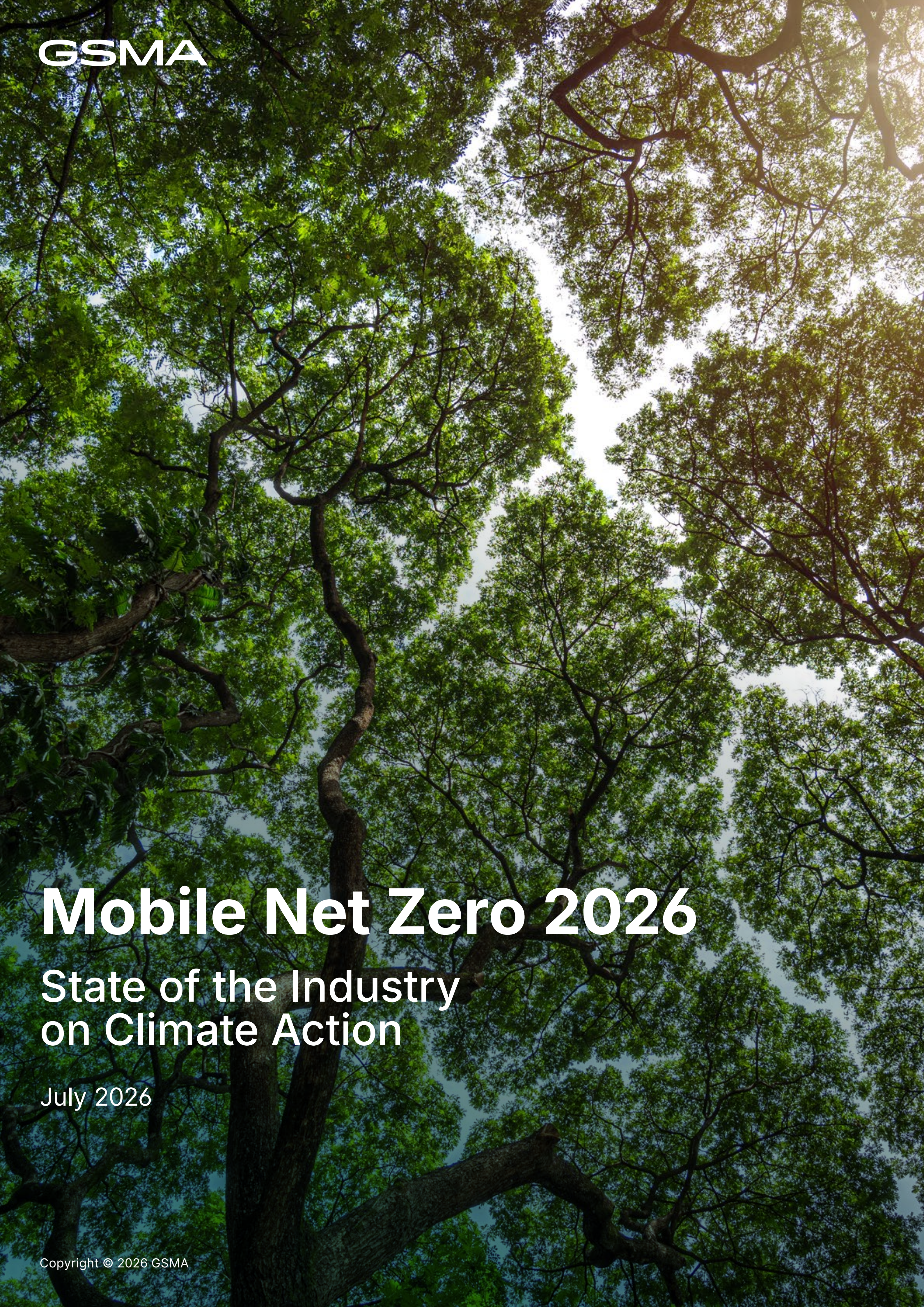

GSMA

Mobile Net Zero 2026

State of the Industry on Climate Action

July 2026

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

We invite you to find out more at **gsma.com**

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Contents

Foreword

The journey to net zero is not a race where everyone starts from the same place or follows the same path. Mobile operators operate in vastly different markets, with different energy systems, regulatory environments, infrastructure challenges and stages of digital development. Yet across our industry, there is a shared ambition: to build a more sustainable, resilient and connected future by reaching net zero emissions by 2050.

This sixth edition of the *Mobile Net Zero: State of the Industry on Climate Action* report demonstrates both the encouraging progress being made and the reality that progress is advancing at different rates across the world. Some operators are already sourcing most of their electricity from renewable energy. Others are taking important first steps in markets where clean energy remains scarce or where reliable electricity is still a challenge. Each is responding to its own circumstances, but all are contributing to the same long-term objective.

That diversity is one of the strengths of our industry. It reminds us that there is no single blueprint for climate action. Success depends on combining global ambition with practical, locally relevant solutions, while creating opportunities to learn from one another and scale what works.

This year's findings show that the industry continues to lead on climate ambition and transparency. More mobile network operators than ever have science-based targets and validated net zero commitments, while climate disclosures continue to improve in both quality and coverage. Operational emissions fell by 5% in 2024 - the fastest annual reduction since we began tracking progress - even as mobile connectivity expands and demand for data continues to grow. This demonstrates that emissions can be reduced while supporting the digital transformation that economies and societies increasingly rely upon.

At the same time, the report is clear that greater progress is needed if the industry is to meet its 2030 milestones. While emissions are falling globally, the pace of reduction must accelerate, particularly in regions where energy transitions are more challenging or where demand for connectivity is growing most rapidly. Supporting these markets is not only essential for achieving our collective climate goals, but also for ensuring that no region is left behind in the transition.

The report highlights how the conversation on climate action is evolving. Energy efficiency remains fundamental, helping operators reduce both emissions and operating costs. Renewable and clean electricity continues to be the single largest driver of operational emissions reductions. Artificial intelligence presents opportunities through innovative solutions and efficiencies, yet uncertainties remain on the energy demand that will be required to power data centres. Growing attention is rightly being given to climate resilience as networks face more frequent and severe weather events.

Perhaps most importantly, this report reinforces that the industry's biggest decarbonisation opportunity lies beyond its direct control. Around three-quarters of the sector's carbon footprint sits within the value chain, making alignment both within operators and across the ecosystem more important than ever. Operators, procurement teams, business units, and more broadly, equipment and device manufacturers, tower companies, and cloud service providers all have a role to play in accelerating progress.

This is why the GSMA continues to bring the industry together through the Climate Action Taskforce. Whether it's sharing knowledge through the annual Climate Action Forum, developing common methodologies such as the Climate Transition Planning Guidance or creating practical solutions such as the GSMA Scope 3 Database, we are helping members translate ambition into measurable action while improving consistency across the sector.

Governments also have an essential role in enabling this transition. Accelerating renewable energy deployment, recognising mobile networks as critical infrastructure, encouraging pragmatic climate disclosure frameworks, will help create the conditions for faster progress everywhere. International cooperation and targeted support will be particularly important for markets facing structural barriers to decarbonisation.

This report provides an honest assessment of where we are today. It celebrates progress, gives clear evidence of what works, and a reminder of the pace that is still required, while recognising that the pace of transition will not be identical across every market. It reinforces an important message: reaching net zero is not simply about reducing emissions - it is about building a more resilient, affordable, inclusive and sustainable digital future.

The opportunity is significant. So too is our collective responsibility. By recognising our different starting points while remaining united by a shared goal, the mobile industry continues to demonstrate that collaboration is one of our most powerful tools for delivering meaningful climate action.

Alix Jagueneau
Head of External Affairs, GSMA

Executive summary

This sixth annual assessment report tracks the progress of the mobile industry in reaching its goal to achieve net zero by 2050, drawing on energy and emissions data from more than 200 mobile network operators and suppliers.

Industry collaboration is vital in the transition to net zero. The GSMA Climate Action Taskforce brings together 81 members representing over 80% of mobile connections across over 160 countries and territories.

Mobile operators continue to lead on climate targets and disclosures

Mobile operators are leading on voluntary climate targets. As of June 2026, 81 operators have near-term science-based targets (SBTs). This represents nearly half the industry by connections and more than two-thirds by revenue. Of these, 77 have been validated by the Science Based Targets Initiative (SBTi). 50 operators have also committed to net-zero targets, 46 of which have been validated. Half the validated targets aim for net zero by 2040 or earlier.

The quality of climate disclosures from operators continues to surpass other sectors. 77 operators disclosed to CDP in 2025, up from 61 in 2020. Nearly a third received the highest score (A) from CDP in 2025, compared with less than 4% of all other companies. This report analyses climate disclosure data from 116 operators representing 85% of all mobile connections.

The mobile industry's operational emissions were an estimated 115 $MtCO_2e$ in 2024, equivalent to 0.2% of global greenhouse gas (GHG) emissions. Operational emissions (Scope 1 and 2) account for around a quarter of the industry's overall carbon footprint, with the remaining three-quarters coming from its value chain (Scope 3).

Emissions are falling, but reductions need to accelerate across all regions to reach 2030 targets

The operational emissions of operators fell by 5% in 2024 – double the average annual decline over the previous four years. Between 2019 and 2024, operators cut emissions by 13% even as mobile connections rose 10% and data traffic more than quadrupled. Preliminary data suggests a further drop of around 3% in 2025.

Despite this progress, the mobile industry is not yet on track to meet its 2030 targets. If trends continue, emissions will fall 33% by 2030 – short of the 45% reduction required under the SBT pathway. Further progress across all regions, particularly Asia, is needed to reduce average annual global emissions to around 7%.

Operational emissions fell in all regions between 2019 and 2024, led by Europe and North America where emissions fell by more than half. Operators in Latin America cut emissions by 40%, in Sub-Saharan Africa by 30% and in the Middle East and North Africa (MENA) by almost 10%. Emissions in Greater China declined for the first time in 2024 – a record 7% drop driven by strong growth in renewables.

Energy efficiency and renewables are cutting energy costs and carbon emissions

Operators consumed around 300 TWh of electricity in 2024 or around 1% of global electricity use. Thanks to more energy-efficient hardware and the phase-out of legacy networks, electricity use per connection has fallen by 3% since 2019 to 29 kWh in 2024. The pace of improvements in the energy intensity of data transmission (kWh/GB) has slowed in recent years, highlighting the need for a broader set of indicators to track real-world progress on energy efficiency. Operators spent around $50 billion on energy in 2024, highlighting the importance of efficiency and renewables to cut costs and carbon emissions.

Renewable energy continues to be the main driver of emission reductions. Operators purchased and generated around 70 TWh of renewable electricity in 2024. The share of operators' electricity from renewables has more than doubled from 10% in 2019 to 24% in 2024. European operators sourced around 70% of their electricity from renewables, while North American operators sourced 50% and Latin American operators 45%.

Operators consumed around 2.5 billion litres of diesel and gasoline in 2024. The closure of the Strait of Hormuz pushed crude prices in April 2026 more than 70% higher than the 2025 average. In regions that depend on diesel the most, some operators are switching to solar and hybrid solutions, with early movers reporting fuel cost savings of around 30%.

The impact of AI on telecommunication operators' energy use is uncertain and varies by region

AI is driving up energy demand from global data centres, but the energy impacts on telco-owned data centres are region-specific. Global data centre electricity consumption is projected to double to around 950 TWh by 2030, driven largely by hyperscalers and AI workloads. Telcos account for less than 10% of overall data centre energy use today, but recent announcements indicate potential for significant growth among telcos in Asia and the Middle East.

AI is not materially affecting network energy use today, but its future impacts are highly uncertain. Direct generative AI traffic has nearly doubled in the past year but remains low at around 0.2% of mobile traffic. Direct impacts on network energy use to 2030 are likely to be limited. Indirect impacts such as AI-induced short-form video consumption are uncertain but potentially greater.

Three-quarters of the mobile industry's carbon footprint is in the value chain, where the progress of suppliers is uneven

Around three-quarters of the mobile industry's overall carbon emissions are Scope 3 value chain emissions, indicating the importance of continued engagement with supply chains and customers. Operators have improved the coverage and quality of Scope 3 disclosures, and the GSMA has developed a new Scope 3 Assessment Tool to support operators with data and align measurement across the industry.

Suppliers are increasingly setting climate targets and reducing emissions, but progress is uneven. 80% of key cloud and IT service providers have validated near-term targets, and around half of network equipment manufacturers and mobile phone manufacturers. Less than a quarter of the 25 largest tower companies have validated targets.

New GSMA analysis has found that most operators have low levels of operational water use, but there are hotspots further up the supply chain. The most significant impacts are upstream in electricity generation, semiconductor manufacturing and copper mining.

Tower companies are both a decarbonisation challenge and opportunity

Analysis of tower companies' climate disclosures reveals a critical decarbonisation blind spot. The top 100 tower companies operate around 4 million sites, two-thirds of the global tower base, and consumed around 2 billion litres of diesel – mostly in Sub-Saharan Africa and Asia Pacific. However, only a quarter of the top 100 tower companies publicly disclosed their emissions last year.

Tower company decarbonisation is hindered by contract structures. Mobile network operators have three practical levers: using master service agreements to mandate energy and emissions disclosure, restructuring energy contracts to reward decarbonisation and coordinating decarbonisation, commitments across multi-operator joint ventures. Tower companies are encouraged to switch from diesel generators to on-site solar and batteries and support broader electricity access efforts.

Circularity is a key lever for Scope 3 decarbonisation, with growing consumer interest in refurbished phones

The average production emissions of smartphones fell 20% between 2019 and 2023 before rising 8% between 2023 and 2025. Reductions were driven mainly by clean energy and increased use of recycled materials. This recent reversal has likely been driven by growing storage capacities and the use of carbon-intensive AI-related hardware.

The ongoing memory crisis caused by AI data centre demand could accelerate the shift to refurbished devices. New smartphone shipments are expected to fall by around 15% in 2026 due to surging memory prices, while the second-hand market is projected to grow by around 8%. Nearly half of consumers globally are likely to consider refurbished for their next purchase, but a lack of transparency and consumer confidence is limiting uptake.

