shares best practices in encouraging individuals to take positive actions in daily life to create planet-friendly outcomes through digital channels. The Coalition has collectively set an ambitious target. The EAC Coalition will creatively leverage technology and partnerships to enhance green awareness and action of 1 billion people around the globe by making greener choices and taking action for the planet by 2025.  For example, financial services providers such as GDFA member Mastercard in collaboration with the Swedish fintech financial technology company Doconomy are enabling their users to buy lower carbon products by providing shoppers with a personalized carbon footprint tracker and insights to help inform their spending decisions.  Mobile apps like Ant Forest, by Ant Group, are also using a combination of incentives, digital engagement and social engagement models to help 600 million make more sustainable choices. Users are rewarded for low-carbon choices through green energy points that they can use to planet real trees. So far, the Ant Forest app has resulted in 122 million trees being planted, reducing carbon emissions by over 6 million tons. |

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| BOX 21 ***Public-private research collaboration in the use of artificial intelligence for climate action***  In 2019, a major academic collaboration was conducted between a range of academic and private sector experts on potential applications for tackling climate change with machine learning.[[100]](#footnote-101) The collaboration was unprecedented in terms of bringing together some of the biggest names in AI research from 12 universities (University of Pennsylvania, Carnegie Mellon University, ETH Zurich, University of Colorado Boulder, Mila, Universite de Montreal, Ecole Polytechnique de Montreal, Harvard University, Mercator Research Institute on Global Commons and Climate Change, Technische Universität Berlin, Massachusetts Institute of Technology, Cornell University, and Stanford University) together with senior experts from DeepMind, Google AI, Microsoft Research and Element AI.  The collaborative endeavor covers possible machine-learning interventions in 13 domains, from electricity systems to farms and forests to climate prediction. Within each domain, it breaks out the contributions for various subdisciplines within machine learning, including computer vision, natural-language processing, and reinforcement learning. This resulting study represents a model of best practice in terms of working across disciplines and between public and private sectors. It should be replicated in other domains such as nature protection and pollution prevention. |

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| BOX 22 ***Modern digital administration – the German AI Application Lab for Sustainability Solutions***  Digitization enables us to think about issues in the context of socio-ecological sustainability in a completely new and different way. In order to take advantage of the emerging transformational momentum through digitization, environmental governance needs new structures, processes and competencies to effectively design in multicomplex and interdisciplinary subject areas. But administration can only shape what it also understands.  The aim of the German Environmental Agency’s AI Application Lab for Sustainability Solutions is to develop and consolidate AI methods as a standard tool in the sustainability transformation toolbox of the German administration and to research and demonstrate the sustainable use of the technology.  The AI Application Lab will analyze environmental data using AI to better identify complex relationships, or even to do so for the first time. It will address pressing issues with an eye toward sustainability research; and ultimately to better derive measures to protect people and the environment. |

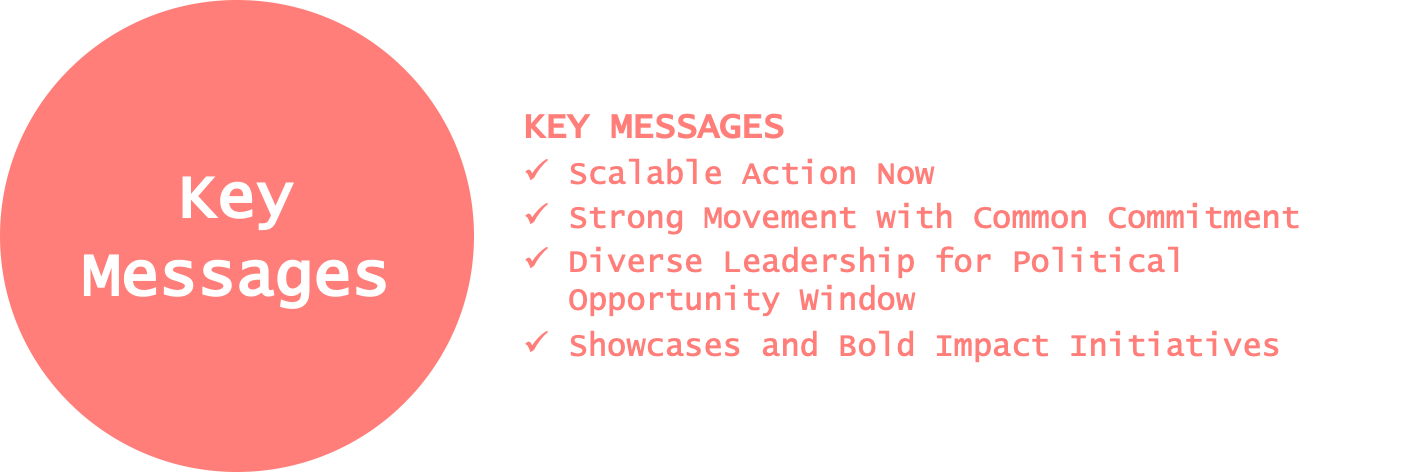
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| BOX 23 ***ARIES for SEEA Explorer: The first AI tool for rapid natural capital accounting***  Artificial Intelligence for Environment & Sustainability (ARIES), developed by researchers at the Basque Centre for Climate Change (BC3), is an integrated, open-source modeling platform for environmental sustainability, where researchers from across the globe can add their own data and models to web-based repositories.  Thanks to the use of artificial intelligence (AI) – specifically semantics and machine reasoning – ARIES automates data and model integration. A core component of ARIES is the use of a set of consistent, shared semantics, which comprise uniform and unambiguous definitions for the data and models involved, and the relationships between them. These semantics are constructed using an intuitive language readable by both people and computers. The ARIES technology automates model selection based on a user’s specific request (e.g., an ecosystem service assessment or condition account for a given country and year), matching the requested concepts to the most suitable models and data for the context of interest. The “most appropriate” models and data for the location, time span and spatiotemporal resolution specified are chosen among those provided by contributors to a communally curated, distributed network of participating institutions, and assembled to produce the best-in-class computation that answers the user’s query.  ARIES, UN DESA and UNEP recently produced a joint [interoperability strategy document](https://seea.un.org/sites/seea.un.org/files/seea_interoperability_strategy.pdf) and launched an easy-to-use application to harness data and AI tools for Ecosystem Accounting within the System of Environmental-Economic Accounting (SEEA) framework. This ground-breaking tool enables ecosystem account production anywhere on Earth, making it easier for countries to measure the contributions of nature to their economic prosperity and wellbeing. |

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| BOX 24 **United for Smart Sustainable Cities (U4SSC) initiative**  ​The “[United for Smart Sustainable Cities](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx)” (U4SSC) is a UN initiative coordinated by ITU, UNECE and UN-Habitat, and supported by CBD, ECLAC, FAO, UNDP, UNECA, UNESCO, UNEP, UNEP-FI, UNFCCC, UNIDO, UNOP, ​UNU-EGOV, UN-Women and WMO to achieve Sustainable Development Goal 11: "Make cities and human settlements inclusive, safe, resilient and sustainable".​  U4SSC is working on the following Thematic Groups:   * City Platforms * Lessons learned from building urban economic resilience at city level during and after COVID-19​ * Compendium of Practices on Innovative Financing for Smart Sustainable Cities Projects * Guiding principles for artificial intelligence in cities * Procurement Guidelines for Smart Sustainable Cities​ * ​Digital Transformation for People-Oriented Cities:   + WG1: Setting the Context: Digital Transformation for People-oriented Cities   + WG2: Policy Benchmarks for Digital Transformation for People-oriented Cities   + WG3: Digital Transformation Assessment for People-oriented Cities   + WG4: Guidelines for Unlocking Net Zero in Cities Through Sustainable Digital Transformation   + WG5: Methodology for Measurement of GHG Emissions in Smart Sustainable Cities   The U4SSC developed a set of [international key performance indicators (KPIs) for Smart Sustainable Cities (SSC)](https://www.itu.int/en/publications/Documents/tsb/2017-U4SSC-Collection-Methodology/index.html) to establish the criteria to evaluate ICT´s contributions in making cities smarter and more sustainable, and to provide cities with the means for self-assessments in order to achieve the sustainable development goals (SDGs). Over 150 cities worldwide are already implementing these KPIs. |

## **3. Conclusion: Next Steps and Commitments for Collective Action**

The preceding two sections of this Action Plan provide a guiding vision and a set of priorities and targets for a sustainable planet in the digital age. To achieve these goals, this section articulates critical commitments that key stakeholders throughout the digitization and sustainable development communities need to make.footer

### **3.1 Key messages**



Humanity's response to the two megatrends of digital and sustainability transformation will shape our collective future. How we connect these two challenges and use digital applications to shift values, behaviors and related incentive structures to drive sustainability will play a critical role in determining what kind of future emerges. We are standing at a pivotal moment in human history. Decisions we take today to address environmental change, sustainable futures and the governance of digital technology will set off a chain reaction that will determine the future trajectory of human evolution and life on this planet.

