UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

2024

Digital economy report

Shaping an environmentally sustainable and inclusive digital future

Digital Day, UNEP HQs, Nairobi

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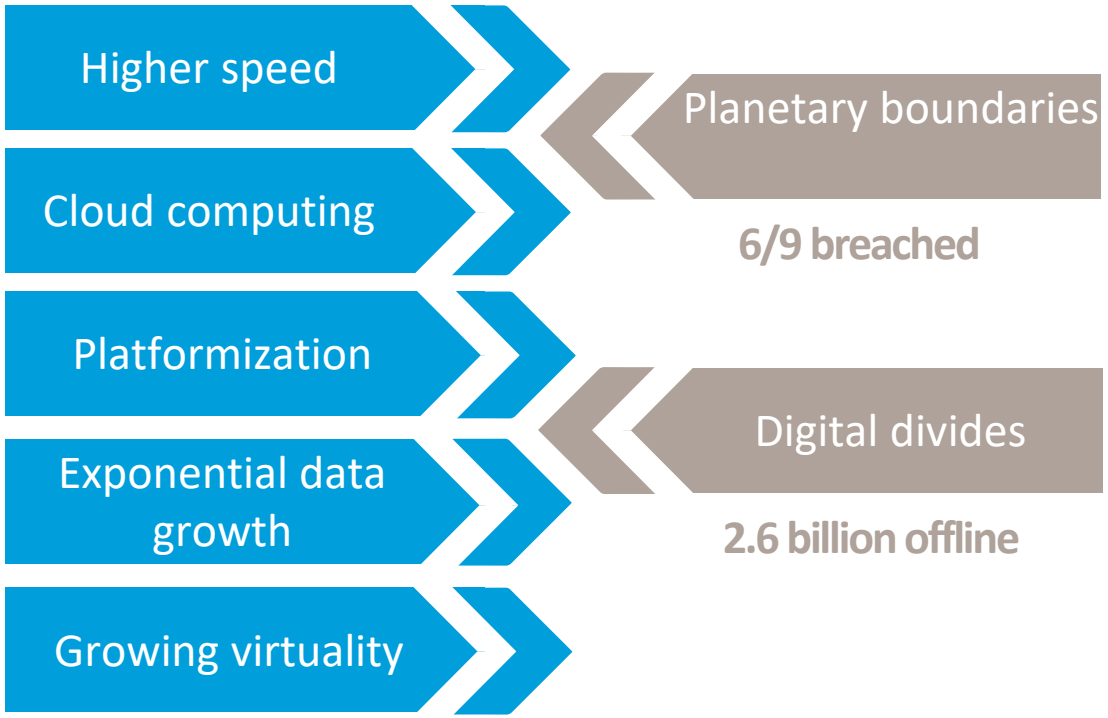
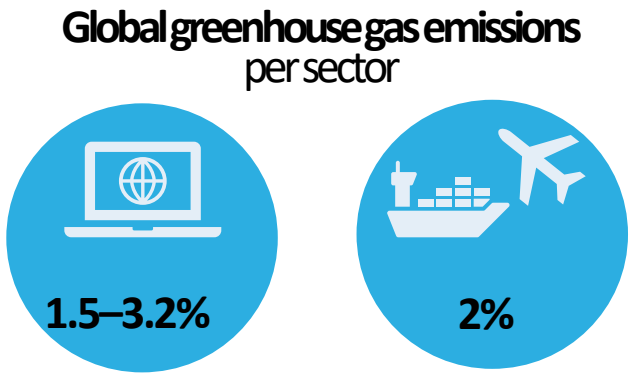
UN trade & development | UNCTAD | 60 years

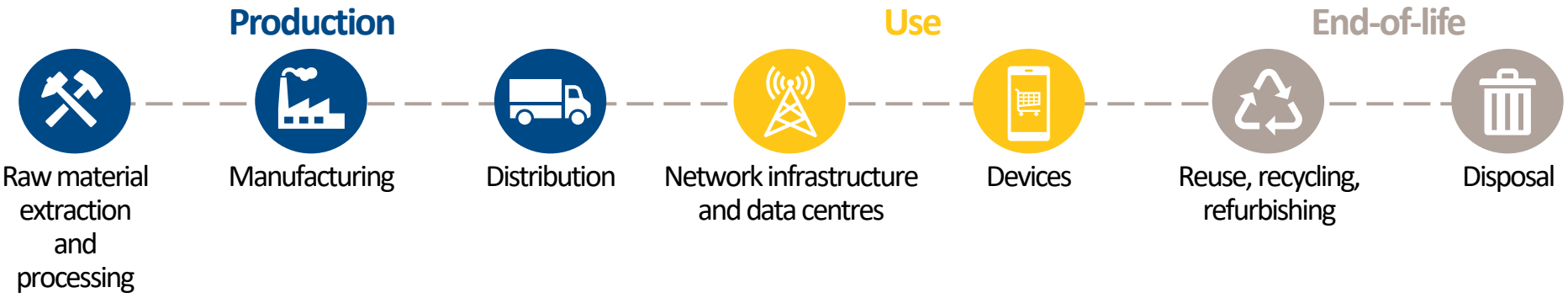
Rapid growth of the digital economy calls for more attention to its environmental impact