Networks must adapt to a changing climate

Mobile network infrastructure must become more climate resilient to continue operating in a changing climate. More extreme weather directly threatens network assets, with indirect risks from reliance on energy systems, water and complex supply chains. Climate transition plans (CTPs) are essential to translate net-zero targets into coordinated, whole-organisation action. At time of publication, 15 operators have committed to aligning their next CTP with the GSMA's Climate Transition Planning Guidance.

Achieving net zero requires action and collaboration from operators, suppliers and governments

Recommended actions:

Operators

- Set science-based climate targets and develop a CTP aligned with GSMA guidance.
- Optimise network energy use, retire legacy networks and increase the use of renewable energy, prioritising additionality.
- Engage suppliers on climate action, including disclosures, integrating climate requirements in procurement and supporting circular economy initiatives.

Suppliers and tower companies

- Publish energy and emissions data, including product environmental reports for devices and equipment.
- Increase the use of clean energy in operations (e.g. on-site solar and batteries for tower companies) and supply chains and incorporate eco-design and circularity in products.
- Manufacturers should develop more energy-efficient equipment, devices and systems.

Governments

- Implement regulations supporting climate disclosure and standardise life cycle assessments to improve comparability.
- Implement policies that accelerate renewable energy, including removing fossil fuel subsidies, streamlining clean energy permitting and reforming electricity market designs.
- Recognise mobile networks as critical infrastructure in resilience planning and mobilise public and concessional finance to support energy access and decarbonisation in low- and middle-income countries.

01

Net zero ambition

In 2019, the mobile industry set an ambitious goal to reach net zero by 2050. This report is the sixth annual assessment of the industry's progress towards this goal.

This report is the sixth annual assessment tracking the industry's progress towards net zero

The mobile industry has an ambition to reach net zero carbon emissions by 2050.

Since 2019, the GSMA and mobile network operators (operators) have developed a comprehensive climate action programme, including guidance on target setting, Scope 3, nature and climate transition planning, as well as research and advocacy to advance circularity and adoption of renewable energy (**Figure 1**).

This report represents the midway point between the 2019 commitments and the 2030 milestones, and addresses three key questions:

1. What progress has the mobile industry made towards net zero?
2. Is the industry on track to reach its short- and long-term climate targets?
3. How can operators, suppliers and policymakers help accelerate the industry's progress?

Figure 1 Timeline of mobile industry milestones toward net zero

2019 - 2020

2019
Net zero by 2050
GSMA Board sets ambition for mobile sector to reach net zero by 2050

2019
Climate Action Taskforce formed
GSMA establishes industry forum to drive climate action

2020
Science-Based Target (SBT) pathway published
GSMA, ITU, GeSI and SBTi launch decarbonisation guidance for the industry

2021-2023

2021
UN Race to Zero breakthrough:
Mobile industry becomes one of the first to pass 20% tipping point of net-zero commitments

2021
Inaugural "Mobile Net Zero" report
GSMA publishes first annual assessment of industry progress towards 2050 net-zero goal

2023
"Scope 3 Guidance for Telecommunications Operators"
GSMA, GeSI and ITU harmonise value-chain emissions methodology

2023-2024

2023
Circularity targets
Leading operators commit to new industry targets on takeback and zero waste by 2030

2023
"Achieving Climate Targets"
GSMA publishes guide to support operators to deliver on targets

2024
Climate Action Forum
First annual in-person Taskforce gathering at London Climate Action Week

2025-2026

2025
"Rethinking Mobile Phones"
GSMA publishes major research report on the business case for circularity, including a global consumer survey on circularity

2025
"Climate Transition Planning Guidance for Telecommunication Companies"
GSMA and ITU publish guidance with 12 operators committing to align with it

2026
"Turning Climate Strategy into Action"
GSMA publishes practical handbook for turning decarbonisation initiatives into investable decisions

Announcements
Reports/publications
Other events

81 operators across more than 160 countries and territories are members of the GSMA Climate Action Taskforce, representing more than 80% of mobile connections worldwide

Progress towards net zero has been strengthened and accelerated through collaboration between operators. To provide a forum for this collaboration, the GSMA created the Climate Action Taskforce in 2019.

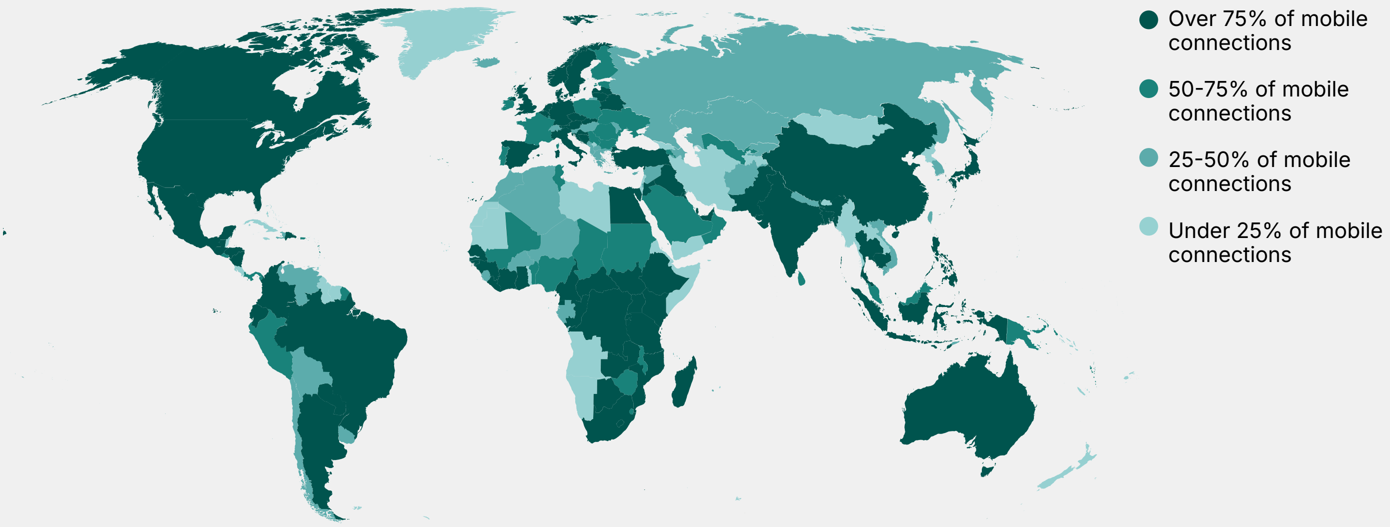
The Taskforce has grown rapidly over the past seven years and now has 81 members, representing more than 80% of mobile connections worldwide with networks in 164 countries and territories (**Figure 2**).

For more information, including the list of members of the Taskforce, see the Climate Action Taskforce web page.

The Climate Action Taskforce has four main purposes:

- To promote and encourage leadership on climate action to move the mobile industry towards net-zero carbon emissions by 2050.
- To agree on climate policy frameworks and advocacy engagement to gain support from governments and other stakeholders for a fair and equitable transition to net zero.
- To share best practices on climate action, helping operators support each other and raise their ambitions.
- To provide thought leadership and conduct research on how mobile technologies support climate mitigation and adaptation.

Figure 2 **Mobile connections covered by GSMA Climate Action Taskforce members**



The GSMA Climate Action Taskforce has 81 members covering more than 80% of mobile connections globally across over 160 countries and territories

Note: Share of connections includes those covered by operating companies (opcos) where majority owned or controlled by a Group that is a member of the Taskforce.

Source: GSMA analysis

81 operators – representing half of mobile connections globally – have near-term science-based targets, including 77 operators with validated targets

A growing number of operators worldwide have committed to rapidly reduce their carbon emissions, taking responsibility for their operational emissions as well as their indirect emissions up and down their value chains.

Near-term science-based targets (SBTs) are defined by the Science Based Targets Initiative (SBTi) to set carbon-reduction targets in line with limiting global warming. First, an organisation commits to a target, then it is validated against a target level. Validated targets are in line with the ambition of the mobile industry to be net zero by 2050.

As of June 2026, 81 operators have set or committed to near-term SBTs, representing around half of all mobile connections globally and more than two-thirds of revenue (**Figure 3**). Six targets were approved by SBTi over the past year, bringing the total number of validated targets to 77, representing 46% of all mobile connections.

Net zero targets submitted to the SBTi are validated by a team of technical experts of emissions reduction targets against the qualitative and quantitative corporate criteria.

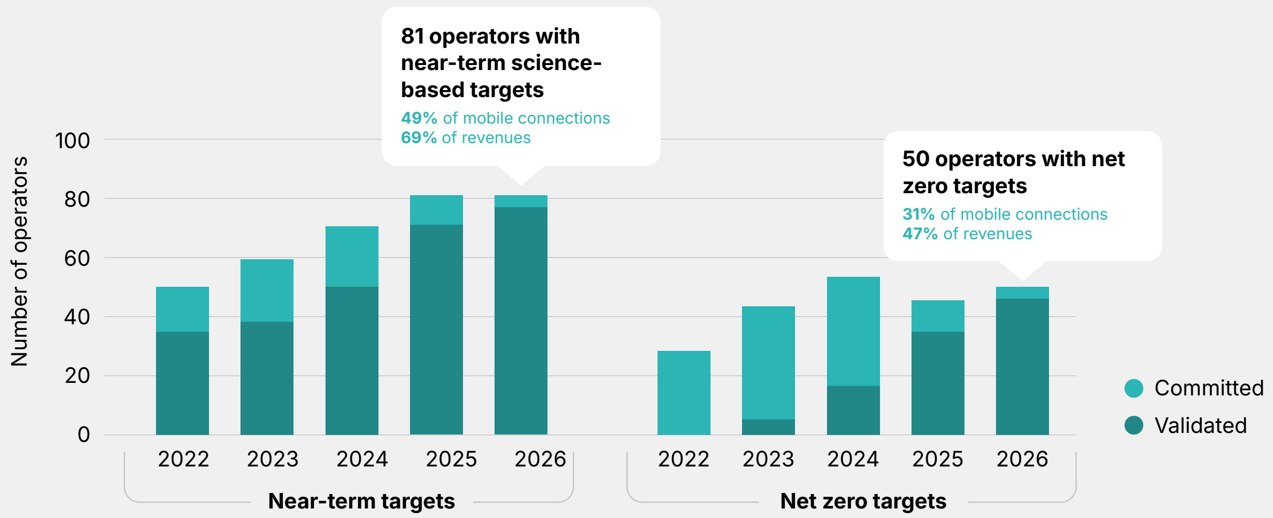
50 operators have submitted net-zero targets to the SBTi, 46 of which have been validated. Over the past year, 11 targets have been validated. Half aim for net zero by 2040 or earlier, with the earliest being a 2030 target from TDC NET and 2035 targets from Tele2 and Swisscom.

For guidance on setting SBTs for operators, see the GSMA's step-by-step guide, *Setting Climate Targets*.

Case Study:
Telenor - Reaching first science-based target

Mobile operators' climate targets

Figure 3 **Mobile operators' near-term science-based targets and net zero targets**



81 mobile network operators, representing nearly half of mobile connections globally, have committed to near-term science-based targets

Note: 2022 net zero targets are "Race to Zero" targets. Several commitments were "removed" from the SBTi Dashboard in 2025 and 2026 due to companies not meeting deadlines for submitting validated targets or not reaching successful validation. 2026 data as of June 2026.

Source: GSMA analysis based on SBTi Target Dashboard

Some regions have achieved rapid reductions since 2019, but all regions need to make progress to achieve the industry's global target by 2030

The *Guidance for ICT Companies Setting Science-Based Targets*[1] outlines emissions reduction pathways for ICT subsectors aligned with 1.5°C, including a 45% reduction for operators between 2020 and 2030.

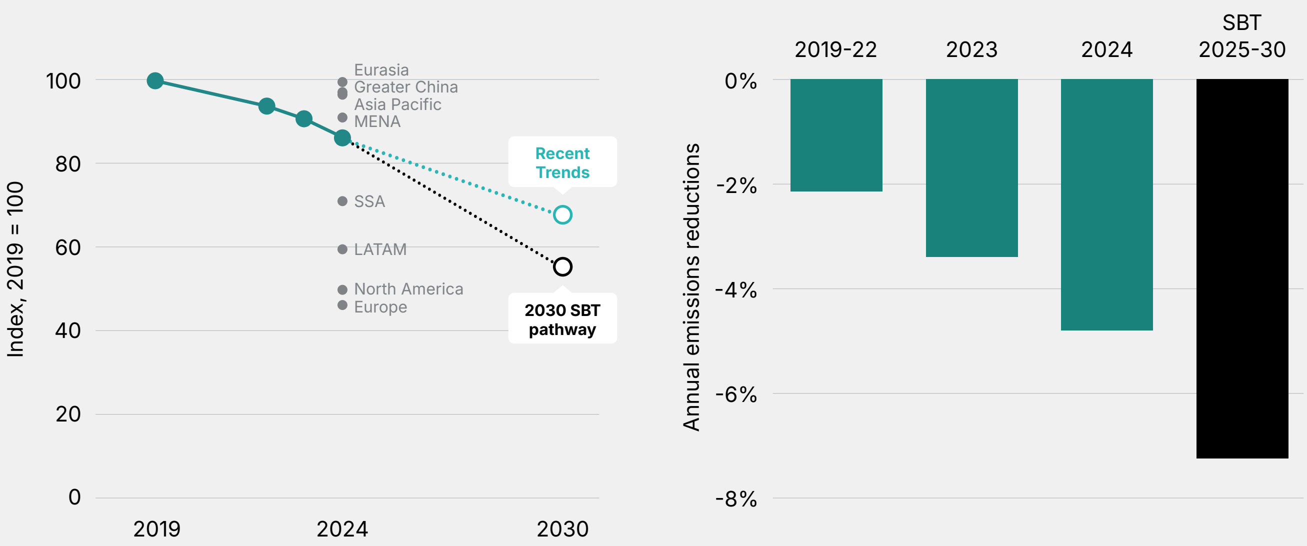
This report analyses the emissions trends of operators from 2019 to 2024, with preliminary estimates for 2025. The analysis, detailed in chapter 3, shows that a continuation of recent trends (2022 to 2024) implies a 33% reduction by 2030, falling short of the 45% reduction under the SBT pathway (**Figure 4**).