This CODES Action Plan is an initial step forward to address these collective challenges. It has identified **Three Shifts of Change** as essential to accelerating environmentally and socially sustainable development in the Digital Age: 1) aligning the digital age with sustainable development, 2) ensuring sustainable digitalization to mitigate negative environmental and social impacts, and 3) directing innovation efforts toward digital sustainability.

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

* **Scalable Action Now**: We urgently need to turn the tide, strongly develop all three shifts in parallel and scale our efforts on our path towards a sustainable planet in the digital age. The world needs heavy intellectual, financial, political and practical involvement as soon and as boldly as possible to provide the 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 sustainable digitization and digital transformation initiatives in different sectors. This network is already growing fast, 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, private sector, business and financial sector, and civil society to ensure that digitization is used to promote a sustainable planet. Digitalization is not a sector, and shaping it sustainably is a task for all. We face a unique political window of opportunity on the global level: the vision outlined in this action plan must be systematically integrated into the Stockholm+50 process in 2022, the Summit of the Future in 2023 and the processes leading to the important Global Digital Compact in 2024. Other global fora and governance frameworks for digital transformation, sustainability, and environmental management should also engage with the tasks layd out in this Action Plan, e.g. the Rio Conventions or the IGF.
* **Showcases and Bold Impact Initiatives**: We need to invest in a diverse series of digital sustainability impact initiatives at all policy levels and scales - all around the world. Exploring and showcasing such ‘innovations with purpose’ on-site is essential to catalyze the three shifts and take forward various strategic priorities in a stepwise and applied manner. These impact initiatives should be designed to further inspire and elevate existing work, improve strategic coordination and collaboration and get into a new mode of productive creation.
* **Exploring new forms of digitalisation that place people and planet at the centre**: We need to explore and foster alternative visions of digitalisation that can help to question growth-depending systems of production and consumption and enable new ways of collaborating in the global economy and living together within planetary boundaries .
* Education is essential!!! Technology and proper environmental management are the keys to building a more sustainable world. Technology is an essential tool, along with proper executive management, to strike the necessary balance in corporate social responsibility.

### **3.2 Next steps for digital sustainability impact initiatives**



The CODES community has collectively identified the following impact initiatives that are needed to catalyze the three shifts and take forward various strategic priorities.

CODES will contribute to catalyzing these initiatives in four main ways:

1. by convening and connecting a global community of common purpose to advance these shifts;
2. by catalyzing collective action, enabling policies and systemic transformations towards all 18 strategic priorities;
3. by coordinating and promoting activities to ensure that the impact initiatives are progressed concurrently;
4. by fostering and demonstrating political leadership in advocating and realizing actions.

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| **Shift 1: Enable**  Aligning vision, values, and objectives of the digital age with sustainable development. | | |
| **Impact Initiative** | **Timeline** | **Relevant Actor** |
| 1. **World Commission on Sustainability in the Digital Age:** Under the aegis of the United Nations, convene a high-level multistakeholder Global Commission on Sustainability in the Digital Age. The commission would explore the key enabling policies, standards, infrastructure and governance frameworks needed to harness digital technologies to accelerate sustainability. The commission would provide a set of recommendations that could inform a UN or UNEA Declaration on Digital Sustainability as well as the planned Global Digital Compact or new international convention. | 2022  World Commission  2023  UN/UNEA Declaration  2024  Global Digital Compact | UN Tech Envoy with CODES |
| 1. **Digital Public Good Data for Sustainability:** A coalition of public and private sector organizations as well as academic and civil society entities is needed to enable the development of a global system of interoperable environment and climate data using best available digital technologies. Cross-Industry and sector data partnerships to be established for joint initiatives that advance access and governance to sustainability data as digital public goods through APIs and global standards. Such a network of data will be the base of green financing mechanisms, risk management, decision making and digital nudging. Multilevel frameworks and standards will be in need. | 2022  Global Principles  2023  Operationalize principles in APIs and cloud infrastructure  2024  Digital Ecosystem of Sustainability Data | Digital Public Goods Alliance  UNDP  UNEP  CODATA  High-level advisory body on global public goods  ITU |
| 1. **Clearing House for Global Standards on Digital Sustainability:** A digital platform and “clearing house” is needed to aggregate and coordinate key standards for digital sustainability developed by a range of actors. This would help build awareness on existing standards, improve coordination, identify gaps and improve implementation and compliance. Key gaps should be identified and work on standards to underpin a circular economy, including the use of digital product passports should be accelerated. | 2022  Clearing house platform for existing standards  2023  Consolidate standards around circular economy  2024  Capacity building programmes | ITU  IEEE  ISO  IETF  OECD |
| 1. **Education for Sustainable Development in the Digital Age Initiative:** A new international programme is needed to enhance digital sustainability skill sets and actively interconnect digital and sustainability communities among all stakeholder groups. Building up a common curriculum, global science initiative and research agenda, exchange among policy makers. An initial focus could include modules on how digital technologies can support decarbonization, dematerialization, detoxification goals within a sustainable circular economy. The initial target audience should include public sector actors, civil society and entrepreneurs.   ESG (ENVIRONMENTAL, SOCIAL, GOVERNANCE)!!!! | 2022  Adoption of curriculum outline  2023  Development of open source modules  2024  Integration across relevant training programmes | UNESCO, Future Earth, ISC, UNEP, GAIA  ITU, EO4GEO Alliance |

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| **Shift 2: Mitigate**  Ensure sustainable digitalization to mitigate negative environmental and social impacts | | |
| **Impact Initiative** | **Timeline** | **Lead Actors** |
| 1. **Sustainable Procurement Pledge for Digital Services and ICT:** All governments, civil society organizations and large private sector companies should adopt sustainable procurement pledge and enabling policies to buy and deploy sustainable digital services as well as Information and Communications Technologies (ICT). | 2022  Development of sustainable procurement principles  2023  Sustainable procurement operational framework  2024  Sustainable procurement compliance and reporting framework | Digital Nations  EU  UNEP  ITU  U4SSC  OECD  Green Electronics Council |
| 1. **Sustainable Digital Infrastructure Initiative:** Governments and digital infrastructure companies should adopt and implement sustainable digital infrastructure targets and policies to decarbonize, dematerialize and detoxify the digital backbone, including net-zero data centers and ICT supply chains. | 2022  Endorse the Roadmap for Sustainable Digital Infrastructure  2023  Implement strategic priorities of the roadmap  2024  Stocktake progress | UNFCCC Climate Champions  Digital Nations  Sustainable Digital Infrastructure Alliance |
| 1. **Sustainable Smart Livelihoods Project**: International organizations, national and regional governments, scientists, civil society and private actors should implement real-world laboratories for inclusive and sustainable urban and rural smart livelihoods that favors a whole-of-society approach. Applied regional solutions should be developed, e.g. for construction and housing, regionally embedded circular economy, infrastructures for mobility, transport and energy supply, that close digital divides. | 2022  Formulation  2023  Implementation  2024  Stocktake progress | UNDP Accelerator Labs  ITU  World Bank  Bauhaus of the Earth |

