Multi-year Expert Meeting on Enhancing the Enabling Economic Environment at All Levels in Support of Inclusive and Sustainable Development, and the Promotion of Economic Integration and Cooperation, seventh session

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Digital Economy Report

Shaping an environmentally sustainable and inclusive digital future

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UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

2024 Digital economy report

Shaping an environmentally sustainable and inclusive digital future

Pilar Fajarnes, Division on Technology and Logistics Multi-year Expert Meeting on Enhancing the Enabling Economic Environment at All Levels in Support of Inclusive and Sustainable Development, and the Promotion of Economic Integration and Cooperation 28 November 2024



Rapid growth of the digital economy calls for more attention to its environmental impact

Sources: Richardson et al. (2023), ITU (2023), IPCC (2023), Ookla (2024).

An "unequal ecological exchange" marks digitalization, limiting development gains

Unequal impacts of climate change Hotter countries face reduced output, while wealthier, cooler ones benefit Vulnerable populations hit harder. Marginalized groups suffer greater losses from extreme weather Negative impacts

from device production and waste often affect regions located far from the principal location of use Developing countries are less able to afford and harness digital technologies to mitigate environmental impacts

Divides in terms of development, environment and digitalization are interrelated and need to be addressed holistically

> Wide digital and e-commerce divides...

Uneven increases in e-commerce adoption across regions Share of population (aged 15+) shopping online, by regions and country groupings (in %)	
2017 2021	
World	24 39
Developed economies	54.6 61.6
Developing – Africa	4.1 6.6
Developing – Asia and Oceania	20.7 38.1
Developing – Latin America and the Caribbean	12 27
LDCs	2.4 5.8
SIDS	22.9 25.2
LLDCs	4.1 7.9

> Environmental impacts are generated along the entire digitalization life cycle

Environmental footprint of ICT

Production phase: Digitalization has a heavy material footprint

- Heavy reliance on raw materials, including minerals and metals, plastics, glass and ceramics
- Complexity of devices is increasing more elements from the periodic table used
 - Phones: 10 elements used in 1960, 27 in 1990 and 63 in 2021
- Challenge: low-carbon and digital technologies largely compete for the same minerals
 - Material resource extraction could increase 60% between 2020–2060
 - Demand for cobalt, graphite and lithium is expected to increase by 500% until 2050

High growth in ICT demand and Internet use pushes the material footprint

Average number of devices and connections per capita, by region, 2018 and 2023 2018 2023 World North America 13.4 5.6 Western Europe Central and Eastern Europe Latin America Asia-Pacific Middle East and Africa

Significant increase in devices per capita in

developed countries

Source: UN Trade and Development (UNCTAD) calculations based on Cisco. *Note:* Country groups are those of the source.

Source: UN Trade and Development (UNCTAD), based on Ericsson Mobility Visualizer. *Note:* Country groupings are as defined by the source.

Geopolitics may exacerbate digitalization's environmental footprint

- High geographic concentration of raw material reserves, extraction and processing
- For example, extraction in 2023:
 - Cobalt: 74% in the Democratic Republic of the Congo
 - Lithium: 72% in Australia and Chile
 - Manganese: 59% in Gabon and South Africa
- Most raw materials are exported for processing

Strategic interest in transition minerals are spurring new industrial policies in many countries

Risk of an expanded environmental footprint through hoarding and overcapacity

Source: UN Trade and Development (UNCTAD), based on OECD (2023a).

Resource-rich developing countries should benefit

Challenges Developing countries engage in low valueadded activities of the ICT value chain

- Risk of deeper commodity dependence
- Unequal ecological exchange
- Environmental and social concerns from mining

- Address trade and rent imbalances
- Regional cooperation for fairer negotiations, industrial policy and infrastructure development
- International cooperation for
 - Sustainable sourcing practices
 - Balancing stakeholder needs

Leverage rising mineral demand for development

- Diversification along the value chain
- Structural transformation

Use phase: Until recently, efficiency gains kept up with growth in demand for data centres

Sources: Masanet et al. (2020): Recalibrating global data center energy-use estimates. IEA (2020): Data centres and data transmission networks; Cisco (2018): Global Cloud Index; Cisco (2019): Visual Networking Index. Slide source: George Kamiya (IEA).