Some regions, including Europe and North America, have outpaced the reduction pathway, achieving average annual emissions reductions of 14% and 13%, respectively.

With preliminary estimates showing progress slowing in 2025, all regions, especially Asia, need to increase average annual reductions to around 7% to achieve the mobile industry's 2030 target.

To develop targets and pathways to 2035, the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) Study Group 5 (SG5) has proposed updating ITU-T L.1470 and the ICT sector pathway in 2026 in cooperation with the GSMA, SBTi, Global Enabling Sustainability Initiative (GeSI) and the International Energy Agency (IEA).[2]

Figure 4 **Mobile network operators' progress towards its science-based target pathway**



Some regions have achieved rapid reductions since 2019, but further progress across all regions is needed for the sector to achieve its global target by 2030

Note: The SBT pathway shows the subsector pathway for mobile network operators – a 45% reduction in combined Scope 1 and 2 emissions between 2020 and 2030 – as developed in the Guidance for ICT Companies Setting Science Based Targets. Operator emissions are indexed to 2019, while the SBT pathway is indexed to 2020.

Source: GSMA analysis based on the latest CDP disclosures and corporate reports

1 GSMA. (2020). *Guidance for ICT Companies Setting Science Based Targets*.
2 ITU. (2026). ITU-T work programme, L.1470 rev.

02

Tracking progress on climate action

Mobile operators continue to lead on climate disclosures, with more than 110 operators publicly disclosing energy and climate data in 2025.

This report analyses energy and emissions data from more than 110 operators, including 77 disclosures to CDP

Public disclosure of climate impacts is vital for transparency and to understand progress towards net zero. CDP provides the most widely used global disclosure system for investors, companies, cities, states and regions. In 2025, more than 22,000 companies reported environmental data through CDP.

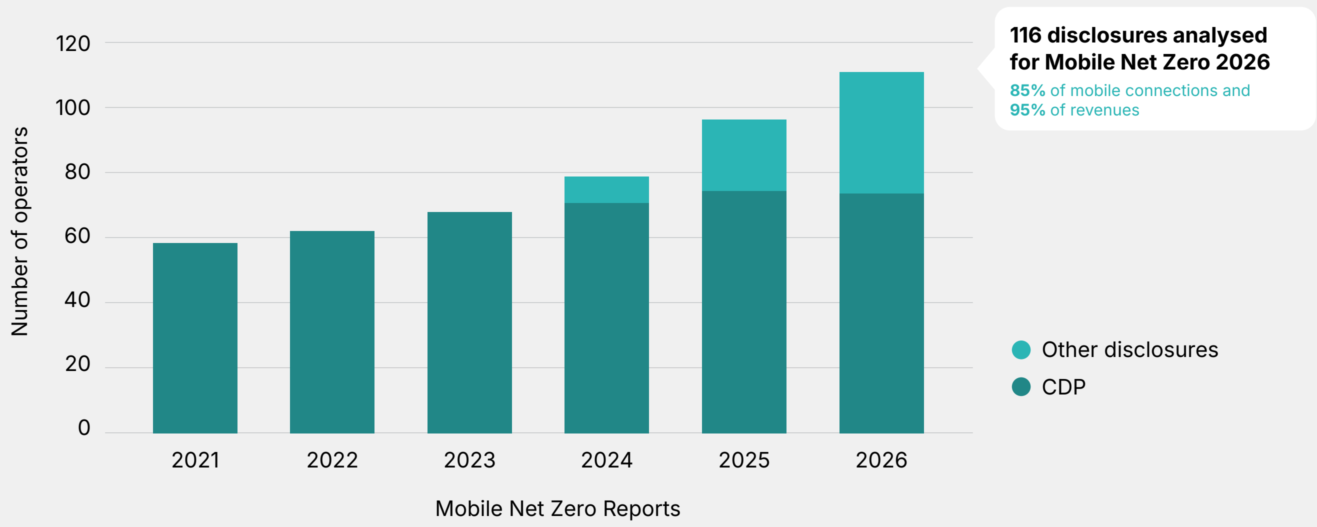
In the 2025 disclosure cycle, 77 operators disclosed to CDP, up from 61 in 2020 (**Figure 5**). The majority of mobile connections in North America (95%), Latin America (87%), Europe (84%), Sub-Saharan Africa (71%) and Asia Pacific (65%) were included in disclosures to CDP.

24 operators – nearly a third of disclosing operators – received the highest disclosure score (A) from CDP in 2025. By comparison, less than 4% of all other companies disclosing to CDP on climate received an A score.[3]

For operators that did not disclose to CDP, this report analyses other public disclosures of emissions and energy data (e.g. integrated annual reports, ESG and sustainability reports), covering 39 operators and 34% of mobile connections (see the Annex for additional details).

Environmental, social and governance (ESG) data and analysis have also become increasingly important for investors to identify risks and opportunities. To harmonise ESG reporting across operators, the GSMA published the first-of-its-kind voluntary reporting framework for the mobile industry, *ESG Metrics for Mobile*. 23 operators covering nearly a quarter of global mobile connections participated in the ESG Metrics for Mobile Benchmarking study 2025.[4]

Figure 5 **CDP and other disclosures analysed in Mobile Net Zero 2026**



116 disclosures have been analysed for Mobile Net Zero 2026, covering 85% of mobile connections and 95% of revenues

Note: CDP disclosure years are one less than the year of Mobile Net Zero, e.g. Mobile Net Zero 2026 uses data disclosed to CDP in 2025, covering data from 2024.

Source: GSMA analysis based on CDP disclosures.

3 CDP. (2026). CDP Scores and A Lists.
4 GSMA Intelligence. (2026). *ESG Metrics for Mobile Benchmarking 2025*.

Aligning the climate disclosures of telecommunications operators

The greenhouse gas (GHG) emissions of nearly all companies globally are reported using the GHG Protocol Corporate Accounting and Reporting Standard. Companies report three types or "scopes" of emissions.

Scope 1 and 2 emissions are typically referred to as a company's "operational emissions", as these are primarily within the control of the company.

Although companies are not directly responsible for Scope 3 emissions, they are considered part of their overall emissions footprint since they have some degree of influence on their suppliers, employees and customers. For Scope 3 emissions, estimates carry a higher margin of error given the complexity and difficulty of gathering and processing data. There are also methodological constraints and a lack of Scope 3 accounting harmonisation.

To address this challenge, the GSMA, GeSI and ITU jointly published *Scope 3 Guidance for Telecommunication Operators* in June 2023, harmonising methods for operators to assess their Scope 3 emissions and increase coverage and transparency.

In consultation with the Climate Action Taskforce, the GSMA recently developed the *Scope 3 Assessment Tool* to support operators with Scope 3 calculations and align measurement across the industry.

Scope 1, 2 and 3 of greenhouse gas emissions

1

Scope 1
Direct emissions from owned and controlled sources, including fuel combustion, company vehicles and fugitive emissions. For an operator, these typically come from the vehicle fleet supporting network operations and maintenance, diesel generators powering base stations and gas used for heating buildings.

2

Scope 2
Indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company. Most Scope 2 emissions from operators come from the electricity purchased from the local utility to power network base station sites, data centres and other buildings.

Scope 2 emissions can be reported as "location-based" or "market-based", with many companies reporting both. "Location-based" reflects average grid emissions intensity where consumption occurs, while "market-based" reflects emissions from contractual instruments a company has chosen to purchase, such as renewable electricity certificates or power purchase agreements (PPAs).

3

Scope 3
All other indirect emissions that an operator is indirectly responsible for, up and down its value chain. For example, emissions related to the buying of network equipment and those produced by its suppliers, as well as emissions from operator services when subscribers and enterprises use them. For operators, Scope 3 is the largest source of emissions and the hardest to measure accurately.

Operational emissions in 2024 were around 115 $MtCO_2e$, equivalent to 0.2% of global GHG emissions

Emission estimates are based on operator data disclosed to CDP and corporate reports, covering 85% of global mobile connections.[5]

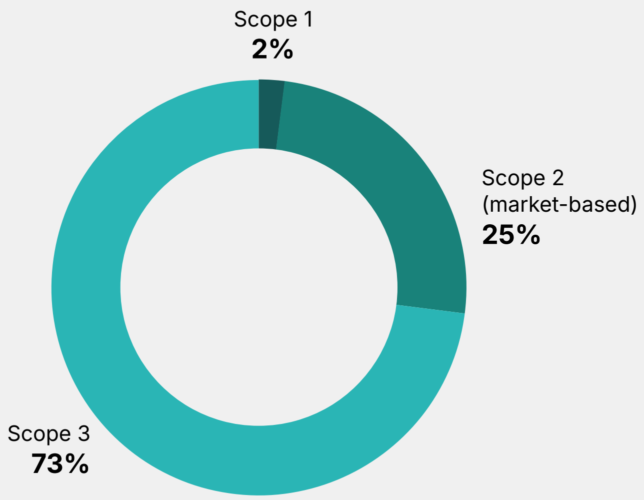
The mobile industry's operational emissions (Scope 1 and Scope 2 market-based) were an estimated 115 million tonnes (Mt) CO_2e in 2024, equivalent to around 0.2% of global GHG emissions[6] or 0.3% of global energy-related CO_2 emissions.[7] Operational emissions account for 27% of the industry's carbon footprint (**Figure 6**).

Operational emissions calculated using Scope 2 location-based emissions were an estimated 137 $MtCO_2e$ – demonstrating the impact of renewable energy purchases by operators.

Value chain emissions (Scope 3) were an estimated 310 $MtCO_2e$ or around three-quarters of the industry's total emissions.

92% of Scope 3 emissions came from six categories: 1) Purchased goods and services; 2) Capital goods; 3) Fuel- and energy-related activities; 8) Upstream leased assets; 11) Use of sold products; and 15) Investments. Value chain emissions are discussed in further detail in chapter 4.

Figure 6 **Mobile industry emissions by scope, 2024**



Nearly three-quarters of mobile operators' overall emissions come from supply chains and customers

Note: Scope 2 emissions are market-based. Using location-based Scope 2 would result in the following shares: Scope 1 (2%), Scope 2 location-based (29%), Scope 3 (69%).

Source: GSMA analysis based on latest CDP disclosures and corporate sustainability reports.

5 Refer to the Annex for details on the data sources and modelling methodology.
6 Based on global emissions of 57.7 $GtCO_2e$ in 2024. See: UNEP. (2025). *Emissions Gap Report 2025*.
7 Based on global energy-related CO_2 emissions of 37.8 $GtCO_2e$ in 2024. See: IEA. (2025). *Global Energy Review 2025*.

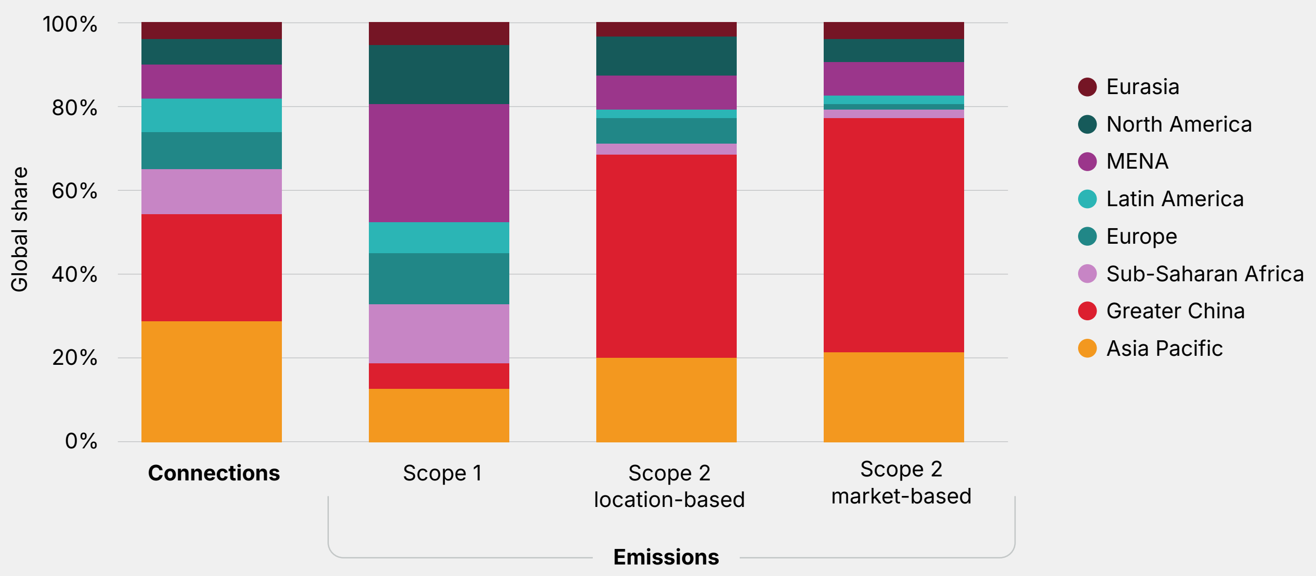
Asia accounts for the majority of global operator emissions

Around three-quarters of operational emissions[8] in 2024 came from Asia Pacific and Greater China, which accounted for 54% of global mobile and fixed connections (**Figure 7**).

Sub-Saharan Africa, Europe and Latin America accounted for a much smaller share of operational emissions (2–3% each) than connections (around 10% each).

Some regions showed higher Scope 1 emissions relative to their share of connections, notably the Middle East and North Africa, North America and Sub-Saharan Africa. For example, the Middle East and North Africa region accounted for 28% of global operator Scope 1 emissions despite accounting for only 8% of mobile connections.