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| **Shift 3: Innovate**  **Directing innovation efforts toward digital sustainability** | | |
| **Impact Initiative** | **Timeline** | **Lead actor** |
| 1. **Sustainability cloud infrastructures to support science-based sustainability targets:** Governments to establish further incentives and regulations for businesses to adopt transparent science-based targets for their sustainability and net-zero goals. Governments should also begin to require sustainability cloud infrastructure that enables monitoring, reporting and verification (MRV) of their targets across their supply chains, including scopes 1,2, and 3. Cloud-infrastructure can drive data driven process optimizations with the view to drive decarbonization, dematerialization and detoxification across their value chains. | 2022  Science-based targets transparently adopted by 100 largest companies by market capitalization  2023  Standard cloud services offered to MRV of targets  2024  Automated monitoring of progress | Digital Nations  ITU  Science-based Targets Initiative  Cloud companies  Digital With Purpose |
| 1. **“Sustainability by design” standards and guidelines for digital platforms:** Governments and digital platforms to consider how they can collaborate to enable and empower consumers to adopt more sustainable lifestyles and behaviors using various forms of behavioral science and green digital nudging on e-commerce platforms, social media and online gaming. In particular, how can these platforms be used to achieve national sustainability goals and reflect sustainability regulations in the user experiences and underlying algorithms. How can sustainability be incorporated by design into the user experiences of these platforms. Information on the environment and climate footprint of products and services should be based on international standards or third party certificates. Nudging frameworks should be based on international ethical principles with due consideration due individual data privacy. | 2022  Definition and draft guidelines  2023  Pledging framework to implement guidelines  2024  Monitoring compliance with framework | UN  ITU  Every Action Counts Coalition  Green Digital Finance Alliance |
| 1. **Intergovernmental Platform on a Sustainable Digital Age:** Inclusive scientifically driven transnational assessment process that provides: i. transparency on the ecological and social footprint of digital goods across the value chain and ii. Establishment of a forward-looking impact assessment on environmental, societal, economic and human impact of digital change. Establish a governance framework based on lessons learned from similar initiatives such as IPBES and the IPCC. | 2022  Formation of Platform and TOR  2023  Development of enhanced assessment methodology  2024  Publication of first flagship report | International Resource Panel  ITU  Rio Conventions |
| 1. **Digital Sustainability Innovation Hubs and Accelerators:** Based on a Global Horizon Scanning Process, a regional network of Innovation Hubs would identify and help accelerate digital sustainability innovations in a co-creative manner. It would include entrepreneurs, engineers, scientists, policy makers and practitioners offering real-world laboratories and scaling opportunities for digital sustainability solutions on the ground. | 2022  Network of Innovation hubs ãnd Accelerators created  2023  % of Innovation proposals brought to market  2024  % of innovation proposals successful scaled | UNEP, UNDP,  UNICEF  World Bank  D4D Hubs  ITU |
| 1. **Global and National Funds and Acceleration Programs on Digital Innovations for Sustainability:** Provide public finance and incentives to stimulate green digital solutions and transformation innovations that accelerate decarbonisation, dematerialization and detoxification of key economic sectors. Initial focus should be on using smart energy access and networks, food commodity transparency and precision farming, smart transport and buildings which contribute to green job creation. | 2022  At least 1 trillion dollars of public innovation funds for digital sainability made available  2023  Breakthrough innovation initiatives launches  2024  Exponential impact identified | World Bank EU  BMZ  USAID  UNDP |