Use phase: Data centres have both global and local impacts

Data centres globally consume an estimated 460 TWh of electricity – similar to all of France's

Data centre energy consumption is expected to more than double by 2026

Pressure on local electricity grids is growing

Ireland: 18% of total electricity consumption

Singapore: 7%

Other local impacts

- Water use for cooling and energy generation
- Noise

Electricity use by 13 of the world's largest data centre operators more than doubled between 2018 and 2022

Annual electricity consumption by selected data centre operators, terawatt hours, 2018–2022

Source: UN Trade and Development (UNCTAD), based on company reports. *Note:* Other includes: Apple, Baidu, Chindata, GDS, Tencent, VNET.

Sources: IEA (2024), Ireland CSO (2023), Singapore MCI (2021).

> Data centres in developing countries

Africa

- Less than 1% of global capacity, 2/3 of which is in South Africa; other relevant countries include Kenya and Nigeria
- Electricity outages remain an obstacle
- **Growth drivers:** Rising Internet users and data sovereignty
- Electricity demand to rise from 1 to 5 TWh (2020–30)
- Market value may reach \$3 billion by 2025
- Opportunity to jointly develop grid and ICT infrastructure
- Spearhead integration of sustainability metrics in data centre development

Asia

- Market value may reach \$28 billion by 2024
- **Growth drivers**: Global cloud providers, social media, video streaming, e-commerce, banking
- **Main countries**: China, India, Singapore, Indonesia, Malaysia, and Thailand
- Drive towards sustainability policies for data centres to address emissions and concerns linked to tropical climate

Latin America and the Caribbean

- Around 30 data centres with 15–20 MW capacity
- **Main countries**: Brazil leads, followed by Chile, Colombia and Mexico
- Investments of \$9 billion expected (2021–2027)
- Hyperscale data centres under civil society pressure for cleaner operations
- Concerns over high water use
- Brazil: Initiative to study data centre development and renewable energy

Sources: Kadium Limited (2022), Africa Data Centres Association (2021), IEA (2022d); EcoBusiness Research (2020), Digital Centre (2021); Echeberría (2020).

Concluding observations on the use phase

- Impact should be assessed using multiple criteria
- Significant measurement challenges exist, including a lack of relevant data
- Electricity consumption by data centres expected to more than double by 2026
- More attention should be given to the water impact
- Effective global organization of data-centre capacity requires effective data governance frameworks
- As users we can reduce the impact by using smaller screens, keep devices longer and avoid data hoarding

End of life? Digitalization-related waste is growing, with uneven regional implications

Digitalization-related waste

Regional disparities are significant and mirror digital divides

Challenges in developing countries

- Limited recording and documenting of waste flows
- Lack of formal collection systems
- Only 1 in 4 have relevant waste management legislation
- Insufficient collection and recycling infrastructure

Source: UN Trade and Development calculations based on UNITAR-SCYCLE.

Solution Growth of digitalization-related waste is set to continue

Programmed obsolescence

(e.g., slowing smartphones, ink cartridges, phasing out software support, rapidly changing models)

Banned in

- France
- Quebec (Canada)

Civil society demands to address the situation

- Laws against planned obsolescence
- Minimum durability criteria
- Product lifetime labelling
- Affordable and accessible repairs
- Right-to-repair legislation
- Monitoring of trends in product lifetime and
- Consumer education and information

International trade in controlled e-waste and uncontrolled used equipment and e-waste

Disclaimer: the boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

Source: UNCTAD, based on Baldé et al. (2022).