Figure 7 **Regional breakdown of connections and emissions, 2024**



Regional share of emissions varies significantly by scope, highlighting both challenges and opportunities in transitioning to net zero

Note: Connections include mobile and fixed broadband connections. Location-based reflects average grid emissions intensity where consumption occurs. Market-based reflects emissions from contractual instruments a company has chosen to purchase, such as renewable electricity certificates or power purchase agreements.

Source: GSMA analysis based on latest CDP disclosures and corporate sustainability reports.

8 Scope 1 and 2 market-based.

03

Emissions from operators

Despite strong growth in demand for data and connectivity, emissions are falling as operators make progress in energy efficiency and renewable energy.

Operational emissions of operators are falling despite surging demand for connectivity

Operational emissions of the industry – combined Scope 1 and 2 (market-based) emissions – fell by around 5% in 2024, more than twice the average annual rate between 2019 and 2023.

Between 2019 and 2024, operational emissions fell 13% while the number of mobile connections globally rose 10% and mobile data traffic more than quadrupled (**Figure 8**). This means that operational emissions per mobile connection have fallen by 16% between 2019 and 2024, while emissions per unit of revenue have fallen by 20%.

Over the same period, global energy-related CO_2 emissions rose 3.6%[9] while global electricity-related emissions rose 10%.[10]

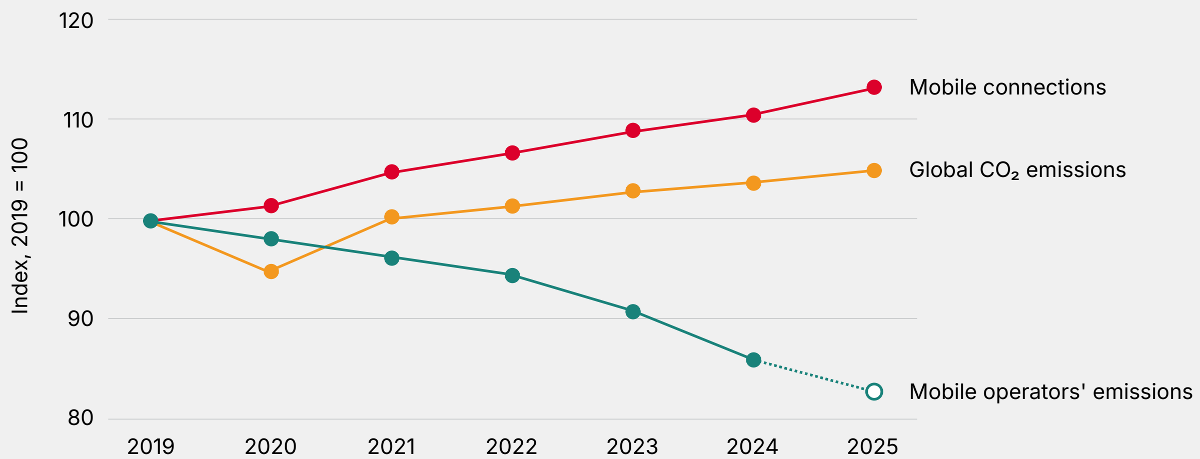
Based on preliminary data covering 67% of mobile connections, operational emissions for 2025 are estimated to drop by 3% from 2024 levels.

Operators disclosing to CDP collectively reported an 8% reduction in operational emissions between 2023 and 2024, with two-thirds reporting a decrease in operational emissions.

Nearly 60% of the reported decrease in operational emissions was driven by increased renewable energy consumption. Other emission reduction efforts, such as energy efficiency and electrification of vehicle fleets and buildings, contributed nearly a quarter.

Around half the reported increase in operational emissions was driven by growth in activity and output (e.g. growth in customer base, data traffic, expansion of networks) followed by acquisitions and mergers (10%).

Figure 8 **Trends in operational emissions, mobile connections, and global emission trends**



Between 2019 and 2024, operational emissions fell 13% while mobile connections grew 10% and mobile data traffic more than quadrupled

Note: 2025 operational emissions are estimated as of June 2026 based on preliminary data from operators covering 67% of mobile connections.

Source: GSMA analysis. Mobile connections and revenue data from GSMA Intelligence; CO2 emissions data from IEA.

9 GSMA analysis based on: IEA. (2026). *Global Energy Review 2026*.
10 GSMA analysis based on: IEA. (2022). *Electricity Market Report – January 2022*; IEA. (2026). *Electricity 2026*.

Operational emissions fell in all regions between 2019 and 2024, led by Europe and North America

Operational emissions in all regions fell between 2019 and 2024, led by a 54% reduction in Europe (**Figure 9**). Several operators in Europe reduced operational emissions by more than 75% over this period, including KPN, Tele2, Telecom Italia, Telefónica, Telenor, Telia and Vodafone.

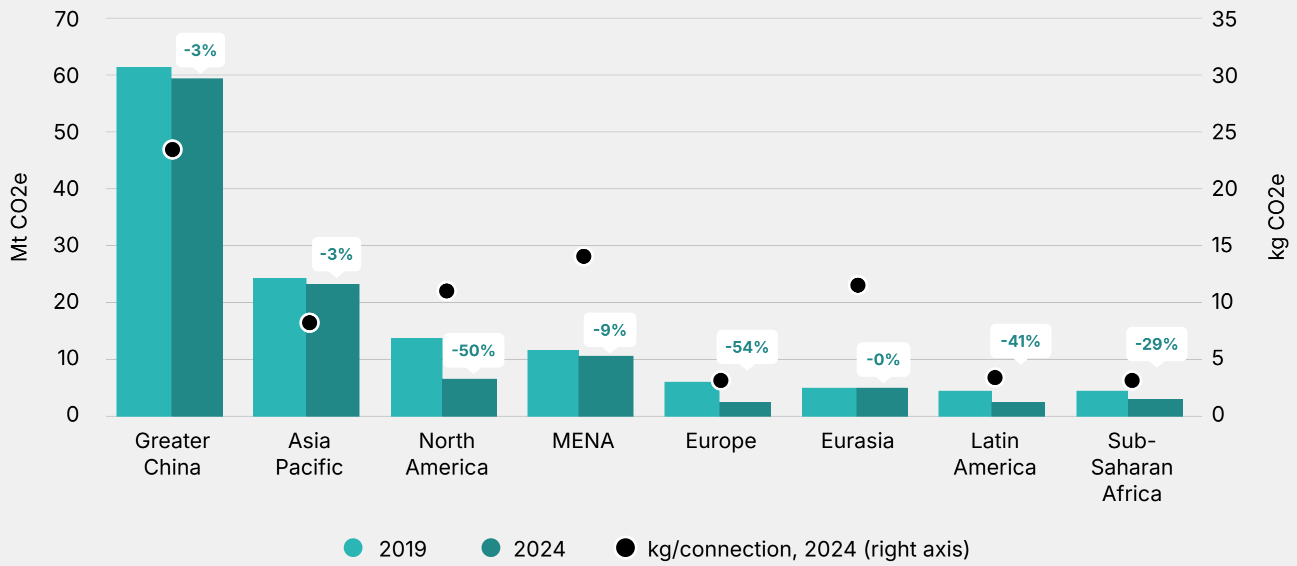
Emissions from North American operators fell by 50% over the same period, led by a 95% reduction from T-Mobile US which has matched 100% of its annual electricity with renewables since 2022. Reductions in North America accounted for nearly 40% of total reductions globally between 2019 and 2024.

In Latin America, operator emissions fell 40%, led by Telefónica and TIM. Both operators sourced 100% of their electricity in Brazil from renewable sources.

Operators in Sub-Saharan Africa reduced their emissions by 30%, led by Vodacom Group which sourced 100% of its purchased electricity from renewable sources. However, Scope 1 emissions from the region increased by 60% between 2019 and 2024, driven by increased use of diesel generators.

Emissions from operators in Middle East and North Africa fell 9%, led by Turkcell which sourced 100% of its purchased electricity from renewables.

Figure 9 **Operational emissions by region, 2019-2024**



Operational emissions in all regions in 2024 were lower than 2019 levels, with North American operators accounting for the largest share of net reductions

Note: Operational emissions include Scope 1 and Scope 2 market-based emissions.

Source: GSMA analysis based on latest CDP disclosures and corporate sustainability reports.

Asia Pacific operator emissions fell by 3% between 2019 and 2024. Japanese operators KDDI, NTT DOCOMO and SoftBank reduced their combined emissions by 40% over the period, counterbalancing large increases in other parts of the region.

Emissions from operators in Greater China fell for the first time in 2024 driven by strong growth in renewables from China Mobile and China Telecom combining to purchase more than 6 TWh in 2024. With Greater China accounting for more than half of global operator emissions, the region's 7% reduction in 2024 was the primary driver of global operator emission reductions in 2024.

Globally, the average mobile connection emitted around 11 kgCO_2e in 2024, with significant regional variation (**Figure 9**, black markers). For comparison, the average operational carbon footprint (excluding launch emissions) of a low earth orbit (LEO) broadband connection such as Starlink is around 220 kgCO_2e – around 20 times higher.[11]

Case Study:
China Telecom - Exploration and Practice of Green Electricity

11 GSMA analysis based on power consumption data from Starlink (2026) and emissions intensity of electricity from IEA (2026). Launch emissions were estimated to be an additional 120-220 kgCO_2e per user per year for Starlink in Osoro et al. (2023).

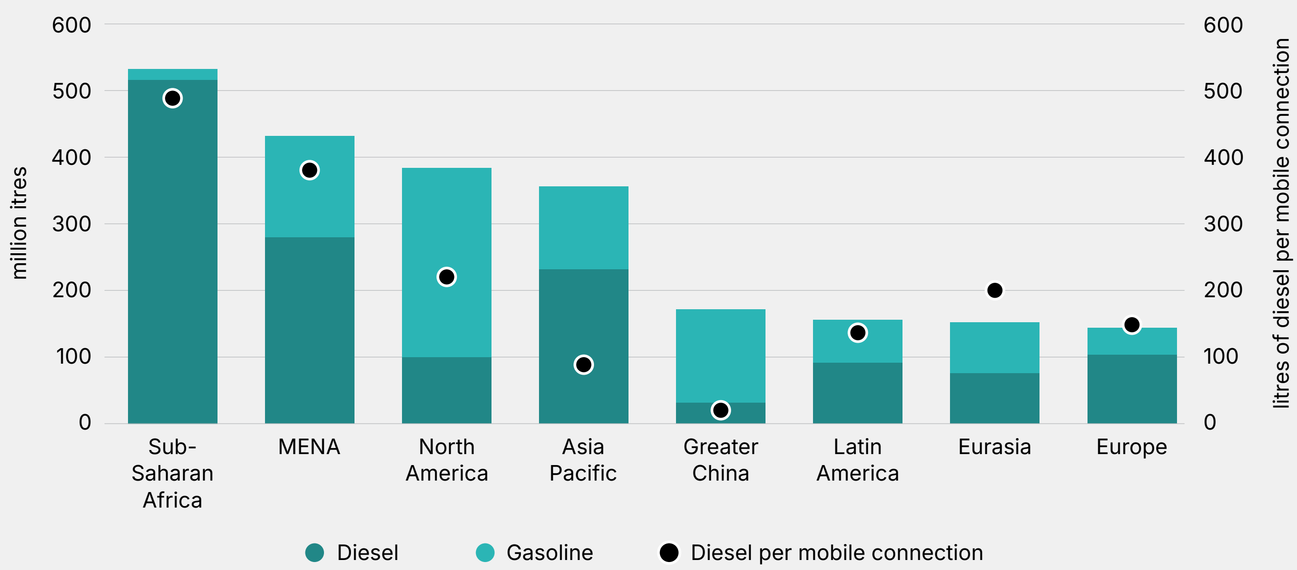
Most Scope 1 emissions came from fuel combustion in generators and vehicles, with operators consuming around 2.5 billion litres of diesel and gasoline in 2024

Scope 1 emissions totalled 8 $MtCO_2e$ in 2024, around 20% lower than in 2019. Most of these emissions came from diesel generators and fleet vehicles, with operators consuming around 2.5 billion litres of diesel and gasoline in 2024 at an estimated cost of $3 billion.

In Sub-Saharan Africa, operators are highly dependent on diesel generators due to poor grid access and reliability. Operators consumed around half a billion litres of diesel in 2024 – over a third of the global total (**Figure 10**) – with tower companies consuming an additional 900 million litres (see chapter 4 for analysis of tower companies). In some countries, diesel can account for as much as half of operators' operating costs.

Diesel generators are also the main source of Scope 1 emissions in Middle East and North Africa due to poor grid access and reliability in some countries or to a lack of incentives to use grid electricity in countries where fuel prices are low.

Figure 10 **Mobile network operators' diesel and gasoline consumption by region, 2024**



Operators spent around $3 billion on fuel in 2024 and face even higher costs in 2026 as fuel prices have surged following the closure of the Strait of Hormuz – the largest oil supply disruption in history

Note: Fuel consumption by tower companies are not included in this figure and are shown in Figure 23. Costs are estimated on regionally weighted average retail prices in 2024.

Source: GSMA analysis based on latest CDP disclosures and corporate sustainability reports.

In contrast, fleet-related emissions account for most Scope 1 emissions in North America, with one operator's fleet accounting for more than 60% of its Scope 1.[12] Similarly in China, operators' Scope 1 emissions came mostly from fleets, with gasoline consumption more than four times higher than diesel.

The price of crude oil, diesel and other fuels have surged in 2026 as a result of the Iran War and closure of the Strait of Hormuz. Crude oil prices in April 2026 were more than 70% higher than the 2025 average. Asia, which sources 60% of its oil and gas from the Middle East, has been hit hardest. In Sub-Saharan Africa, where diesel consumption and dependence on imports are also high, operators have announced plans to switch to solar and hybrid solutions to cut rising diesel fuel costs. Operators that have already switched to solar are reporting fuel cost savings of about 30%.[13]

A new GSMA handbook, *Turning Climate Strategy into Action*, includes step-by-step guidance on creating the business case for switching from a diesel generator to a hybrid diesel-solar PV and battery system.