## **Annex I: Entry Points for Strategic Shift 1**

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| **Enabler 1.1: Connect communities and transformations** |
| **Entry points for action:**  **Government:**   * Organize and support national platforms for exchange and collaboration of stakeholders in the field of sustainability and digital transformation.   **Corporations and Finance:**   * Take a globalized view to investing in, scaling, and merging green technology innovations by actively seeking and capturing new, low-carbon business opportunities * Collaborate with the governments to define how the required short and long-term financing will be mobilized to implement climate objectives and facilitate a country’s transition to a low-carbon, climate-resilient economy   **Civil Society:**   * Expand and promote interdisciplinarity in scientific efforts for sustainable and equitable AI and digital technologies   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Secretary General’s Digital Cooperation Roadmap](https://www.un.org/techenvoy/content/roadmap-digital-cooperation) and the [Coalition for Digital Environmental Sustainability (CODES)](http://www.sparkblue.org/CODES) should continue to convene key stakeholders from across the digital transformation and sustainability sectors to forge collaboration and a common vision * [The UN Environmental Assembly (UNEA)](https://www.unep.org/environmentassembly/) should consider adopting a resolution or declaration on key principles for digital sustainability based on an inclusive multi-stakeholder process. * [The International Telecommunications Union (ITU)](https://www.itu.int/en/ITU-T/Pages/default.aspx) should continue to support governments, the ICT sector, in the development of international standards on sustainability and digital transformation. * [The Internet Governance Forum (IGF)](https://www.intgovforum.org/multilingual/) should continue to support the nascent Policy Network on Environment (PNE) to recommend principles on digital governance and sustainability using a multi-stakeholder engagement process. * [UN Environmental Management Group (EMG)](https://unemg.org/) should establish a working group on digital transformation and sustainability with a view to making recommendations on a common UN-wide policy on mitigating risks and harnessing opportunities * [United 4 Smart Sustainable Cities (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) should continue supporting cities and communities with the development of guidelines to encourage the use of ICTs to facilitate and ease the transition to smart sustainable cities. |
| **Enabler 1.2: Build digital competencies** |
| **Entry points for action:**  **Government:**   * National ministries should build up their own in-house digital transformation competencies and corresponding strategies, especially within ministries on environment, energy, sustainable development and nature. * States should promote digital and sustainability skills in all areas of training and further education.   **Corporations and Finance:**   * Invest in the development of education and training programmes on digital sustainability, especially through mechanisms such as the Intl. Day of Women and girls in Science Assembly and its folloup work.   **Civil Society:**   * Demand increased access to digital literacy and be actively engaged in development of this concept   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Atingi Digital4Sustainability Learning Programme](https://digital4sustainability.atingi.org/climate/) should progressively build out open source training modules on the different thematic areas linked to digital transformation and sustainability. Priority should be given to addressing risks and opportunities for climate action, nature protection and pollution prevention. * [Principles for Digital Development Training Programme](https://digitalprinciples.course.tc/) should continue to be used as core training for digital development and be expanded to include environmental sustainability considerations. * ICLEI Europe: [AI4 Cities](https://ai4cities.eu/) increase outreach efforts to relevant stakeholder groups * [ISC’s CODATA: Data skills programme](https://codata.org/initiatives/data-skills/) for researchers, information professionals, policy makers and citizens increase outreach efforts to relevant stakeholder groups * [IEEE’s Course on Digital Transformation: Moving Toward a Digital Society](https://iln.ieee.org/Public/ContentDetails.aspx?id=4093474F47674264B88AAED1E67C7061) should be reviewed to ensure sufficient content is included on the environmental dimensions of digital transformation * [Open HPI: Clean-IT: Towards Sustainable Digital Technologies](https://open.hpi.de/courses/cleanit2021) increase outreach efforts to relevant stakeholder groups * [Open SAP: Helping Business Thrive in a Circular Economy](https://open.sap.com/courses/ce1)increase outreach efforts to relevant stakeholder groups * [UN Innovation Network](https://www.uninnovation.network/) - increase investments in UN-system wide training on the opportunities and risks of digital transformation for the Sustainable Development Goals. * [Giga - Connecting every school to the internet](https://gigaconnect.org/) * The [EO4GEO Alliance](http://www.eo4geo.eu/) aims to help bridging the skills gap between supply and demand of education and training in the Earth Observation and the Geospatial sector stimulating a more integrated approach on skills development across different value chains and enhancing the inclusion/recognition of these applications' value in everyday aspects of life. |
| **Enabler 1.3: Harness science and systems thinking** |
| **Entry points for action:**  **Government:**   * Implement a global assessment process on the opportunities and risks for sustainable development and a circular economy in the digital age.   **Corporations and Finance:**   * Align business, portfolios, and strategy with the objectives of the Paris Agreement consistent with achieving a global target of net-zero emissions by 2050   **Civil Society:**   * Implement global and national research programmes and university curricula on sustainability in the digital age, with particular emphasis on development of grammar school, high school and college-level curricula aimed at promoting more girls in science and women in post-graduate work.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [International Resource Panel’s workstream on “Sustainable Trade in Resources: Global Material Flows, Circularity and Trade”](https://www.unep.org/resources/publication/sustainable-trade-resources-global-material-flows-circularity-and-trade) should conduct a global assessment process on the opportunities and risks for sustainable development and a circular economy in the digital age. * [UNEP’s Global Environmental Outlook](https://www.unep.org/global-environment-outlook) process for the 7th report should begin to include digital transformation as both a risk and opportunity to achieve global environmental goals. * [Future Earth](https://futureearth.org/) to continue expanding multi-stakeholder efforts on [Sustainability in the Digital Age](https://sustainabilitydigitalage.org/) and on advancing the [Montreal Statement on Sustainability in the Digital Age](https://sustainabilitydigitalage.org/montreal-statement/) * [Digitalization for Sustainability – Science in Dialogue” (D4S)](https://digitalization-for-sustainability.com/) to develop frameworks for systems analysis and the implications of digital transformation * SEI SDG Synergies Platform - https://www.sdgsynergies.org/ |
| **Enabler 1.4 Advance Multilateral Action** |
| **Entry points for action**  **Government:**   * Promote and pursue decentralized, agile, and collaborative governance to improve delivery of sustainable public services; and enable comprehensive and inclusive public participation in leveraging digital innovations * Initiate new Frameworks that progress global cooperation on advancing digital sustainability and norm diffusion through transnational governance   **Corporations and Finance:**   * Advocate, advance and collaborate on integrated sustainability centered policymaking across borders, sectors, and SDGs to account for the design, development, and deployment of digital technology   **Civil Society:**   * Undertake purchasing practices that, within individual limits and capacities, favor sustainability   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [European Council Conclusions on Digitalization for the Benefit of the Environment](https://www.consilium.europa.eu/en/press/press-releases/2020/12/17/digitalisation-for-the-benefit-of-the-environment-council-approves-conclusions/) * [OECD Mission Oriented Innovation Lab](https://oecd-opsi.org/projects/mission-oriented-innovation/) * [Digital4Development Hub](https://toolkit-digitalisierung.de/en/partners/multilateral/d4d-hub/) * [BMZ Digital Transformation Centers](https://toolkit-digitalisierung.de/en/projects/digital-transformation-centers/) * [The Dialogue on Global Digital Finance Governance](https://sdgfinance.undp.org/digital-finance) * [Coalition for Digital Environmental Sustainability (CODES)](http://www.sparkblue.org/CODES) * [Ubunt](https://explore.ubuntoo.com/)oo [- environmental solutions platform](https://explore.ubuntoo.com/) * [Climate Technology Centre and Network (CTCN)](https://www.ctc-n.org/) * [UNDP Accelerator Labs](https://acceleratorlabs.undp.org/) * [The International Telecommunications Union](https://www.itu.int/en/ITU-T/Pages/default.aspx) * [United 4 Smart Sustainable Cities (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) * [Digital Public Goods Alliance](https://digitalpublicgoods.net/) * UNFCCC’s multiple initiatives including Climate champions, Race to Zero, Resilience Frontiers and the Innovation Hub * ICC’s SME climate hub   Trase.earth |
| **Enabler 1.5: Build agile frontrunner coalitions** |
| **Entry points for action:**  **Government:**   * Promote and pursue decentralized, agile, and collaborative governance to improve delivery of sustainable public services; and enable comprehensive and inclusive public participation in leveraging digital innovations   **Corporations and Finance:**   * Collaborate with the governments to define how the required short and long-term financing will be mobilized to implement climate objectives and facilitate a country’s transition to a low-carbon, climate-resilient economy * Align investment agendas with climate-conscious investors   **Civil Society:**   * Seek and establish synergic relationships with citizens, governance, and private sectors through digital infrastructure   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Digital With Purpose](https://digitalwithpurpose.org) movement * [Every Actions Counts Coalition](https://greendigitalfinancealliance.org/initiatives-publications/eac-coalition/) * [Green Digital Finance Alliance](https://greendigitalfinancealliance.org/) * [Sustainable Digital Infrastructure Alliance](https://sdialliance.org/) * [Green Software Foundation](https://greensoftware.foundation/) * [Global Enabling Sustainability Initiative](https://gesi.org/) * [International Society for Digital Earth](http://www.digitalearth-isde.org/) * [Digital Future Society](https://digitalfuturesociety.com/about-us/) * [The GovLab](https://thegovlab.org/) * UNFCCC Race to Zero * Exponential roadmap initiative * The Future Society * Climate Chain Coalition * UN Innovation Network * [Icebreaker One](https://icebreakerone.org/) |
| **Enabler 1.6: Adopt norms and standards** |
| **Entry points for action:**  **Government:**   * Increase investments in global standards for digital cooperation and sustainability * Advance new global Digital commons perspective on data governance with a focus on global sustainability, transnational fairness, and justice   **Corporations and Finance:**   * Adopt global digital interoperability and accounting frameworks for carbon accounting * Standardize and simplify sustainability reporting so statistical analysis and benchmarking are possible including setting precise criteria for ESG definitions and taxonomy   **Civil Society:**   * Demand standardized digital information about the environmental and carbon performance of products and services in order to align spending decisions with sustainability values * Exert pressure as shareholders, employees, and consumers to demand standardized digital information about the environmental and carbon performance of products and services in order to align spending decisions with sustainability values   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [The International Telecommunications Union (ITU) Standardization Sector](https://www.itu.int/en/ITU-T/Pages/default.aspx) (ITU-T) and other organizations such as ISO, IETF, IEEE should continue to play lead roles in the development and coordination of international standards needed for digital sustainability. The process to develop such standards must be multi-stakeholder, globally representative and include further coordination. * [Principles for Digital Development](https://digitalprinciples.org/) should be expanded to include environmental sustainability considerations. * [Corporate Digital Responsibility](https://corporatedigitalresponsibility.net/) should be considered and/or adopted by companies as they undergo digital transformation processes. * [Certified B-Corporation requirements](https://bcorporation.net/certification/meet-the-requirements) should be augmented to consider digital sustainability opportunities in their assessment frameworks. * [Principles for Green Software Engineering](https://principles.green/) should continue to be refined and adopted as a foundation of principles for green software design. * [Science-based Targets Initiative](https://sciencebasedtargets.org/) should showcase digital technologies that can support monitoring, reporting and verification of environment and climate targets. * [The International Sustainability Standards Board (ISSB)](https://www.iasplus.com/en/news/2021/11/issb) should consider how ESG disclosures can be disclosed digitally. * [Digital With Purpose](https://digitalwithpurpose.org) movement should continue to be expanded with an international multi-stakeholder governance board and applicability for small and medium-sized enterprises (SMEs) * [The Internet Governance Forum (IGF)](https://www.intgovforum.org/multilingual/) should continue to support the nascent Policy Network on Environment (PNE) to recommend principles on digital governance and sustainability * [Coalition for Digital Environmental Sustainability (CODES)](http://www.sparkblue.org/CODES) can formulate a workstream to develop core principles on digital sustainability * [FAIR Data Principles](https://www.go-fair.org/fair-principles/) (Findable, Accessible, Interoperable, and Reusable) principles should continue to be refined and further operationalized. Expansion should include measures to assess data quality ([Q-FAIR](https://geospatialcommission.blog.gov.uk/2021/06/25/byte-ing-back-better-introducing-a-q-fair-approach-to-geospatial-data-improvement/)). * [CARE Principles for Indigenous Data Governance](https://www.gida-global.org/care) (Collective Benefit, Authority to Control, Responsibility and Ethics) should continue to be further refined and operationalized. * [Global Agreement on the Ethics of Artificial Intelligence](https://news.un.org/en/story/2021/11/1106612) should be used as an international normative foundation on the ethical application of AI on environment and social sustainability. * SME Climate Hub * SBTI SME Initiative |