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

Environmental impacts are generated along the entire digitalization life cycle



Direct effects

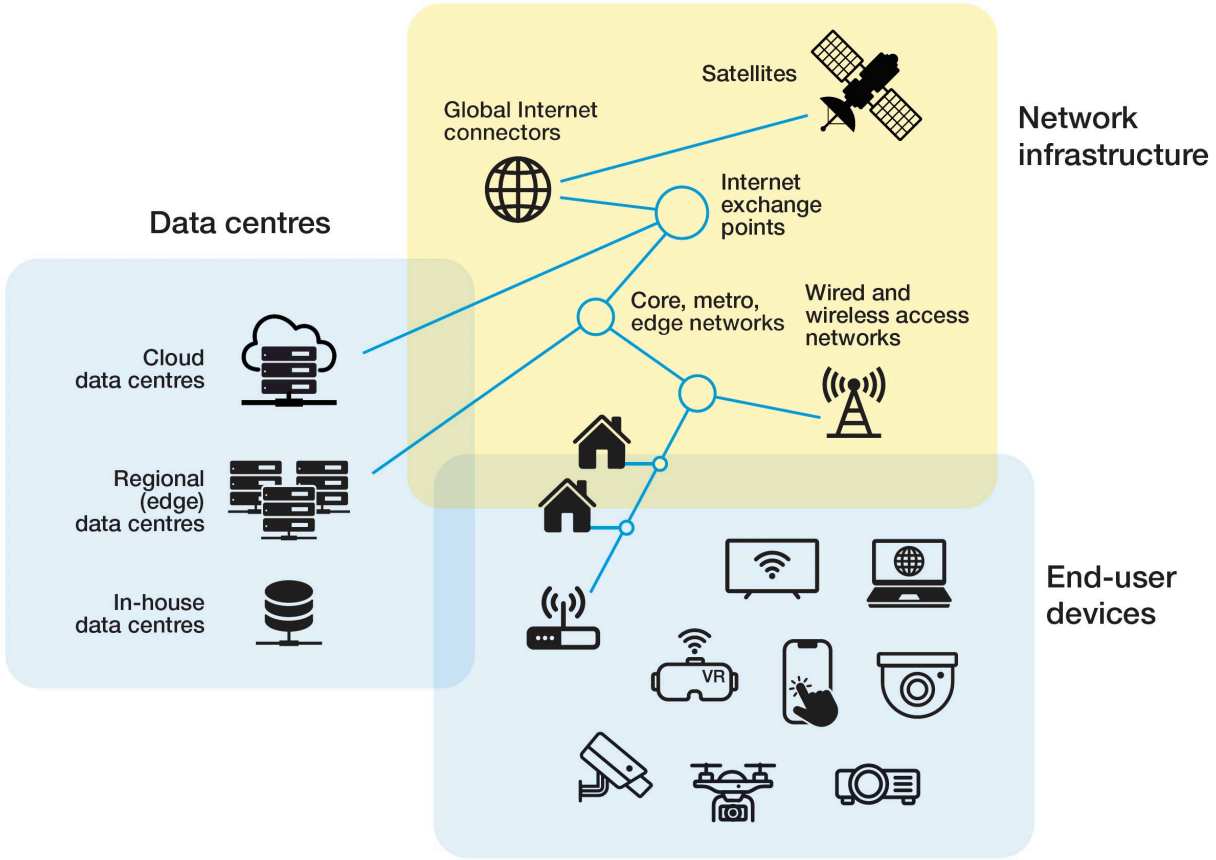
Natural resource depletion
Energy use
Water use
Greenhouse gas emissions
Pollution
...

Indirect effects

Optimization
Induced consumption
...