Some companies are using an internal carbon price to assign a monetary cost to their emissions and incentivise decarbonisation, while also preparing for future regulatory carbon costs. Nearly a third of operators that disclosed to CDP in 2025 had an internal carbon price, with an average minimum price of almost $50 (range of $6–$150). An additional 40% are planning to implement a price in the next two years.

12 AT&T (2024). *AT&T Basis of Calculations for Greenhouse Gas Emissions Data*.
13 Olingo, A. (2 May 2026). "*Africa's cellphone towers turn to solar as diesel costs surge*". *The Independent*; Okebiorun, O. (6 May 2026). "*Rising diesel costs push Africa's telecom giants toward solar power despite China's plan to end export incentives*". *Business Insider Africa*.

Operators consumed around 300 TWh of electricity in 2024 – mostly to power their networks – equivalent to 1% of global electricity use

Nearly all operators' Scope 2 emissions come from purchased electricity. Operators[14] consumed around 300 terawatt-hours (TWh) of electricity in 2024, or around 1% of global electricity use. This includes electricity used to power mobile and fixed networks, data centres, offices, stores, electric fleet vehicles and other operations.[15]

Globally, operator electricity use in 2024 was 16% higher than in 2019, driven primarily by strong growth in demand from China, where electricity use increased by 35%. The Greater China region accounted for the largest share of electricity use globally in 2024 (43%) followed by Asia Pacific (17%), North America (13%) and Europe (11%) (**Figure 11**).

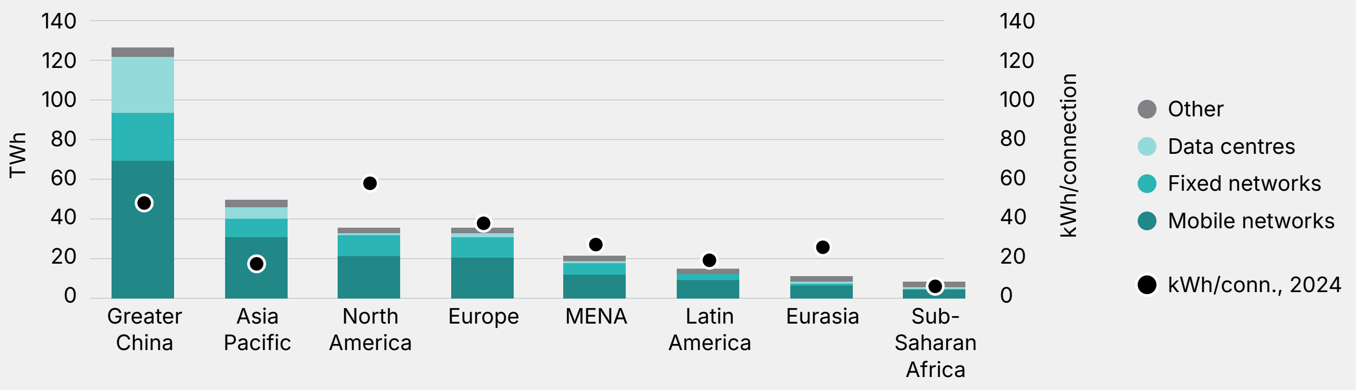
Between 2019 and 2024, electricity use per connection fell slightly to 29 kilowatt hours (kWh) per year. The highest average electricity use per connection was in North America (58 kWh), followed by Greater China (47 kWh) and Europe (37 kWh), due in part to the higher prevalence of fixed broadband connections in these regions (**Figure 11**, black markers). In the United States, high penetration of fixed wireless access (FWA) may also contribute to higher energy use per connection. In Greater China, data centres also make up an important and growing share of operator electricity use.

Sub-Saharan Africa, which has relatively low 5G penetration, very few fixed broadband connections and poor access to grid electricity, had an average annual electricity use of just 7 kWh per connection, or 12 kWh per connection when energy from on-site generators and tower companies are included.

For most operators, networks account for the majority of overall electricity use. Disclosures from more than 30 operators show that, on average, three-quarters of electricity use was consumed in fixed and mobile access networks, with mobile networks typically accounting for 60–80% of total network electricity (for operators providing both mobile and fixed services). For most operators – except for those with large data centre businesses, primarily in Asia – data centres account for less than 10% of overall electricity use.

Given that most operational emissions come from electricity, reducing operational emissions requires action in two key areas: energy efficiency – particularly in networks – and increasing the share of renewable and low-carbon electricity.

Figure 11 **Electricity use by mobile operators by region, 2024**



Networks account for the majority of operator electricity use, highlighting the critical role of energy efficiency and renewable energy to reduce Scope 2 emissions

Note: MENA = Middle East and North Africa. Connections include mobile and fixed broadband.

Source: GSMA analysis based on latest CDP disclosures and corporate sustainability reports.

14 This figure covers electricity consumed by mobile network operators and excludes electricity consumed by tower companies and telecoms operators that exclusively operate fixed-line networks.
15 Electricity consumed by customer premises equipment (i.e. by customers) are not included in these figures.

Operators are becoming more energy efficient, with total electricity use per connection falling below 30 kWh per connection in 2024

Energy efficiency is a top priority for operators. Energy accounts for an important share of operational costs, and volatile fossil fuel prices – as seen with the current energy crisis – have increased the urgency of improving energy efficiency.

Total electricity use per connection[16] – a key indicator of energy efficiency – varies significantly between operators and regions. At the global level, overall average electricity use per connection[17] has fallen by 3% since 2019, reaching 29 kWh per connection in 2024.

Trends diverge at the regional and country level. For example, Europe, Latin America, North America and Sub-Saharan Africa have seen electricity use per connection drop by more than 10% since 2019, while China has seen a 12% increase.

Multiple factors contribute to differences in total electricity use per connection. One of the biggest factors is the extent to which an operator also runs fixed-line operations, since the average fixed connection consumes around twice as much energy as a mobile connection.[18]

Operators with major colocation data centre operations (more common in Asia) also consume much more energy per connection compared with those only offering network services.

Focusing only on network energy use, technical factors such as network deployment, as well as other factors such as population distribution, geography and topography, could also affect energy consumption. For example, operators with higher adoption of FWA, such as those in the United States, consume more electricity per connection.

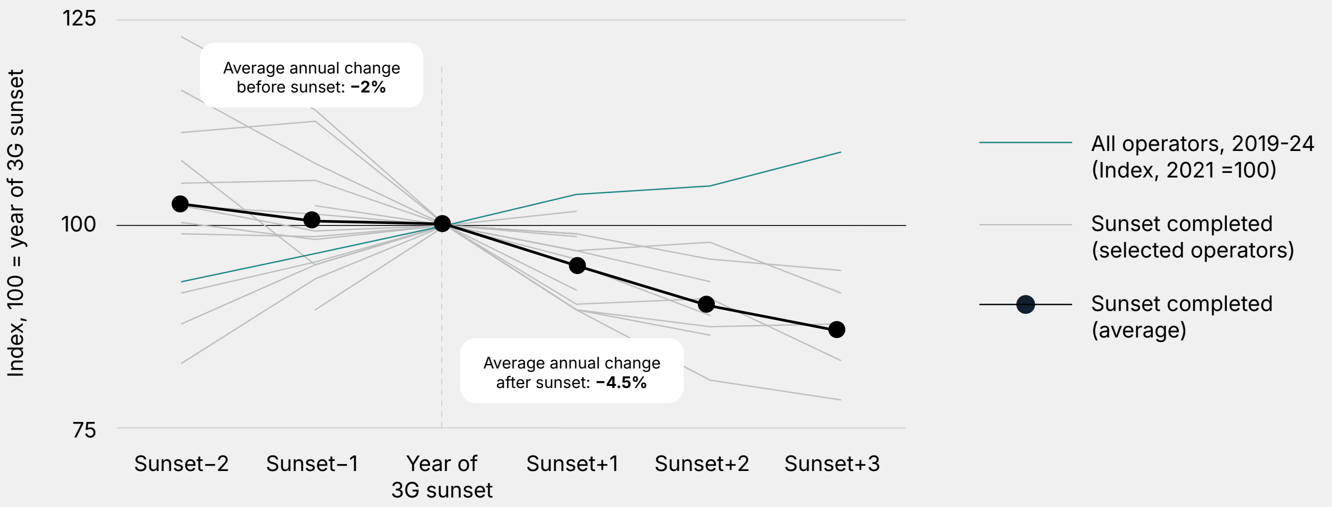
16 Connections include mobile connections and fixed broadband connections.
17 Total electricity use by operators, including data centres and offices, divided by total number of mobile connections and fixed broadband connections.
18 The global average fixed broadband connection consumes around 50 kWh of electricity per year, compared with around 25 kWh for a mobile broadband connection, although the specific values vary depending on the technology and region. Fixed broadband consumption excludes electricity consumed by customer premises equipment, which typically adds around 80 kWh per connection per year.

Despite the higher energy efficiency of 5G per unit of data transmitted, the densification of towers and increased antenna elements means electricity consumption of mobile networks is expected to increase in the near term.

This increase can be mitigated by the retirement of older, less energy-efficient 2G and 3G networks. Analysis of 14 selected operators from advanced markets that have completed their 3G sunsets show that electricity consumption dropped by an average of 4.5% per year following sunsets compared with just 2% per year in the two years preceding sunsets (**Figure 12**). The switch from copper to fibre in fixed networks also offers significant energy savings. Additionally, the deployment of energy-efficiency features of 5G, such as AI-optimised sleep modes, also offer important energy-saving opportunities for operators.

Case Study:
Telefónica – Digital Twin for Energy-Efficient Data Centres

Figure 12 **Electricity consumption before and after 3G sunset, selected operators**



Legacy network sunsets can be an important source of energy savings

Note: Analysis covers 14 selected operators that have completed 3G sunsets from North America (3), Europe (5), and Asia Pacific (6).

Source: GSMA analysis based on corporate sustainability reports and publicly reported 3G sunset dates.

Reductions in the energy intensity of data transmission are slowing, highlighting the need to track other indicators of energy efficiency

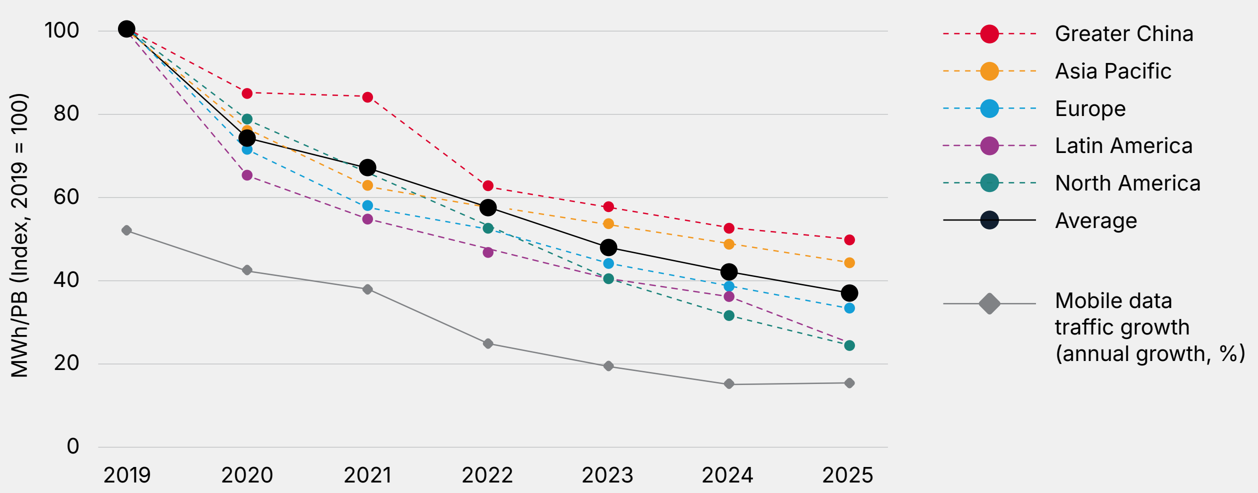
There are different ways to measure the energy efficiency of networks. The most commonly reported metric by operators is the energy intensity of data transmission (i.e. energy use per unit data), typically reported in kWh per gigabyte (kWh/GB) or megawatt hours per petabyte (MWh/PB). Operators that report this metric typically report based on company-wide or network-wide energy use.

Public data from 18 operators shows that the energy intensity of data transmission fell by an average of 15% per year between 2019 and 2025 (**Figure 13**). However, there is significant variation between operators, both in terms of their absolute energy intensities (25–450 MWh/PB in 2024) and their average annual improvement rates.

The average annual reduction of these 18 operators has slowed in recent years, halving from more than 25% in 2020 to 12% in 2025. This trend partly reflects a slowing of data traffic growth,[19] particularly in advanced markets, rather than slowing progress or effort on energy efficiency. Global mobile data traffic continues to expand, but growth has slowed from 40–45% in 2020 to 16% in 2025 (**Figure 13**), with further deceleration projected to 14% by 2030.[20] This highlights the need for a broader set of indicators to track real-world progress in energy efficiency, such as energy per connection or coverage.

Similar results and trends are observed in other data sets. 23 operators reporting energy intensities as part of the GSMA *ESG Metrics for Mobile Benchmark 2025*[21] had a range of 23–297 MWh/PB, with an average year-over-year reduction of 14%. 16 operator groups participating in the GSMA Intelligence *Energy Efficiency Benchmark 2025*[22] had an average mobile network energy intensity of 80 MWh/PB. The average mobile connection used 17 kWh per year while the average network site consumed 24 MWh per year.

Figure 13 **Energy intensity of data transmission of selected operators, 2019-2025**



The energy intensity of data transmission of selected operators have fallen by an average of 65% since 2019, but reductions have slowed in recent years

Note: The data shown are averages across 18 selected operators disclosing this data and are intended to show indicative trends.