## **Annex II: Entry Points for Strategic Shift 2**

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| **Problem 2.1: Energy and emissions** |
| **Entry points for action:**  **Government:**   * Enforce stricter regulations to encourage divestment from carbon heavy to low/no carbon energy and resource use   **Corporations and Finance:**   * Achieve full ESG transparency, accountability and disclosure across the entire value chain using digital technologies. * Enhance market transparency and facilitate the alignment of capital flows with low-carbon, climate-resilient energy, and resource efficient circular activities.   **Civil Society:**   * Inform and influence policy development through evidence-based research, data, and knowledge to inform the development of global norms and standards for digital sustainability, ensuring the inclusion of the voices of girls and women in science. * Demand equal pay for equal work done by men and women doing the same job.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * The International Telecommunication Union through its [ITU-T Study Group 5 on Environment, Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx) is responsible for studying design methodologies that reduce the adverse environmental effects of ICT through standardization, including e-waste and the circular economy. ITU-T SG5 is developing a series of standards on E-waste and circular economy, power feeding and energy storage, energy efficiency, smart energy and green data centres, assessment methodologies of ICTs and CO2 trajectories, adaptation to climate change, and low-cost sustainable infrastructure. * [ITU-T Focus Group on "Environmental Efficiency for Artificial Intelligence and other Emerging Technologies](https://www.itu.int/en/ITU-T/focusgroups/ai4ee/Pages/default.aspx) is analyzing the relationship between emerging digital technologies and environmental efficiency to benchmark best practices and provide a basis for new ITU standards. The Focus Group is developing a set of output reports aiming to address the environmental efficiency, as well as water and energy consumption of emerging digital technologies, and provide guidance to stakeholders on how to operate these technologies in a more environmentally efficient manner to meet the UN Sustainable Development Goals. * Sustainable Digital Infrastructure Alliance should continue to expand membership to the global level while implementing the [Roadmap to Sustainable Digital Infrastructure by 2030](https://sdialliance.org/roadmap). * [Digital With Purpose](https://digitalwithpurpose.org/) movement should continue to test ways to measure and quantify the net impact digital companies are having on specific sustainability goals and net zero outcomes. * [Playing for the Planet Alliance](https://playing4theplanet.org/) should upscale efforts to develop measures for calculating scope 1,2,3 emissions in the gaming sector. * [Digital Goes Green](https://www.digitalgoes.green/) to continue to develop an environmental impact assessment framework for digital services. * [Green 500](https://www.top500.org/lists/green500/2021/11/) * [ICT Pact](https://circularandfairictpact.com/) * [Carbon Call](https://carboncall.org/) * [Carbon Mark](https://ix.imperial.ac.uk/research-area/data-for-carbon-footprinting/): Using Machine Learning and Big Data to create a global, open-source, full life-cycle, carbon footprinting mechanism. * [RE100](https://www.there100.org/) * [GMSA](https://www.gsma.com/) * [EU Blockchain Observatory and Forum](https://www.eublockchainforum.eu/) * Exponential Roadmap Initiative - supply chain leaders * SME Climate Hub   Key principles, standards and guidelines relevant to this strategic priority include:   * [ITU-T SG5: Environment Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx)   + ITU-T L.1300-series Energy efficiency, smart energy and green data centers standards   + ITU-T L.1400-series: Assessment methodologies of ICTs and CO2 trajectories standards (for goods, networks, services, organizations, cities and sector levels) in particular ITU-T L.1410, ITU-T L.1420, ITU-T L.1470, ITU-T L.1471 * [Digital Nations - Sustainable Government Information Technology](https://www.leadingdigitalgovs.org/sustainable-government-it) * [One Planet Programme on Sustainable Public Procurement (SPP)](https://www.oneplanetnetwork.org/sustainable-public-procurement) * [EU Green Public Procurement guidebook](https://ec.europa.eu/environment/gpp/buying_handbook_en.htm) * [OECD green ICT assessments](https://www.oecd.org/sti/ieconomy/42825130.pdf) * [Carbon Impact of Video Streaming - Carbon Trust](https://prod-drupal-files.storage.googleapis.com/documents/resource/public/Carbon-impact-of-video-streaming.pdf): examining and validating methodologies to accurately measure the environmental impact of digital services. |
| **Problem 2.2: Materiality** |
| **Entry points for action:**  **Government:**   * Enforce stricter regulations that demand increased transparency on the ecological footprint of digital goods across the value chain .   **Corporations and Finance:**   * Achieve full ESG transparency, accountability and disclosure across the entire value chain using digital technologies. * Enhance market transparency and understanding of climate-related and environmental risks and opportunities in order to inform investment processes.   **Civil Society:**   * Demand standardized digital information about the social, environmental and carbon performance of products and services in order to align spending decisions with sustainability values.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [ITU-T Study Group 5: Environment, Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx) * [E-waste coalition](https://www.itu.int/en/ITU-D/Environment/Pages/Priority-Areas/E-waste-Coalition.aspx) * [Digital With Purpose](https://digitalwithpurpose.org/) * [Digital Goes Green](https://www.digitalgoes.green/mission/) * [Sustainable Digital Infrastructure Alliance](https://sdialliance.org/) * [Greensoftware Foundation](https://greensoftware.foundation/) * [Internet Engineering Task Force (IETF)](https://www.ietf.org/) * [Blue Angel – the German Ecolable](https://www.blauer-engel.de/en/productworld/server-and-data-storage-products) * [European Committee for Standardization (CEN)](https://www.cencenelec.eu/about-cen/) * [European Committee for Electrotechnical Standardization (CENELEC)](https://www.cencenelec.eu/about-cenelec/) * [Global Enabling Sustainability Initiative (GeSI)](https://www.gesi.org/) * [Science-based Targets Network (SBTN)](https://sciencebasedtargetsnetwork.org/) * [Responsible Business Alliance](http://www.responsiblebusiness.org/) * [ICT4S research community](https://conf.researchr.org/home/ict4s-2022) * [United for Smart Sustainable Cities](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx) (U4SSC)   Key principles, standards and guidelines relevant to this strategic priority include:   * [ITU-T SG5: Environment Climate Change and Circular Economy (standards on):](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx)   + ITU-T L.1000-series: E-waste and circular economy   + ITU-T L.1304: Procurement criteria for sustainable data centres   + ITU-T L.1400-series: Assessment methodologies of ICTs and CO2 trajectories standards (for goods, networks, services, organizations, cities and sector levels) - in particular ITU-T L.1410   + Ongoing work on Circular Economy and Green Procurement * [Digital Nations - Sustainable Government Information Technology](https://www.leadingdigitalgovs.org/sustainable-government-it) * [One Planet Programme on Sustainable Public Procurement (SPP)](https://www.oneplanetnetwork.org/sustainable-public-procurement) * [EU Green Public Procurement guidebook](https://ec.europa.eu/environment/gpp/buying_handbook_en.htm) * [OECD green ICT assessments](https://www.oecd.org/sti/ieconomy/42825130.pdf) * U4SSC Thematic Group on Procurement Guidelines for Smart Sustainable Cities. |
| **Problem 2.3: Consumption** |