Environmental footprint of ICT

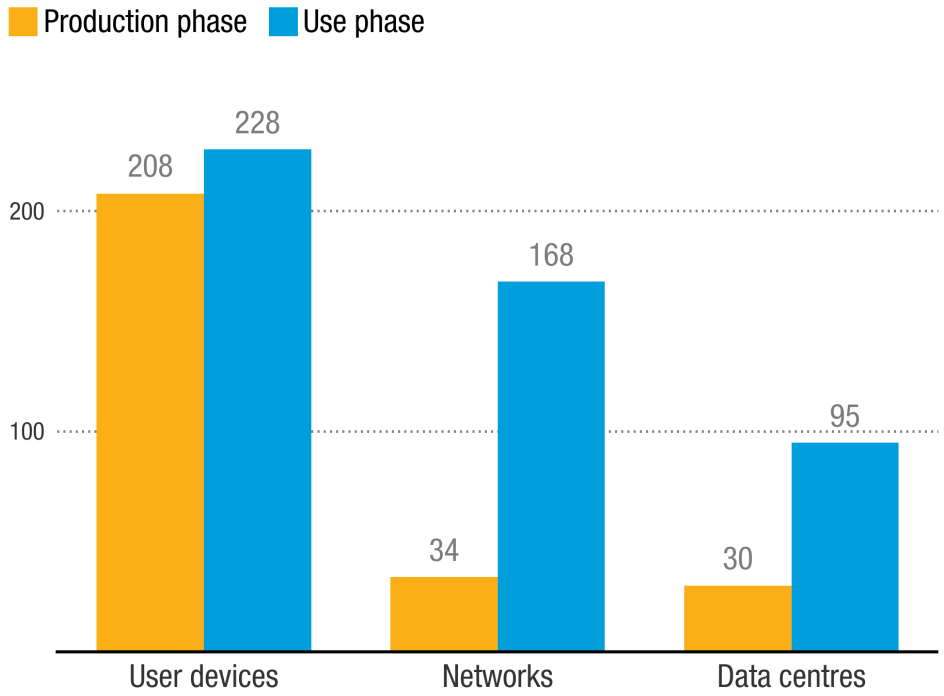
Environmental risks and opportunities vary for different components of the ICT sector



Source: UNCTAD, based on Pohl and Hinterholzer (2023).

Higher CO2 emissions from use phase across ICT infrastructure

Life-cycle greenhouse gas emissions, by ICT infrastructure type, megatons of CO2 equivalent emissions, 2020

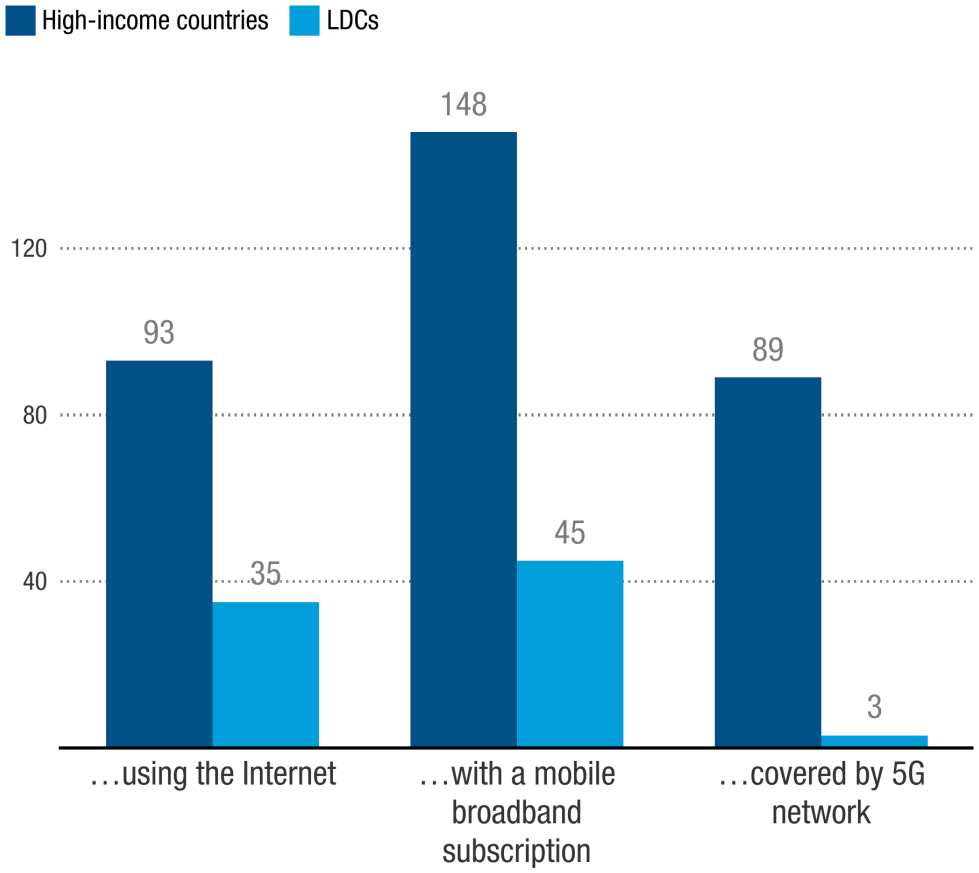


Source: UN Trade and Development (UNCTAD), based on Malmodin et al. (2024)