Source: GSMA analysis based on corporate sustainability reports. Mobile data traffic growth rates based on Ericsson (2025) and GSMA Intelligence (2026)

19 Ericsson. (2025). *Mobile data traffic growth rates*.
20 GSMA analysis based on: Ericsson. (2025). *Ericsson Mobility Visualizer*; GSMA Intelligence (2026), and Cisco. (2026). *AI Impact on Wide Area Networks*
21 GSMA Intelligence. (2026). *ESG Metrics for Mobile Benchmarking 2025*.
22 GSMA Intelligence. (2026). *Going green: measuring the energy efficiency of mobile networks and towers*.

AI and hyperscalers are driving rapid growth in data centre energy demand

Global data centre electricity use rose by 75% (more than 180 TWh) between 2019 and 2024[23] due to growing demand for data centre services, including artificial intelligence (AI) (**Figure 14**). Over the same period, electricity use of telecommunications networks rose by less than 20%.

Data centre electricity use continued to grow quickly in 2025, up 17% (more than 70 TWh) to nearly 500 TWh.[24] Telco-owned data centres currently account for only 10% of overall data centre energy consumption, mostly in Greater China and Asia Pacific.[25]

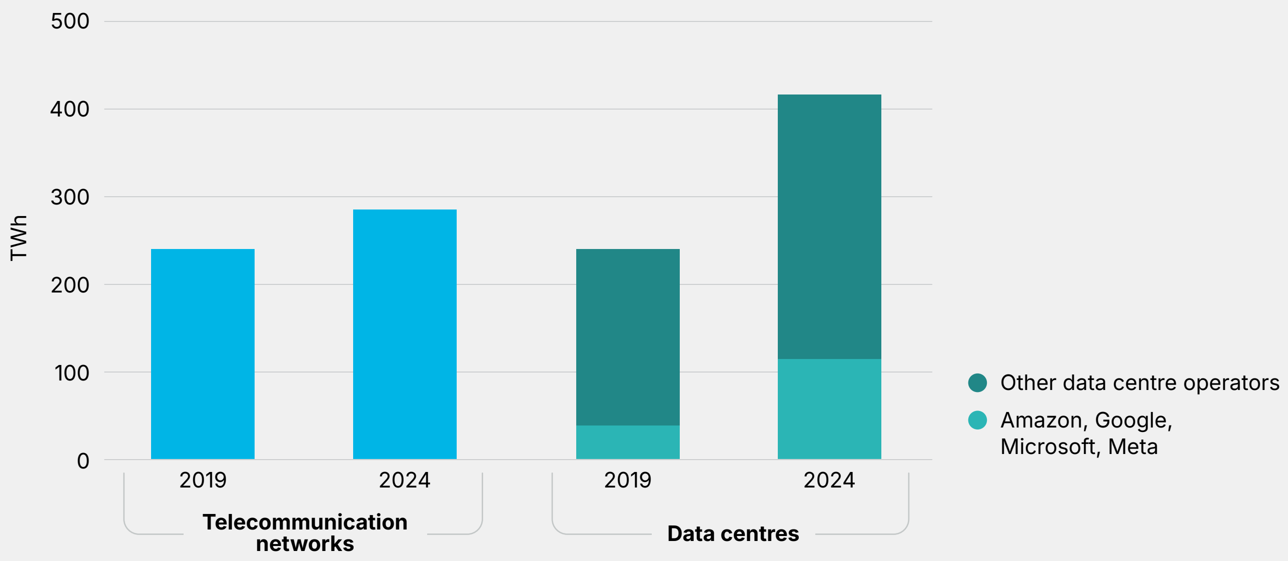
Much of this recent growth is driven by hyperscale data centres handling most AI-related workloads. The four largest hyperscalers – Amazon, Google, Meta and Microsoft – saw their combined data centre electricity use more than triple to around 115 TWh in 2024.[26]

Near-term data centre energy demand growth is expected to be driven primarily by accelerated servers (e.g. GPUs) to serve GenAI workloads, primarily in cloud and hyperscale data centres.

Global data centre energy use is projected to further double between 2025 and 2030 to 950 TWh, with energy use from AI-focused data centres tripling over the same period.[27] The U.S. accounts for nearly half of the growth over this period.

Although data centres are projected to only account for a tenth of the overall electricity demand growth to 2030, the geographical concentration and rapid pace of development means that a considerable amount of new data centre energy demand will be met by fossil fuels. In the U.S., more than 100 GW of new dedicated onsite natural gas-fired capacity is currently planned to supply data centres.[28]

Figure 14 **Electricity use trends of telecommunication networks and data centres, 2019-2024**



Data centre energy demand has risen quickly since 2019, especially among the largest hyperscalers due to the rapid growth in AI demand

Note: Telecommunication networks include mobile, fixed and core networks, and exclude data centres operated by telecom operators. "Other data centres" include other hyperscale operators, colocation operators, cloud service providers, enterprise, edge and telco data centres.

Source: GSMA analysis based on IEA (2025), EDNA (2025), and company disclosures

23 GSMA analysis based on IEA. (2025). *Energy and AI*.
24 IEA. (2026). *Key Questions on Energy and AI*
25 GSMA. (2026). *Energy Implications of AI for Mobile Operators*.
26 GSMA analysis of EDNA (2025) and corporate sustainability reports.
27 IEA. (2026). *Key Questions on Energy and AI*.
28 IEA. (2025). Energy and AI and IEA. (2026). *Key Questions on Energy and AI*.

Several telcos, mostly in Asia and the Middle East, have announced large AI data centre projects that could put upward pressure on energy and emissions

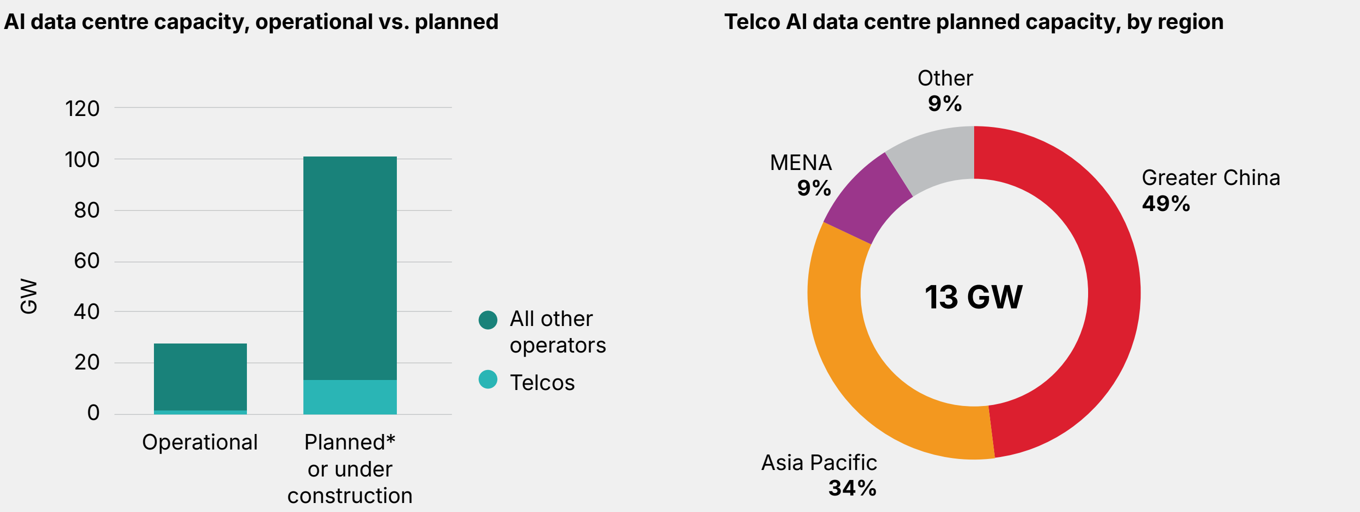
Telco-owned AI data centres[29] account for less than 5% of global operational capacity today but could play a growing role in the future. Several operators have announced projects and partnerships[30] to build large data centres focused on AI workloads in the coming years. Based on public announcements, telcos account for 12% of announced or planned AI data centre capacity globally (**Figure 15**, left).

While telco-owned AI data centres are not expected to be a driving force behind global AI data centre growth, they are likely to account for a significant share of AI data centre capacity in some countries, including China, South Korea, India, Saudi Arabia and Canada. Half of the announced or planned capacity will be in China, with an additional 30% in the rest of Asia (**Figure 15**, right). Once fully built, this could add more than 60 TWh of electricity demand to operators in these countries.

Some industry suppliers such as NVIDIA and Nokia see AI-RAN as a route for operators to become providers of distributed inference closer to end users.[31] This emerging model coincides with growing public opposition to new gigawatt-scale AI data centre projects, particularly in the U.S. Grid connection delays and concerns over rising electricity prices and local water and noise impacts have led to stalled or cancelled data centre builds.[32]

These pressures suggest a growing share of inference workloads may be handled by smaller, more efficient and more localised facilities in which operators may play a growing role. Some inference tasks may also be handled on laptops and smartphones, helping to distribute computational and energy demand.

Figure 15 **Current and announced AI data centre capacity by operator type and telco region**



Although telcos are not a primary driver of AI data centre growth globally, operators in Asia are poised to play an important role – with growing energy and emissions implications

*Planned includes announced projects. "AI data centres" include AI data centres, GPU clusters, GPU-aaS, and AI factories, planned for delivery as late as 2032.

Source: Telco figures based on GSMA analysis of public announcements and media coverage as of May 2026.
Total operational capacity data from EpochAI as of January 2026. Total planned or under construction data from AI Data Centre Index as of April 2026.

29 It is important to note that it is difficult to distinguish AI data centres from multipurpose data centres that handle both conventional (non-AI) and AI-related workloads. This analysis focuses on telco announcements on AI data centres or associated terms, such as "GPU clusters".
30 Some of these initiatives are joint ventures or partnerships with third parties, such as cloud providers, chip manufacturers or specialist data centre operators, rather than projects undertaken by the operators alone. For the purpose of this analysis and completeness, these projects are included in this analysis. From an emissions accounting perspective, these arrangements raise questions about allocation and how these emissions will be counted by telcos and their partners (e.g. in Scope 1 and 2 or Scope 3).
31 GSMA analysis based on Nvidia (2026) and Nvidia (2026).
32 GSMA analysis based on FT (2026), ArsTechnica (2026), Sightline Climate (2026) and WRI (2026).

Indirect impacts of AI on network traffic and energy are significant, but uncertain

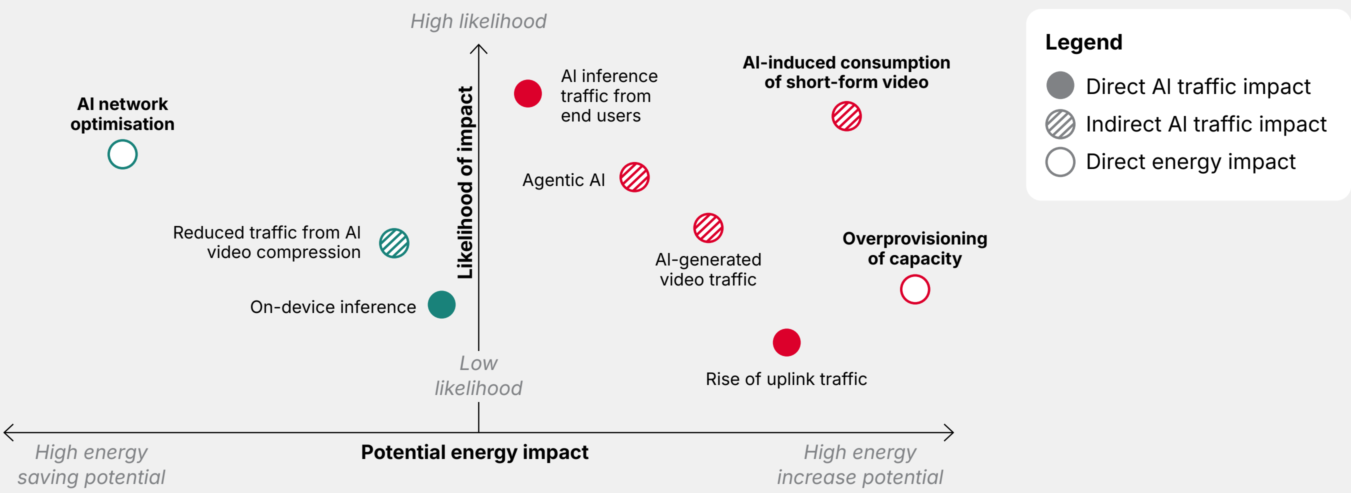
In terms of network operations and energy, AI could have both direct and indirect impacts that could increase or decrease network traffic and energy use (**Figure 16**).

Recent data[33] shows that **direct GenAI inference traffic** (i.e. traffic from GenAI apps such as ChatGPT) has nearly doubled over the past year but remains low at around 0.2% of mobile traffic as of early 2026. Although GenAI traffic is likely to continue growing, the potential impact of user-generated inference traffic on network energy use to 2030 is expected to be relatively low.

One of the larger potential AI-related drivers to energy demand growth in networks is the **rise of uplink traffic**, driven by users uploading more videos to AI-enabled services. However, limited adoption of wearables and battery constraints that limit continuous upload suggest this is unlikely to drive significant energy demand growth. **On-device inference** is unlikely to have impacts on network energy use, but could save energy in data centres due to offloading of compute and the use of smaller, more efficient on-device models.[34]

AI could have a much larger impact on traffic and energy through **indirect effects**, such as the generation and consumption of GenAI videos, induced traffic from recommender algorithms and the rise of agentic AI.

Figure 16 **Potential impacts of AI on network energy use to 2030**



AI is a double-edged sword for network energy consumption: network optimisation could cut energy use, while indirect AI traffic and overprovisioning of capacity could increase network energy demand

Note: Red indicates potential energy increases. Green indicates potential energy savings. Bolded impacts indicate the most significant potential impacts.

Source: GSMA analysis.