| **Entry points for action:**  **Government:**   * Increase knowledge about the impact of consumption on the environment needs and deepen cooperation at different levels in society to enable more eco-smart consumption and lifestyles. This must be done through convening multilateral forums, public broadcasting services and encouraging environmental focus in the education systems. * Enforce regulations that encourage sustainable consumption patterns in the food, transport, and housing areas, for example, requiring country of origin labeling of meat and related products.   **Corporations and Finance:**   * Begin transition towards 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, green economy and a circular economy. * Harness the power of social influence to elicit pro-environmental consumer behaviors.   **Civil Society:**   * Undertake purchasing practices that, within individual limit, skills and capacities, favor sustainability. * Demand standardized digital information about the social, environmental and carbon performance of products and services in order to align spending decisions with sustainability values.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Digitalization for Sustainability – Science in Dialogue” (D4S)](https://digitalization-for-sustainability.com/) * [ICT4S research community](https://conf.researchr.org/home/ict4s-2022) * [Digital Goes Green](https://www.digitalgoes.green/) * [Audit AI](https://developer.nvidia.com/blog/nvidia-research-auditing-ai-models-for-verified-deployment-under-semantic-specifications/) * [Further development of comparative methods such as the Content Thematic Component Differentiation](https://www.mdpi.com/2071-1050/13/13/7215/pdf) * [EU Ethics guidelines for trustworthy AI](https://op.europa.eu/en/publication-detail/-/publication/d3988569-0434-11ea-8c1f-01aa75ed71a1) * [Network for Digital Economy and Environment (nDEE)](https://networkdee.org/) * [How Earth Observation benefits citizens (SEBs)](https://earsc.org/sebs/) * Global E-waste Statistics Partnership |
| **Problem 2.4: Misinformation** |
| **Entry points for action:**  **Government:**   * Eliminate or reduce the immunity granted to platform companies that treats them differently from any other media and specifically immunizes them from liabilities that apply to all these other entities. This includes liabilities for fraud, for defamation, and for violating contract terms. * Enact rules that require platforms sharing the information about the algorithms and their uses with a watchdog, whether academic or nonprofit organizations. * Enact regulations that hold platforms accountable when they publish and promote information from other news sources without due approvals and validation.   **Corporations and Finance:**   * Invest in technology to find and flag misinformation and identify it for users through algorithms and crowdsourcing.x * Weaken financial incentives and algorithmic amplification for misinformed content, especially false news and disinformation. * Strengthen online accountability through stronger real-name policies and enforcement against fake accounts.     **Civil Society:**   * Continue conducting research on the spread of misinformation combined with the social and political implications for sustainability. * Academic Institutions must enhance news literacy; learning how to evaluate news sources, not accept at face value all content that gets published on social media or digital news site.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Center for Human Technology](https://www.humanetech.com/) * [Center for Countering Digital Hate](https://www.counterhate.com/) * [Facebook Climate Science Center](https://www.facebook.com/climatescienceinfo) * [Google initiative on verified climate science](https://www.un.org/en/climatechange/google-search-information) * [Twitter initiative on authoritative climate information](https://www.washingtonpost.com/business/2021/11/01/twitter-climate-disinformation/) |
| **Problem 2.5: Digital divide** |
| **Entry points for action**:  **Government:**   * Increase investment in human-centered and sustainable digital and data infrastructure programs, to address digital divides: including but not limited to access, affordability, gender, income, rural-urban, and cultural divide. * Encourage the development of new social contracts premised on Digital Humanism - new framework and governance structures that protect people from digital authoritarianism. * Undertake the development of new transnational governance systems that regulate data control and access, and hold private and public actors accountable.   **Corporations and Finance:**   * Provide financing for, and invest in broadband infrastructure in low to no connectivity areas to ensure basic internet connectivity. * Work collaboratively with public entities and nonprofit leaders to build the tech-enabled systems and structures with a focus on improving digital literacy.   **Civil Society:**   * Citizens in areas with favored connectivity must advocate for equity in connectivity in less favored areas. * Advocate for the development and deployment of increased e-government tools in order to enhance e-readiness, encourage and educate the usage of ICT, and support the development of ICT skills in a non-discriminatory manner.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Partner Connect Digital Coalition](https://www.itu.int/en/mediacentre/Pages/PR-09-2021-P2C-Bridging-Digital-Divide.aspx) * [Digital Poverty Alliance](https://digitalpovertyalliance.org/) * [ITU / UNESCO Broadband Commission](https://www.broadbandcommission.org/) * [Giga - Connecting every school to the Internet](https://gigaconnect.org/) * [GMSA](https://www.gsma.com/)   Key principles, standards and guidelines relevant to this strategic priority include:   * [World Wide Web Foundation REACT policy framework on Digital Inclusion](https://webfoundation.org/react/) * [Work of the Roundtable on Global Connectivity within the Secretary General’s Digital Cooperation Roadmap](https://www.un.org/techenvoy/content/global-connectivity) |
| **Problem 2.6: Rights violations** |
| **Entry points for action:**  **Government:**   * Enforce stricter regulations that demand increased transparency on the human rights adherence in the end-to-end value chains associated with digital goods. * Enforce transnational agreements that ensure corporate accountability in meeting human rights in all jurisdictions of operations across national boundaries.   **Corporations and Finance:**   * Increase monitoring and reporting of rights violations across ICT supply chains. * Achieve full ESG transparency, accountability and disclosure across the entire value chain using digital technologies. * Lending organizations must publish guidelines on supervisory expectations in relation to approaches that borrowing organizations must take to enforce and protect human rights.   **Civil Society:**   * Connect the monitoring of human rights violations to potential drivers that originate in the digital sector.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Amnesty International](https://www.amnesty.org/en/) * [UN High Commissioner for Human Rights](https://www.ohchr.org/EN/pages/home.aspx) * [Global Witness](https://www.globalwitness.org/en/) * [Responsible Business Alliance (RBA)](http://www.responsiblebusiness.org/)   Key principles, standards and guidelines relevant to this strategic priority include:   * [GESI Good Practice Guide on Remedy Human Right Impacts](https://www.gesi.org/research/gesi-good-practice-guide-on-remedy-human-rights-impacts) * [UN Guiding Principles on Business and Human Rights](https://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf) * [Global Agreement on the Ethics of Artificial Intelligence](https://news.un.org/en/story/2021/11/1106612) * [OHCHR’s work on privacy in the digital age](https://www.ohchr.org/en/issues/digitalage/pages/digitalageindex.aspx) * [Work of the Roundtable on ensuring the protection of human rights in the digital era](https://www.un.org/techenvoy/content/digital-human-rights) |