Gaping digital and e-commerce divides…

Access and use of the Internet varies significantly between country groupings: Share of people…

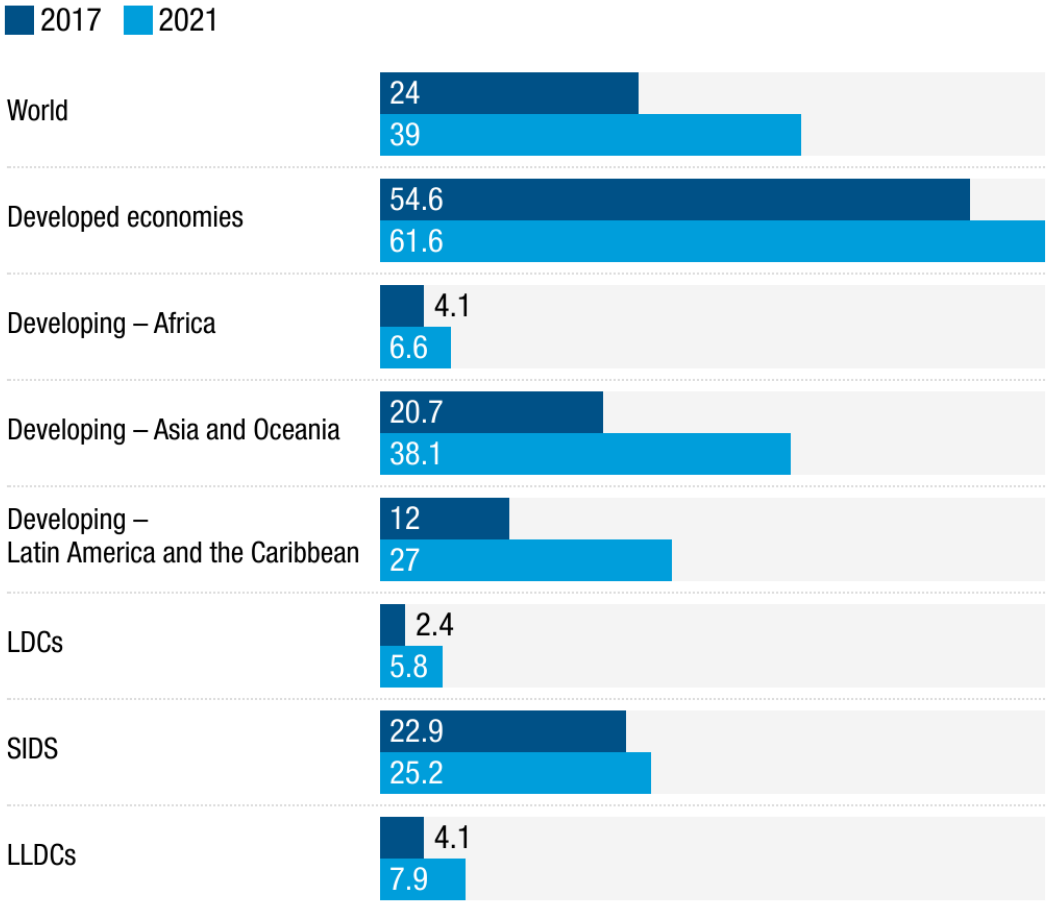
(in %)



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

Uneven increases in e-commerce adoption across regions

Share of population (aged 15+) shopping online, by regions and country groupings (in %)



Source: UN Trade and Development (UNCTAD), based on World Bank Global Findex 2021.

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

Sources: Justice et Paix (2019); Le Monde Diplomatique (2021); UNEP and IRP(2024); Hund et al./World Bank (2020).

Supply response pushes the mining frontier

Growing demand

- Both low-carbon and digital technologies require significant amounts of raw materials

New exploration

- Spurring **increased exploration** for new deposits
  - Global exploration budgets: +34% in 2021; +16% in 2022
  - But declining rates of discoveries of some critical minerals in recent years

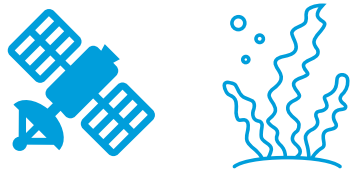
Development of new mines

- Sharp increase in **mine development**
  - Investments: +20% in 2021; +30% in 2022

Production

- Increasing supply pressures and extraction difficulties as ore grades decline
  - Less efficient and time lag in availability

New mining frontiers?