The digitalization-related waste hierarchy of options for reducingenvironmental impact

Sustainability requires consumption in the digital economy to be rethought towards digital sufficiency

Aim to deliver human well-being within planetary boundaries

- High-income countries marked by overconsumption
- Digital divides persist in developing countries (in terms of access, affordability and use)
- Digitalization necessary for economic participation

Achieving sustainable digital sufficiency requires

- moderation of overconsumption
- allowing those not sufficiently connected to keep digitalizing for development

Source: UN Trade and Development, based on Wiedmann et al. (2020).

A digital economy that is circular by design can foster environmental sustainability

Source: UNCTAD, adapted from Deloitte (2023).

From waste to resource/value

Circularity principles Reduce Refuse Reuse Repair Recycle

Opportunities for developing countries

- Value addition and job creation by formalizing recycling and recovering
- Repair, refurbishing and second-hand markets may **reduce digital divides**
- Sustainable practices reduce resource
 use and waste
- Regional cooperation for processing facilities to create value

Shifting towards a circular digital economy for inclusive and sustainable development

developmen

Concluding observations on the end-of-life phase

- Digitalization-related waste expected to increase
- Current waste management practices are insufficient
- Most waste is generated in rich countries
- Shift to a circular digital economy needed to reduce waste
- Market for recycling, refurbished and second-hand electronics estimated to triple in coming decade
- Developing countries should be able to benefit from this shift
- Globally, coordinated response is needed

> A new policy mindset is required to address key challenges

Innovative approaches needed Embrace new business models and strategies that maximize digitalization's positive impacts while minimizing the negatives

Reduce consumption

to optimize scarce resource use without harming future generations

Cut carbon emissions

to prevent catastrophic climate change

Leverage digitalizationrelated waste to transform waste into opportunities for recovery, recycling and reuse within a circular economy

SDG 12 is particularly relevant

This goal points to the need to use the planet's scarce natural resources more responsibly, produce more sustainably

- Achieve the sustainable management and efficient use of natural resources (12.2)
- Achieve the environmentally sound management of chemicals and all wastes (12.4)
- Substantially reduce waste generation (12.5)
- Encourage companies, especially large and transnational ones, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (12.6)

- Promote public procurement practices that are sustainable (12.7)
- Ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles (12.8)
- Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production (12.a)

Addressing the double bind of developing countries

Developing countries bear the **brunt of the costs of digitalization**

- Raw material extraction
- Digitalization-related waste
- Climate vulnerability
- Digital divide

Developed countries capture most benefits

Common but differentiated responsibilities

Policy implications

Digitally-developed countries should

- take the main responsibity towards shifting to an inclusive and sustainable digital future
- **support** developing countries in building capacities to harness digitalization, in an environmentally sustainable manner

An integrated global approach to digitalization and the environment that works for people and the planet

Multilateral and cross-sector dialogue between digital and lowcarbon policy communities for international standards and policymaking

Multi-stakeholder partnerships

across governments, businesses and academia for stronger outcomes

Focus on environmental impact of digitalization's role in global environmental processes and vice versa

UN Trade and Development (UNCTAD) calls for

The international community to develop **inclusive and integrated approaches** that

- align digital and environmental policies at all levels and drives collective action
- track ICT sector's
 environmental footprint
 comprehensively

Bold action needed at national and international level

National level

Integrate digital, economic and environmental sustainability strategies

Focus on reducing GHG emissions, water use and waste by using digital solutions, while being mindful of digital footprint

International level

- Strategies and policies that recognize countries' diverse needs and priorities, recognizing opportunities especially for developing ones
- Development partners should reinforce support to low-income countries to strengthen capabilities for digitalization and sustainability

Relevant policy dialogues

Link between digitalization and the environment is getting recognized

We commit, by 2030, to:

Promote sustainability across the life cycle of digital technologies, including context-specific measures to increase resource efficiency and to conserve and sustainably use natural resources and that aim to ensure that digital infrastructure and equipment are sustainably designed to address environmental challenges in the context of sustainable development and efforts to eradicate poverty

Global Digital Compact 21 September 2024

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Together, we can harness the benefits of digitalization, while closing the digital divide and protecting our planet

António Guterres Secretary-General United Nations

For more information

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