## **Annex III: Entry Points for Strategic Shift 3**

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| **3.1 Innovation: Planetary digital twin** |
| **Entry points for action:**  **Government:**   * Promote global safeguards and governance for managing and leveraging data as digital public good. * Co-finance, alongside private organizations, initiatives that seek to improve compute requirements required to process the vast volumes of data, especially for real-time data processing scenarios. * Enforce adoption of data standards and safeguards, open APIs and communication protocols that enable safety, privacy, interoperability, transferability, and quality control of key data across disparate systems.   **Corporations and Finance:**   * Co-finance, alongside governments, in initiatives that seek to improve compute requirements required to process the vast volumes of data, especially for real-time data processing scenarios. * Adopt and progress open data principles that encourage integration of validated citizen science contributions and observations as well as other open-source tools and algorithms into the digital twin ecosystems. * Progress the 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.   **Civil Society:**   * Continue undertaking research to validating the socio-ethical value and the socio-ethical risks of emerging technologies like digital twins. * Advocate for responsible and socio-environmental values based development of digital twin technologies.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Destination Earth - Digital Twin of the Planet](https://digital-strategy.ec.europa.eu/en/policies/destination-earth) * [Big Earth Data Science Engineering Program (CASEarth)](http://english.casearth.com/) * [Global Environmental Data Strategy](https://wedocs.unep.org/bitstream/handle/20.500.11822/28486/K1901170.pdf?sequence=3&isAllowed=y) requested by UNEA 4/23 * UNEP’s [World Environment Situation Room](http://data.unep.org) * Various applications of open data cube technology including [Digital Earth Africa](https://www.digitalearthafrica.org/), [Digital Earth Pacific](https://www.spc.int/DigitalEarthPacific) * [Group on Earth Observations (GEO) work on Digital Earth](https://www.earthobservations.org/geo_blog_obs.php?id=329) * [Computational Sustainability](https://www.computational-sustainability.org/) * [International Society for Digital Earth](http://www.digitalearth-isde.org/) * [Sustainability in the Digital Age](https://sustainabilitydigitalage.org/) * [Joint Centre for Excellence in Environmental Intelligence](https://www.metoffice.gov.uk/research/approach/collaboration/joint-centre-for-excellence-in-environmental-intelligence) * [Alan Turing Institute Environment and Sustainability Interest Group](https://www.turing.ac.uk/research/interest-groups/environment-and-sustainability) * [Global Initiative on AI and Data Commons](https://www.itu.int/en/ITU-T/extcoop/ai-data-commons/Pages/default.aspx) * ​ [Working towards a digital twin on Earth](https://www.esa.int/Applications/Observing_the_Earth/Working_towards_a_Digital_Twin_of_Earth) * International Telecommunication Union   Cloud-based initiatives for sustainability modeling:   * [Artificial Intelligence for Environment & Sustainability (AIRES) to support the System of Environmental Economic Accounting (SEEA)](https://seea.un.org/content/aries-for-seea) * [Microsoft Planetary Computer](https://planetarycomputer.microsoft.com/) * [Google Earth Engine](https://earthengine.google.com/) * [Nvidia Omniverse platform for digital twinning and 3D simulations](https://developer.nvidia.com/nvidia-omniverse-platform) * [Amazon sustainability data initiative](https://sustainability.aboutamazon.com/environment/the-cloud/asdi) * [Salesforce sustainability cloud](https://www.salesforce.com/products/sustainability-cloud/overview/) * [Global Open Science Cloud Initiative](https://codata.org/initiatives/decadal-programme2/global-open-science-cloud/)   On Climate Change   * [Camda Data 2.0 working group](https://camda.global/) * [Climate TRACE](https://www.climatetrace.org/) * [Climate Chain Coalition](https://www.climatechaincoalition.io/) * [Climate Change AI](https://www.climatechange.ai/) * [Centre for AI & Climate](https://www.c-ai-c.org/) * [Climate Informatics](http://www.climateinformatics.org/) * [Icebreaker One](https://icebreakerone.org/) * [Data Driven Lab](https://datadrivenlab.org/)   On Nature and Biodiversity   * [UN Biodiversity Lab](https://unbiodiversitylab.org/) * [IPBES](https://ipbes.net/) * [Restor](https://restor.eco/) * [The Life Map](https://redlistrevival.org/) * [e-shape](https://e-shape.eu)   On Chemicals and Pollution   * [Global Partnership on Marine Litter (GPML)](https://www.gpmarinelitter.org/what-we-do/gpml-digital-platform)   Key principles, standards and guidelines relevant to this strategic priority include:   * [FAIR principles for scientific data](https://www.go-fair.org/fair-principles/) * [CARE Principles for Indigenous Data Governance](https://www.gida-global.org/care) * [ISC-CODATA’s Decadal Programme ‘Data for the Planet: making data work for cross-domain grand challenges’](https://codata.org/initiatives/decadal-programme2/) * [International Open Data Charter](https://opendatacharter.net/) * [Data Interoperability Collaborative](https://www.data4sdgs.org/initiatives/data-interoperability-collaborative) |
| **3.2 Sustainable circular economy and green economy** |
| **Entry points for action:**  **Government:**   * [International Resource Panel](https://www.resourcepanel.org/) should adopt a new track on digital transformation and a circular economy. * Countries should develop national circular economy action plans (e.g. like EUs CEAP). * Introduce a range of pilots for digital product passports.   **Corporations and Finance:**   * Use the process of digital transformation as an opportunity to rethink how business models can contribute to sustainability and how companies can achieve full environmental transparency and accountability across their entire value chain.   **Civil Society:**   * Undertake purchasing practices that, within individual limits and capacities, favor sustainability. * Demand standardized digital information about the social, environmental and carbon performance of products and services in order to align spending decisions with sustainability values.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [UNDP’s digital transformation initiative](https://digital.undp.org/content/digital/en/home/stories/three-pathways-undp-is-leveraging-digital-technology-to-achieve-.html) * [GIZ’s Innovation Challenge](https://beeline-challenges.com/detail/627/gizs-innovation-challenge-2021/) BMZ Digilab * [Greentech Alliance](https://www.greentech.earth/) * [Ellen Macarthur Foundation](https://ellenmacarthurfoundation.org/) * [European Green Digital Coalition](https://digital-strategy.ec.europa.eu/en/policies/european-green-digital-coalition) * [WEF 2030 Vision](https://www.weforum.org/projects/frontier-2030) * [Platform for Accelerating a Circular Economy (PACE)](https://pacecircular.org/) * [Circular Electronics Partnership (CEP)](https://www.wbcsd.org/Programs/Circular-Economy/News/Circular-Electronics-Partnership-CEP-The-first-private-sector-alliance-for-circular-electronics) * [Digital With Purpose](https://digitalwithpurpose.org/) * [ITU-T Study Group 5: Environment, Climate Change and Circular Economy](https://www.itu.int/en/ITU-T/studygroups/2017-2020/05/Pages/default.aspx) * [ITU Sustainability passport for digital products](https://www.itu.int/hub/2021/07/new-itu-standards-project-to-define-a-sustainability-passport-for-digital-products/) * [International Resource Panel’s workstream on “Sustainable Trade in Resources: Global Material Flows, Circularity and Trade”](https://www.unep.org/resources/publication/sustainable-trade-resources-global-material-flows-circularity-and-trade) * [Green Digital Finance Alliance](https://greendigitalfinancealliance.org/) * EU's regulations on sustainable finance * [UK Center for Greening Finance and Investment](https://www.ox.ac.uk/news/2021-02-15-uk-launches-new-oxford-led-research-centre-accelerate-greening-global-financial) * UNEP Finance Initiative * [Icebreaker One](http://icebreakerone.org/) * [UNFCCC Global Innovation Hub](https://unfccc.int/topics/un-climate-change-global-innovation-hub) * [Global E-waste Statistics Partnership](https://globalewaste.org/)   Key principles, standards and guidelines relevant to this strategic priority include:   * [GS1 Digital Link](https://www.gs1.org/standards/gs1-digital-link) * ITU-T L.1000-L1199 standards: set of standards that can form the basis for adopting a circular approach to digitalization. * [Green fintech taxonomy](https://greendigitalfinancealliance.org/a-green-fintech-taxonomy-and-data-landscaping/) * [Sustainability Passport for Digital Products](https://www.itu.int/en/myitu/News/2021/07/15/16/04/New-ITU-standards-project-to-define-a-sustainability-passport-for-digital-products) * [Planet Mark](https://www.planetmark.com/)   Sustainable procurement:   * [SAP Ariba - Procurement with Purpose](https://www.ariba.com/resources/library/library-pages/helping-the-world-run-better-with-sap-working-toward-equitable-society) * [Digital Nations - Sustainable Government Information Technology](https://www.leadingdigitalgovs.org/sustainable-government-it) * [One Planet Programme on Sustainable Public Procurement (SPP)](https://www.oneplanetnetwork.org/sustainable-public-procurement) * EU Green Public Procurement standards * U4SSC Thematic Group on Procurement Guidelines for Smart Sustainable Cities​ * ITU work on standards and guidelines on Green Procurement |
| **3.3 Sustainable consumption** |