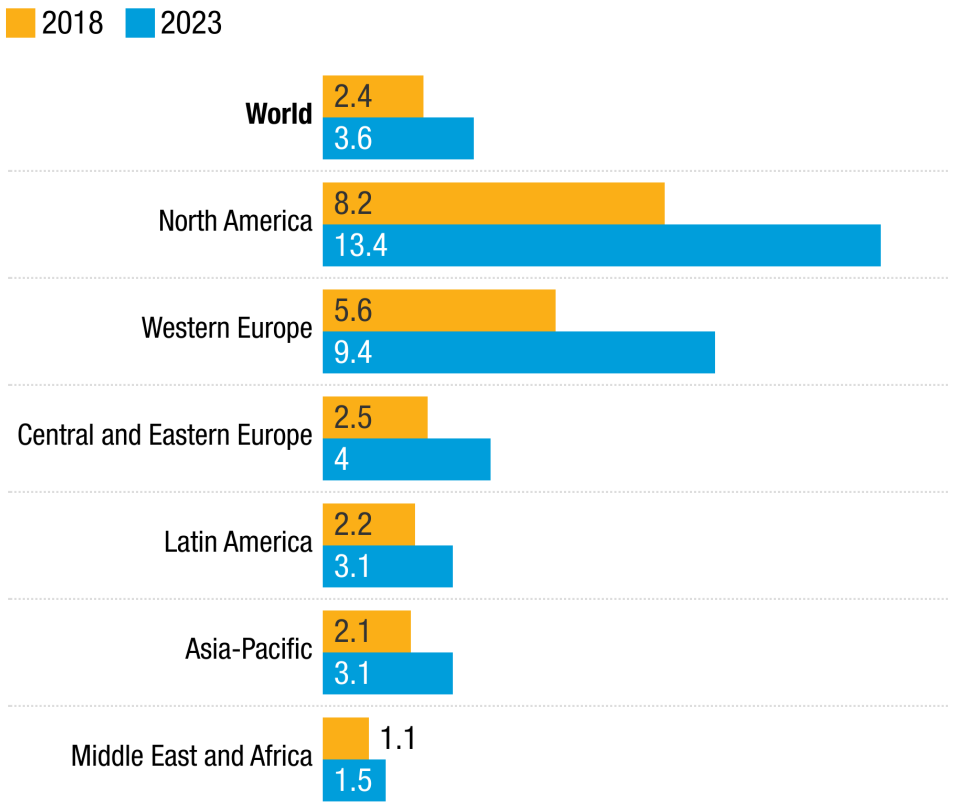
Need to rethink modes of consumption and production in view of potential limits to minerals supply on a finite planet and intergenerational equity

Sources: S&P Global Market Intelligence (2023); IEA (2023a)

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

Significant increase in devices per capita in developed countries

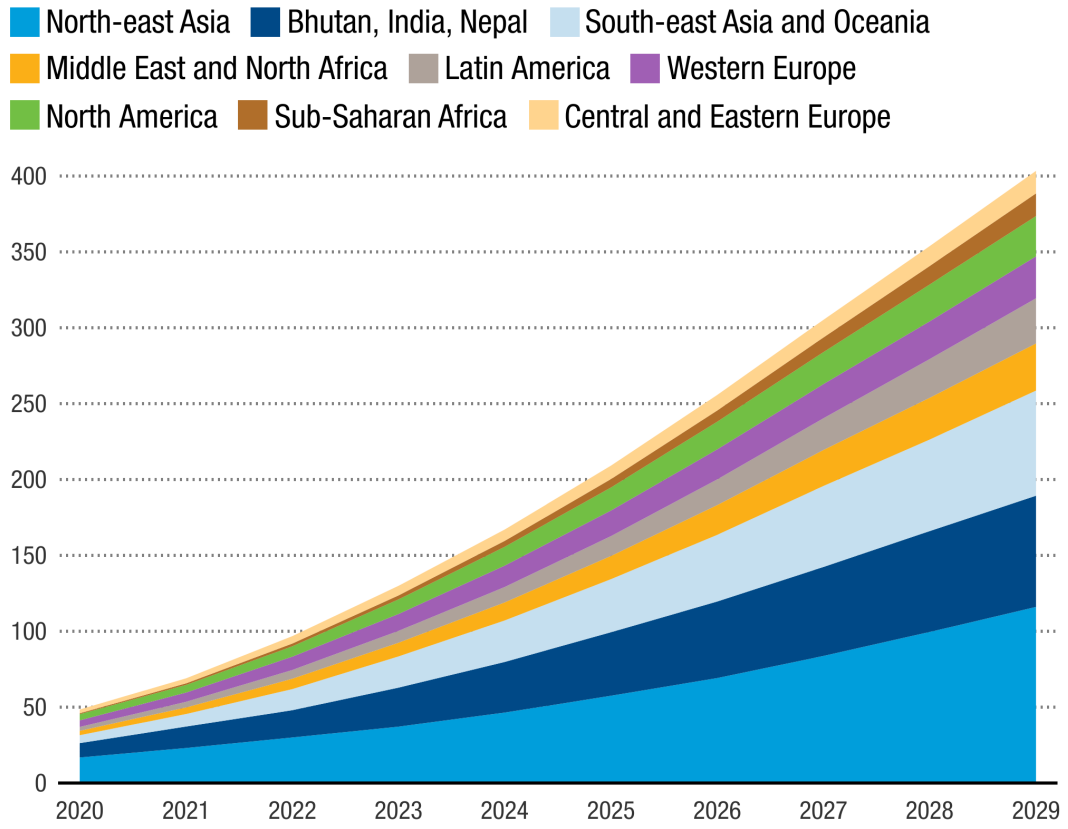
Average number of devices and connections per capita, by region, 2018 and 2023