33 GSMA analysis based on GSMA Intelligence (2026), Ericsson (2025), Nokia (2025), AppLogic Networks (2026) and Cisco (2026).
34 IEA. (2025). "Chapter 2.4.1", *Energy and AI* .

Since video accounts for around two-thirds of mobile traffic, any AI-related effect on video traffic could have an outsized impact on network traffic and energy use. For example, **AI-induced consumption of short-form videos** from recommender algorithms could increase mobile network energy use. Short-form videos are increasingly dominating mobile traffic, as many videos are preloaded to drive engagement and ensure high quality of service.[35]

On the other hand, **AI-optimised video encoding and compression** could play a role in reducing traffic, but with limited impacts on energy savings due to the rebound effects of high-quality service and usage.[36]

Agentic AI is expected to mostly drive increased traffic within and between data centres as well as machine-to-machine traffic in fixed networks, where energy impacts in access networks from traffic growth are likely to be limited.

One of the most important direct energy impacts of AI is **AI network optimisation** to improve the energy efficiency of network operations, including through AI-enabled sleep modes, dynamic shutdown, load balancing and traffic forecasting.[37] On the other hand, the biggest AI-related risk to energy growth in networks is the **overprovisioning of network capacity** if operators invest in new infrastructure due to anticipated AI-driven growth in traffic and changing traffic patterns that several vendors have forecasted.[38]

35 Ericsson. (2025). *Short-form dominates video traffic.*
36 Gomes, J. et al. (2026). *End-to-End Neural Video Compression: A Review*.
37 GSMA. (2026). *Energy Implications of AI for Mobile Operators*.
38 Network equipment vendors Cisco, Ericsson, Nokia and Ciena have published reports that suggest AI traffic will require more network capacity and infrastructure.

Operators are buying and using more renewable energy, with purchased and generated renewables accounting for a quarter of electricity consumption

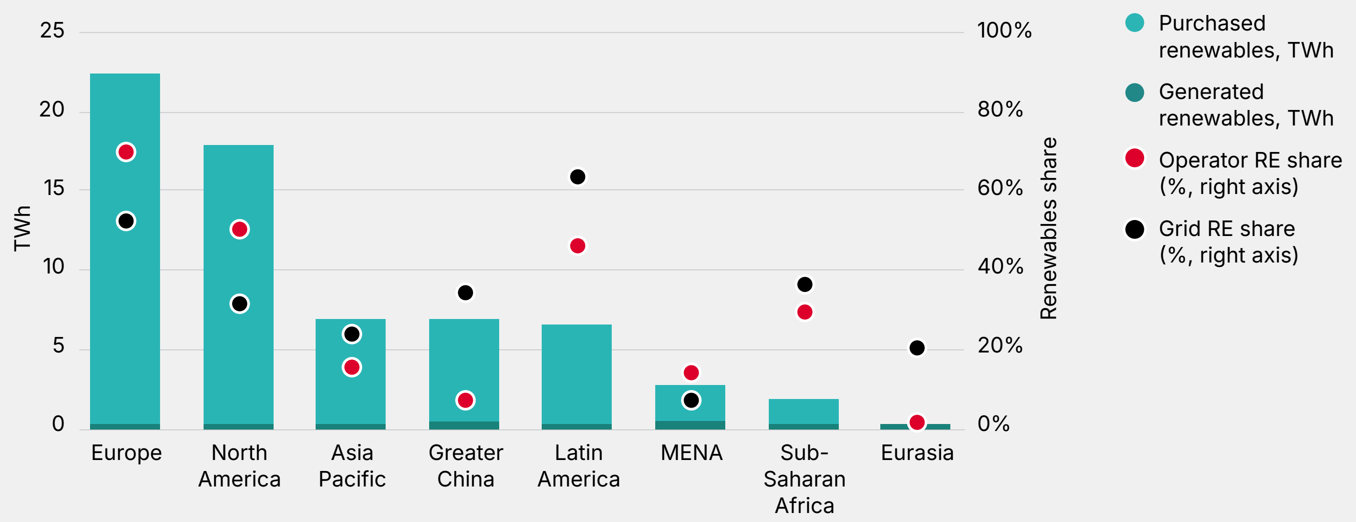
Renewable energy is already playing a major role in reducing the emissions of operators, accounting for nearly 60% of operational emission reductions between 2023 and 2024.

Globally, operators purchased and generated around 70 TWh of renewable electricity in 2024, equivalent to the annual electricity demand of Czechia or the total renewable electricity generation of Indonesia. This includes around 2 TWh generated by operators (mostly solar), helping to reduce emissions by displacing diesel generation and grid electricity. Without these renewables, operational emissions are estimated to have been 23 $MtCO_2e$ (20%) higher in 2024.

The share of operator electricity from purchased and generated renewables has more than doubled from 10% in 2019 to 24% in 2024. 14 operators, mostly in Europe, matched 100% of their electricity use in 2024 with renewables.

European operators purchased and generated 22 TWh of renewable electricity in 2024 or around 70% of their electricity consumption (**Figure 17**). North American operators sourced half of their electricity from renewables, while those in Latin America sourced 45%.

Figure 17 **Renewable electricity purchased and generated by region, 2024**



Operators collectively purchased and generated 70 TWh of renewable electricity in 2024, led by European operators who sourced around 70% of their electricity from renewables

Note: Purchased renewables by operators primarily come from solar and wind, while generated renewables primarily come from on-site solar. RE = renewable energy.

Source: GSMA analysis based on latest CDP disclosures. Grid share of renewables based on Ember Yearly Electricity Data (2026)

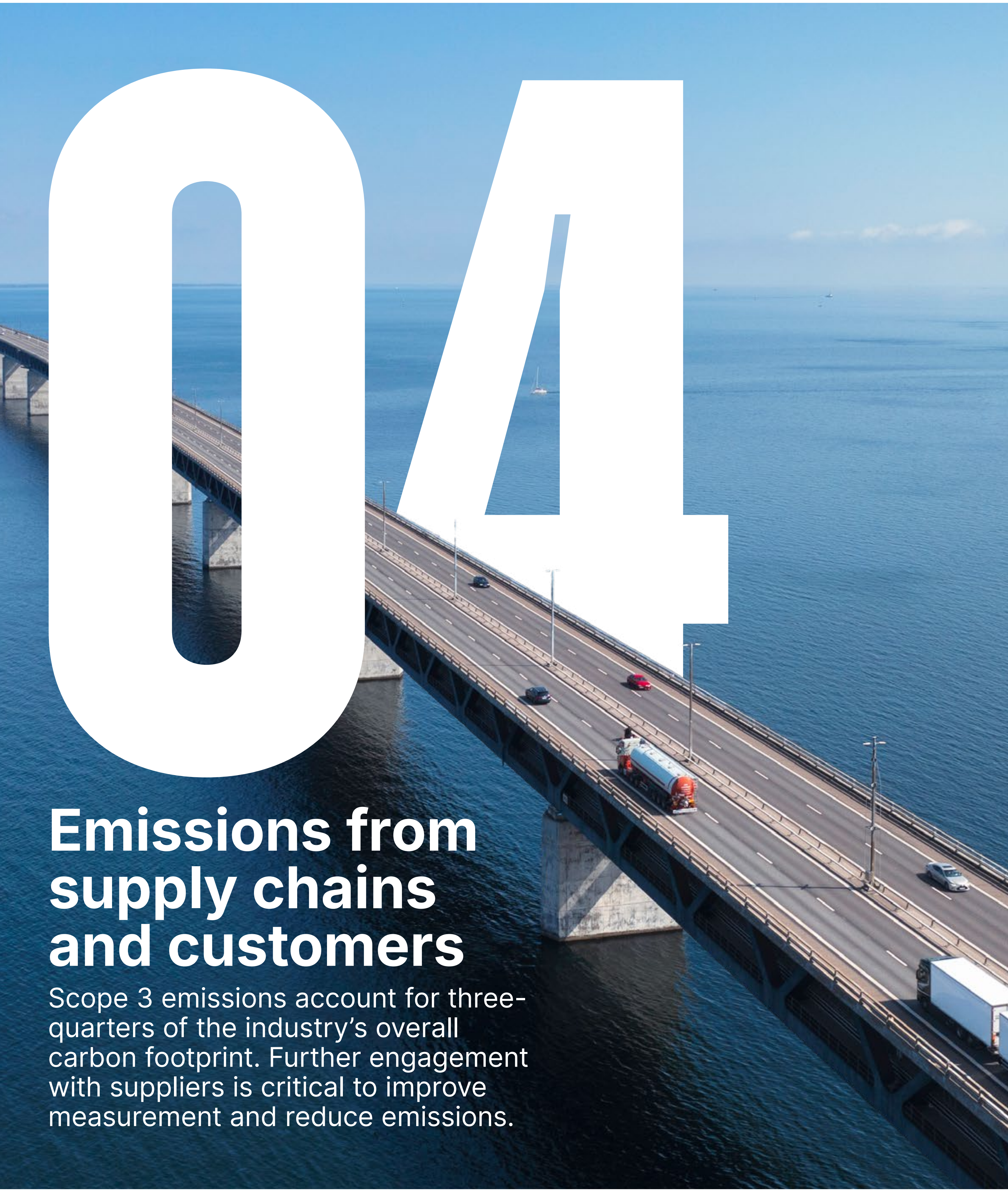
In Asia Pacific, operators sourced around 7 TWh from renewables, with Japanese operators accounting for more than 70% of the total. Renewables purchases in Greater China quadrupled in 2024 to almost 7 TWh, but the share remains low at 6% compared with the one-third renewable share of the grid mix.

Operators in emerging markets, including Sub-Saharan Africa and Asia, face challenges in accessing renewable energy. A new GSMA whitepaper, *Renewable Energy for Mobile Networks in Asia*, shows that market readiness and policy frameworks for renewable energy vary significantly across Asia. In some countries, procurement mechanisms to access off-site renewables (e.g. PPAs) are limited or under development. In more advanced markets, barriers for operators include high costs or a lack of options for distributed loads such as mobile towers.

As of May 2026, 18 operators are RE100[39] members, purchasing a combined 32 TWh of renewables in 2024 out of a total electricity consumption of more than 50 TWh (63%). Data disclosed by these RE100 members to CDP show that a growing share of renewable electricity was purchased through PPAs, up five percentage points to 33%. 45% of the purchased renewables came from unbundled certificates and 22% from green tariffs with electricity suppliers and other instruments.

Case Study:
Globe – Scaling-up Energy Transition through Site Aggregation

39 RE100 (2026), RE100 Members.



04

Emissions from supply chains and customers

Scope 3 emissions account for three-quarters of the industry's overall carbon footprint. Further engagement with suppliers is critical to improve measurement and reduce emissions.

More than 70% of operators' Scope 3 emissions came from just four categories: 1) Purchased goods and services; 2) Capital goods; 3) Fuel- and energy-related activities; and 11) Use of sold products.

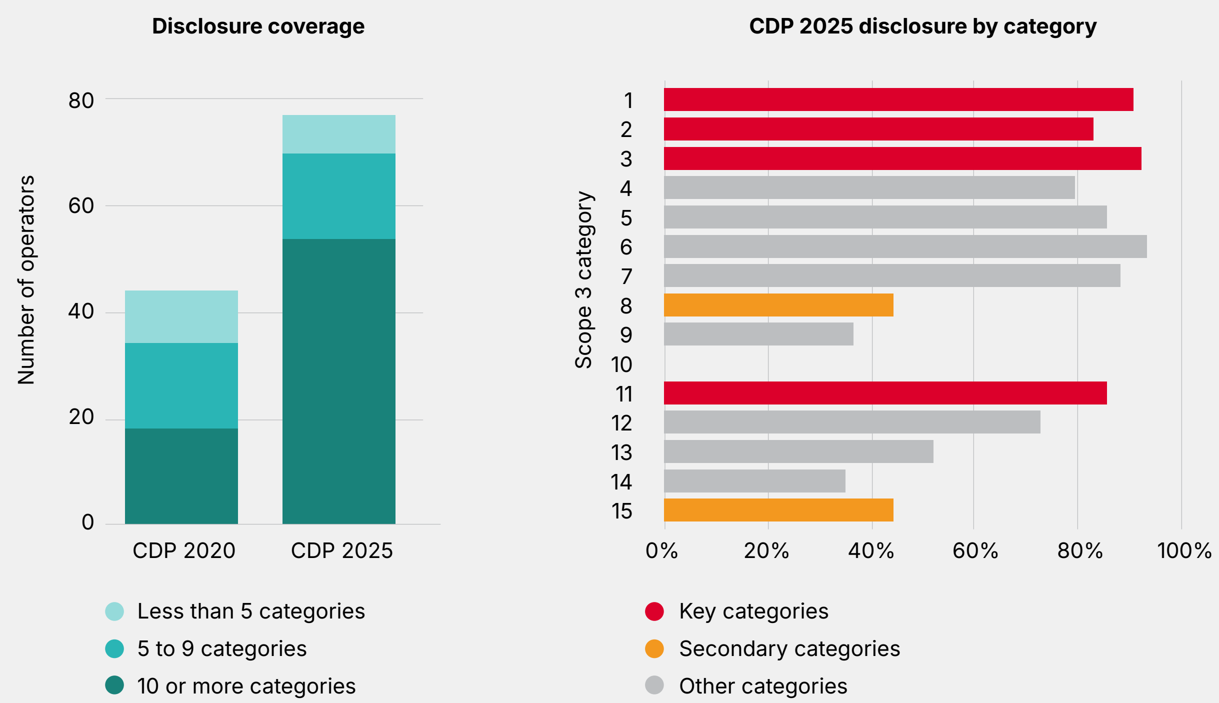
Nearly all operators disclosing to CDP in 2025 disclosed their Scope 3 emissions, including nearly 60% of operators disclosing 10 or more categories, up from 40% in 2020 (**Figure 18**, left).