| **Entry points for action:**  **Government:**   * Commit to a circular global economy, enhancing it through digital innovations and digital product passports that better monitor and trace resources and foster sustainable business models. * Actively promote more eco-smart consumption and lifestyles. The assignment would include various ways of 'nudging' consumers by encouraging and making it easier for them to choose the best alternatives from an environmental perspective. * Enact policies that encourage positive developments in the sharing economy. * Promote effective, independently certified ecolabelling schemes.   **Corporations and Finance:**   * Actively invest in process and product innovation that advances circularity. * Actively invest in digital applications that influence consumer purchasing behavior towards more sustainable products. * Scale-up private finance for circular projects through the development of new (local) green bond markets. * Facilitate private investment into domestic low-carbon and circular development through new green investment banks (strategic investment funds). * Consider new mechanisms to blend public finance with private investment to reduce risks and/or increase returns of green investments.   **Civil Society:**   * Undertake purchasing practices that, within individual limits and capacities, favor sustainability. * Demand standardized digital information about the social, environmental and carbon performance of products and services in order to align spending decisions with sustainability values.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Playing for the Planet Alliance](https://playing4theplanet.org/) * [Google Sustainability Choices - Green Apps](https://blog.google/outreach-initiatives/sustainability/sustainability-2021/) * [Amazon Climate Pledge Friendly Products](https://www.amazon.com/b?ie=UTF8&node=21221607011) * [Every Action Counts Coalition](https://greendigitalfinancealliance.org/initiatives-publications/eac-coalition/) * [SITRA Sustainable Lifestyles](https://www.sitra.fi/en/topics/sustainable-everyday-life/#what-is-it-about) * [Global E-waste Statistics Partnership](https://globalewaste.org/)   Key principles, standards and guidelines relevant to this strategic priority include:   * [Guidelines for sustainability information on e-commerce platforms](https://www.oneplanetnetwork.org/news-and-events/news/project-launch-guidelines-providing-product-sustainability-information-e) * [Consumers International - Digital Trust](https://www.consumersinternational.org/what-we-do/digital/) * [EU Digital Services Act](https://digital-strategy.ec.europa.eu/en/policies/digital-services-act-package) * [EU Digital Markets Act](https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/digital-markets-act-ensuring-fair-and-open-digital-markets_en) |
| **3.4 Knowledge commons** |
| **Entry points for action:**  **Government:**   * Increase investments in global standards for digital cooperation and sustainability. * Government can serve as an open-data provider, catalyst, user, and policy maker to create value and mitigate risks. Across all levels of government, millions of individual data records are collected, stored, and analyzed. By making these data available to enterprising companies and individuals, government can spurring private-sector innovation and increase transparency. * Public-sector leaders must validate and address data risks that can threaten individuals and organizations or undermine open-data initiatives.   **Corporations and Finance:**   * Collaborate with governments to progress a Global Digital commons perspective on data governance with a focus on global sustainability, transnational fairness, and justice. * Enact bold regulations in investment criteria that progress data commons and open data frameworks.   **Civil Society:**   * Continue to undertake research and knowledge share to develop and progress new open science standards and governance structures.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Global Open Science Cloud Initiative](https://codata.org/initiatives/decadal-programme2/global-open-science-cloud/) * International Standards Organization. * ITU should continue to produce a summary of [UN Activities on Artificial Intelligence (AI)](https://www.itu.int/pub/S-GEN-UNACT-2021) to share knowledge and best practice across the UN System. * UN systems should continue to invest in the [UN Innovation Network](https://www.uninnovation.network/), sharing best practices on digital transformation and sustainability. * Replicate good practices in terms of collaboration between academic and private sector experts in the development of research papers on applications of digital technology for sustainability, using the Climate AI[[101]](#footnote-102) paper as a model. * [United for Smart Sustainable Cities (U4SSC)](https://www.itu.int/en/ITU-T/ssc/united/Pages/default.aspx)   Key principles, standards and guidelines relevant to this strategic priority include:   * [UNESCO Recommendations on Open Science](https://en.unesco.org/science-sustai) * [FAIR principles for scientific data](https://www.go-fair.org/fair-principles/) (findability, accessibility, interoperability, reusability) * [Open Science guidelines](https://www.fosteropenscience.eu/foster-taxonomy/open-science-guidelines) * Systematic use of Digital Object Identifier for science research. * Public money and public data for public research and knowledge. |
| **3.5 Networked and Agile Governance Breakthroughs** |
| **Entry points for action:**  **Government:**   * Promote and pursue decentralized, agile, and collaborative governance to improve delivery of sustainable public services; and enable comprehensive and inclusive public participation in leveraging digital innovations. * Promote cooperation and global standards to enhance access to and use of data on sustainability data, and make these data digital public goods with comprehensive and universal access. * Enact bold regulations that progress climate friendly behaviors for all sections of the society. * Commit to a circular global economy, enhancing it through digital innovations and digital product passports that better monitor and trace resources and foster sustainable business models. * Invest in new digital mechanisms to support public participation in decision-making to crowd sourcing governance priorities and solutions from citizens.   **Corporations and Finance:**   * Promote digital sustainability and protect citizens’ digital rights, by embedding sustainability goals into the use of digital technologies. * Leverage digital tools and systems to facilitate monitoring and reporting of key KPIs. * Leverage digital tools and technologies to transition from a “do no harm’ framework towards a “do good” framework –single bottom line to a triple bottom line; a collective framework across corporations and sectors. * Take higher accountability for scope 2 and 3 emissions and strive for increased transparency and accountability across the value chain of products/services.   **Civil Society:**   * Advocate and champion for more participatory spaces to influence intergovernmental negotiations on sustainability.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * [Digital Nations - Leading Digital Governments](https://www.leadingdigitalgovs.org/) * [The GovLab](https://thegovlab.org/) * [Open Government Partnership: workstream on digital governance](https://www.opengovpartnership.org/policy-area/digital-governance/) * [European EPA Network](https://epanet.eea.europa.eu/) * [United Citizens Organization for Action for Climate Empowerment](https://www.glocha.org/united-citizens-organization-announcement-at-cop26/)   Key principles, standards and guidelines relevant to this strategic priority include:   * [Principles and Recommendations to align BigFintech governance with the SDGs](https://sdgfinance.undp.org/digital-finance/principles) * [UNEP’s Environmental Rule of Law Second Report for 2022](https://www.unep.org/resources/assessment/environmental-rule-law-first-global-report) |
| **3.6 Access revolution** |
| **Entry points for action:**  **Government:**   * Progress UN Roadmap for Access Revolution. * Enact policies and undertake national action against power imbalances and for digital inclusion. * Establish region specific digital equity offices. The offices would be responsible for publishing a Digital Equity Plan for the jurisdiction. * Collaborate with the private sector to advance digital infrastructure and digital public goods.   **Corporations and Finance:**   * Increase investments to foster local digital ecosystems, and establish multi-faceted partnerships that support open technology and infrastructure needs. * Increase investments to support access to micro-finance, access to open education as well as to develop and scale local business models for green digital jobs, products and services.   **Civil Society:**   * Inform and influence policy development through evidence-based research, data, and knowledge to inform the development of global norms and standards for digital public goods. * Advocate and champion for more participatory spaces to influence intergovernmental negotiations on sustainability.   Examples of multi-stakeholder and cross-cutting initiatives that can address this strategic priority:   * H[igh-Speed Access for All: Canada's Connectivity Strategy](https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00002.html) * [Cloud Based Public Health System](https://institute.global/advisory/oracle-hms-partnership) * [Digital Investment Toolkit](https://www.usaid.gov/sites/default/files/documents/15396/Digital_Investment_Review_Tool_Final_20191021.pdf) * [Digital Connectivity and Cybersecurity Partnership (DCCP)](https://www.usaid.gov/sites/default/files/documents/DAI-1098_DCCP_Factsheet-FINAL-web.pdf) * [Technology for Development](https://www.dfat.gov.au/publications/international-relations/international-cyber-engagement-strategy/aices/chapters/part_7_technology_for_development.html) * [Digital Public Goods Alliance](https://digitalpublicgoods.net/) * [Digital Impact Alliance](https://digitalimpactalliance.org/) * [Open Government Partnership](https://www.opengovpartnership.org/) * [Digital Poverty Alliance](https://digitalpovertyalliance.org)   Key principles, standards and guidelines relevant to this strategic priority include: |

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