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

Mobile data traffic is expected to more than double within the next 5 years

Data traffic by region, exabytes per month, 2020–2029



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

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

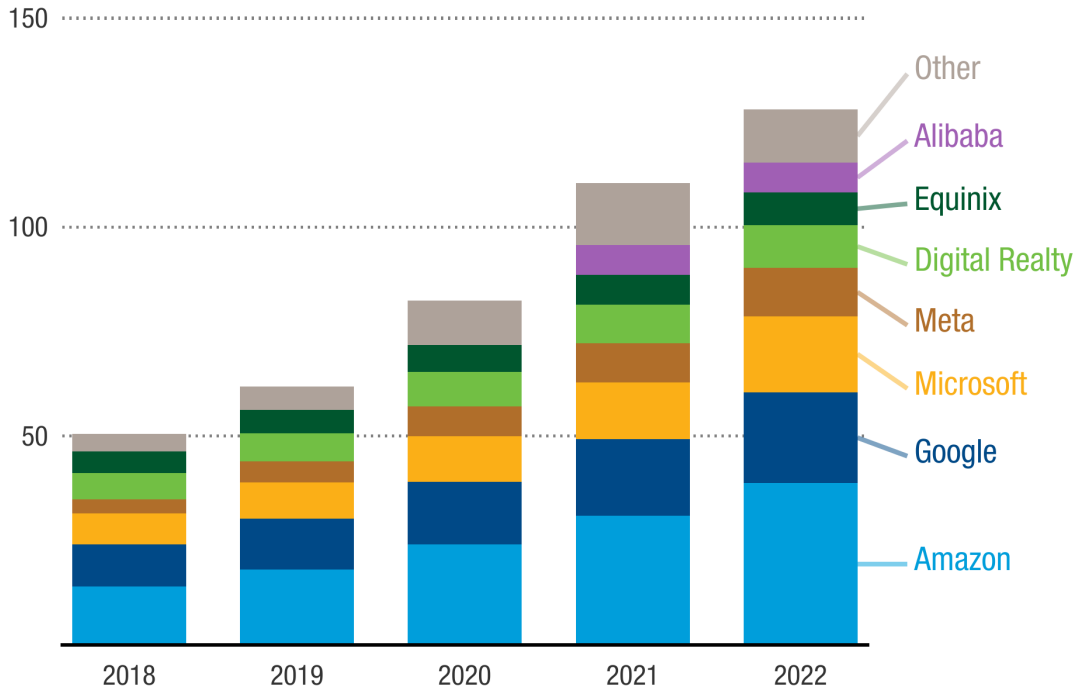
- Ireland: 18% of total electricity consumption
- Singapore: 7%

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

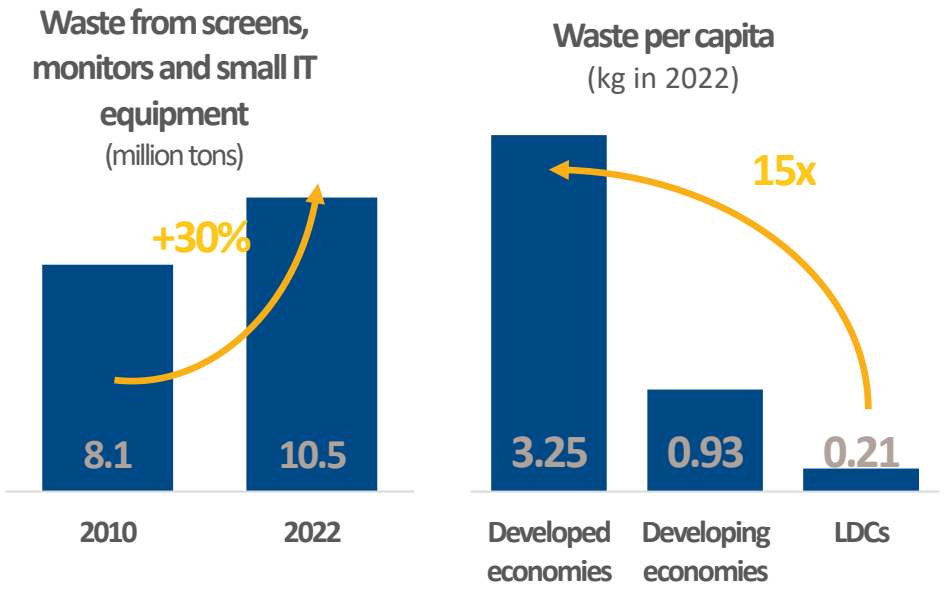


Source: UN Trade and Development (UNCTAD), based on company reports.
Note: Other includes: Apple, Baidu, Chindata, GDS, Tencent, VNET.

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

Digitalization-related waste is growing, with uneven regional implications

Regional disparities are significant and mirror digital divides

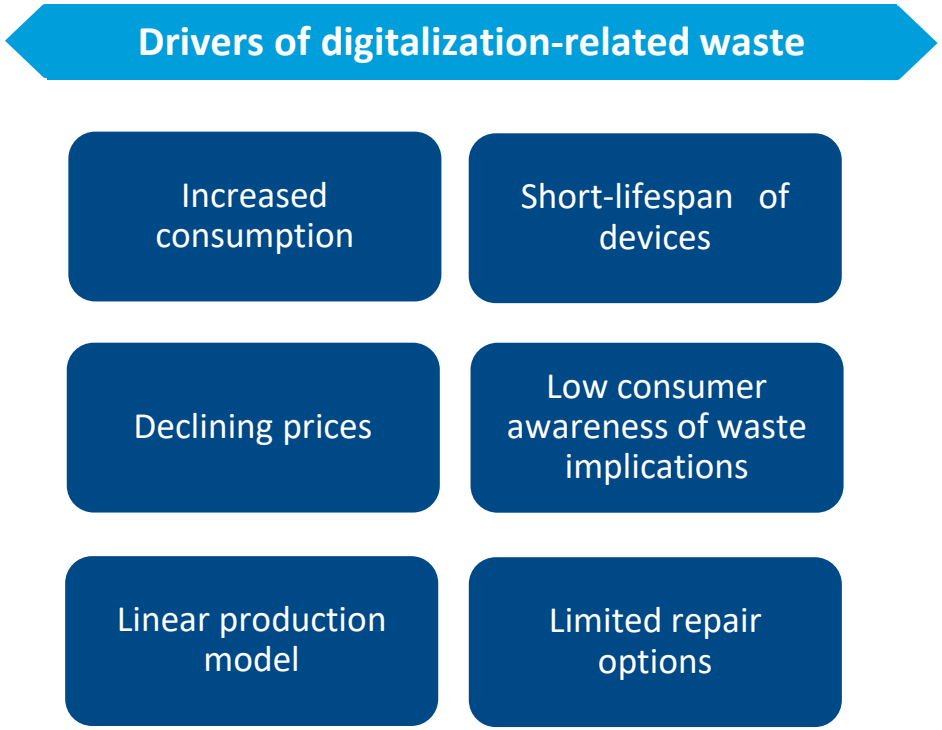


Challenges in developing countries

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

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

Growth of digitalization-related waste is set to continue

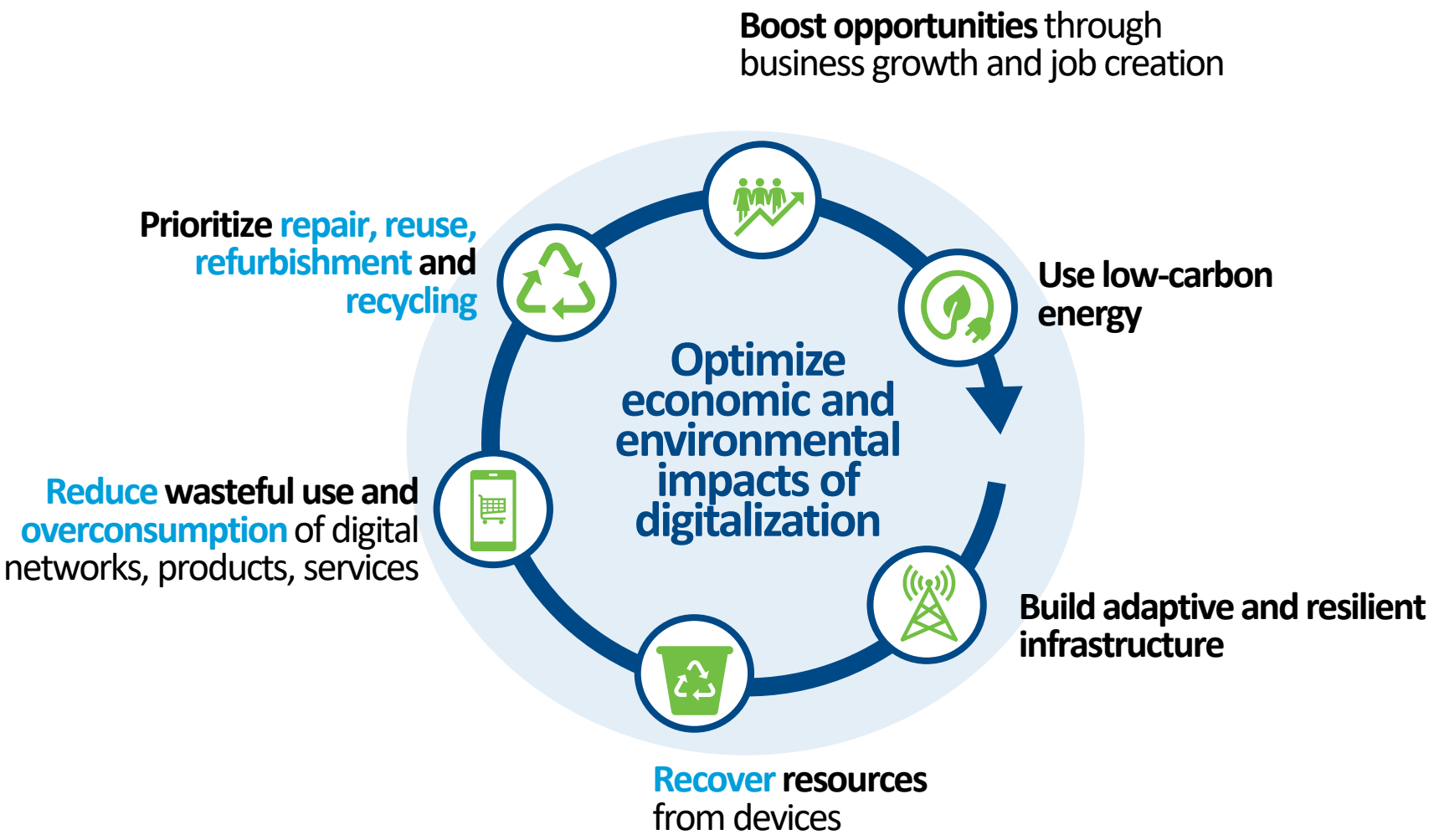


Programmed obsolescence
(e.g., slowing smartphones, ink cartridges, phasing out software support, rapidly changing models)

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

Shifting towards a circular digital economy for inclusive and sustainable development



Business opportunities from a shift to a circular digital economy

- Global market for **electronics recycling** estimated to grow from $37 billion to $108 billion (2022–2030)
- Value of **refurbished electronics** estimated to increase from $85.9 billion to $262.2 billion (2022–2032)
- Global **consumer electronics repair and maintenance** industry generated $15.3 billion in 2021 and is expected to generate $21.6 billion by 2031
- **Second-hand electronics** product market in Europe was valued at $78.9 billion in 2022 and is expected to reach $225.5 billion by 2031

Source: UN Trade and Development calculations based on Research and Markets, 2024; Market Research Future, 2024; Allied Market Research, 2023: Transparency Market Research, 2023.

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 digitalization-related waste to transform waste into opportunities for recovery, recycling and reuse within a circular economy

Addressing the double bind of developing countries

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

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

Developed countries capture most benefits

Common but differentiated responsibilities

Policy implications

Digitally-developed countries should

- **lead** the shift to an inclusive and sustainable digital future
- **support** developing countries in building capacities to harness digitalization

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

Upcoming policy dialogues

Summit of the Future
Our Common Agenda
Global Digital Compact

working together towards 2025
World Summit on the Information Society
Turning targets into action
Geneva 2003 | Tunis 2005 | New York 2015

2030 Agenda for Sustainable Development

Actions needed

- Harness the UN SG's Panel on Critical Minerals to ensure a just and sustainable low-carbon and digital transition
- Harmonize reporting standards and improve data transparency regarding environmental impacts of the ICT sector
- Include ICT sector in NDCs related to GHG emissions
- Strengthen regulations on energy and water consumption for data centres
- Expand international support to strengthening e-waste legislation and management systems in developing countries
- Build on the GDC to align digital and environmental policies at all levels
- Recognize disparities in living standards and resource use within and between countries at different levels of development

A just and sustainable digital economy requires just and sustainable policies

António Guterres
Secretary-General
United Nations

For more information

unctad.org/der2024