Four key Scope 3 categories – 1) Purchased goods and services; 2) Capital goods; 3) Fuel- and energy-related activities; and 11) Use of sold products – accounted for more than 70% of operators' overall Scope 3 emissions, with Category 1 accounting for 37% and Category 2 for 15%.

More than 80% of operators disclosing to CDP reported on each of these categories (**Figure 18**, right), including 75% of operators that reported on all four categories.

Categories 8 (upstream leased assets) and 15 (investments) each accounted for around 10% of all Scope 3 emissions but are not applicable to all operators.

Figure 18 **Scope 3 disclosure coverage of operators disclosing to CDP**



Operators are disclosing a growing number of Scope 3 categories, including on key categories that account for over 80% of operators' Scope 3 emissions

Note: Analysis based on disclosures of 77 operators to CDP.

Source: GSMA analysis based on latest CDP disclosures.

Differences in business models, country contexts and accounting approaches result in major differences in Scope 3 emissions across operators and regions

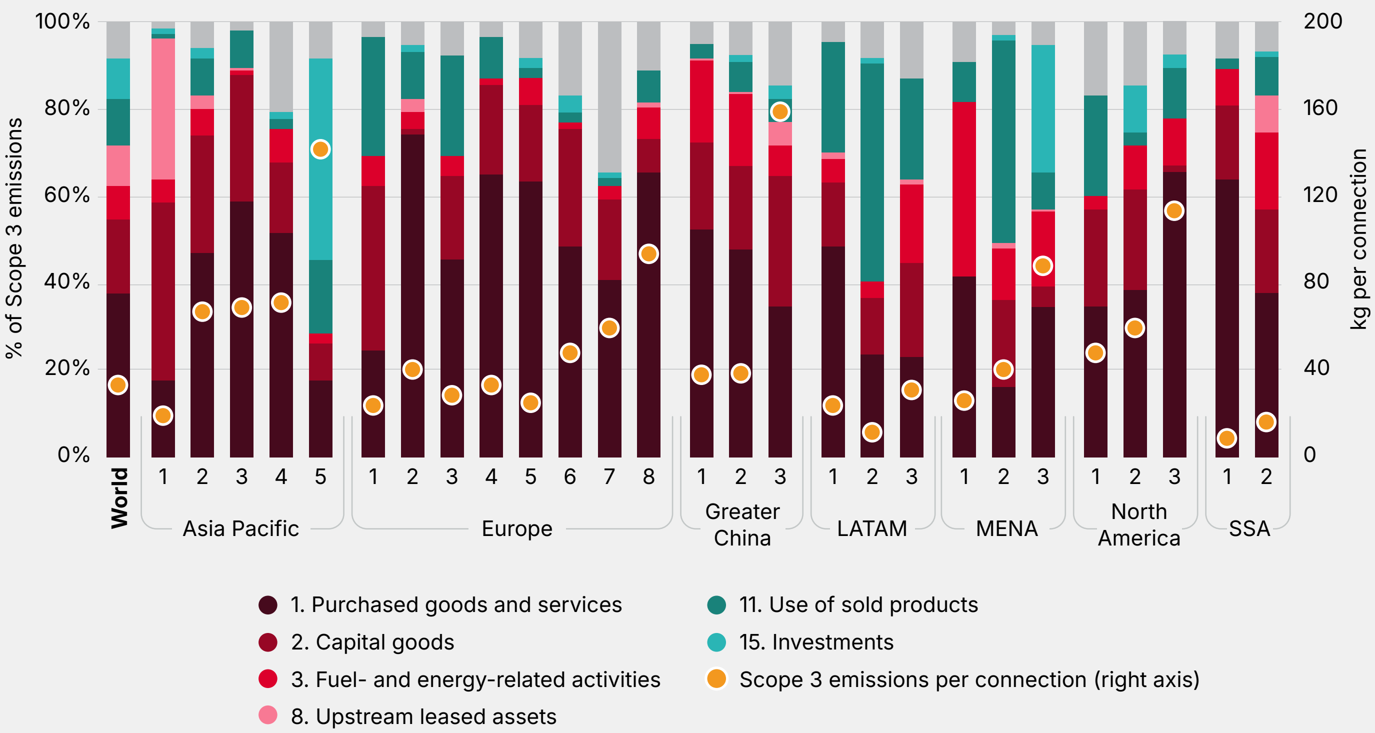
Scope 3 emissions of operators were an estimated 310 $MtCO_2e$ in 2024, or around three-quarters of the mobile industry's total emissions.

The global average Scope 3 emissions per connection were 30 $kgCO_2e$, but this varies significantly between operators and regions, ranging from around 10 kg per connection in developing markets to more than 100 kg per connection for some operators in advanced economies (**Figure 19**, yellow markers).

For most operators, the majority of Scope 3 emissions come from Categories 1 (purchased goods and services) and 2 (capital goods), but the relative share of each category varies significantly between operators.

Some of these variations stem from differences in their operations and business models, as well as their country of operations. For example, operators in carbon-intensive grids (e.g. South Africa, Saudi Arabia, India, Poland) or those that consume a lot of diesel or gasoline typically have a higher share of Category 3 emissions (fuel- and energy-related activities) due to the upstream emissions from fossil fuel production.

Figure 19 **Scope 3 emissions by Category for selected operators**



The amount and sources of Scope 3 emissions can differ substantially between operators and regions

Note: World shows the industry-level total of all operators disclosing Scope 3 data to CDP. Connections include mobile and fixed broadband.

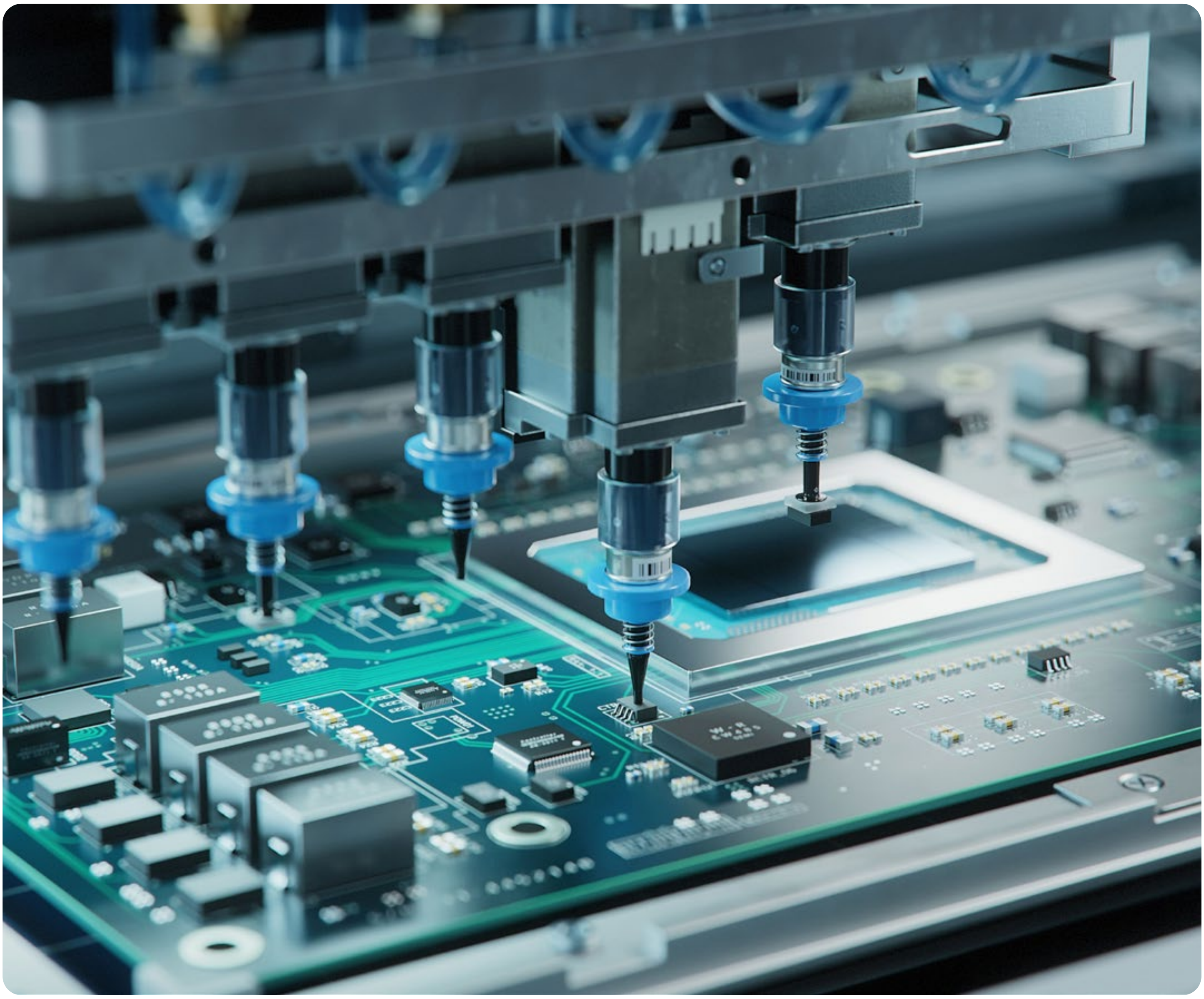
Source: GSMA analysis based on latest CDP disclosures.

Operators that have outsourced their towers to tower companies generally have a higher share of Scope 3 emissions in Category 8 (upstream leased assets).

Operators that serve many fixed broadband customers typically have higher Category 11 or 13 emissions due to the emissions from customer use of modems and other customer premises equipment, particularly in countries with carbon-intensive electricity. Operators that do not sell or lease devices typically have very low Category 11 emissions.

Most operators report no emissions from Category 15 (investments), but some operator groups with major investments and joint ventures have a higher proportion of Scope 3 emissions from Category 15.

Scope 3 emissions may also differ over time for an operator due to structural factors or differences in methodology and data sources. For example, a highly capital-intensive year could have significantly higher Category 1 and 2 emissions compared with other years. Some differences may also stem from methodological differences or a lack of data.



The GSMA is supporting operators to align the mobile industry on Scope 3 emissions and data sources

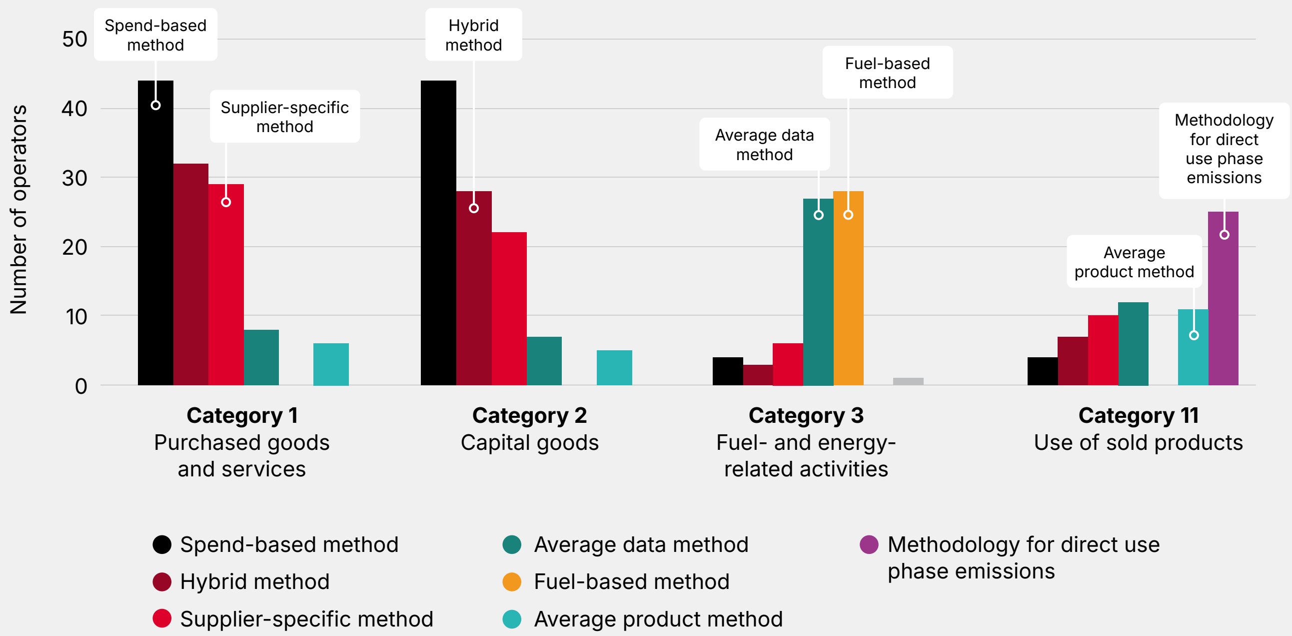
The type of data and assumptions also have major impacts on the quality and accuracy of Scope 3 estimates. Analysis of CDP disclosures shows that spend-based methods (i.e. industry average emission factors) remain the most common approach to estimates of Scope 3 emissions from category 1 and 2 (**Figure 20**). Given the limitations of industry average emission factors, including different data sources, the use of supplier-specific emission factors can help improve the quality of Scope 3 disclosures (see discussion related to **Figure 24**).

To help align methodologies and advise on data sources, the GSMA *Scope 3 Guidance for Telecommunication Operators* was launched in 2023 and has been widely adopted by operators.

The GSMA is also working with operators to help improve the availability of supplier data and align the mobile industry on data sources. In 2025, the GSMA developed a *Scope 3 Assessment Tool* to support operators in improving both the coverage and accuracy of their Scope 3 inventory calculations. The tool is backed by a comprehensive database covering supplier-specific emission factors of more than 100 key suppliers, industry average emission factors of 400 sectors and 149 countries from CEDA and product-level emission factors covering more than 200 common products, including smartphones. Tool features and capabilities are under continuous development, with expansion of supplier and product-level emission factors updated annually.

The GSMA has also developed guidance on *Quantifying the Carbon Savings of Circularity* to help operators calculate how circularity initiatives affect Scope 3 emission inventories.

Figure 20 **Scope 3 emissions by accounting approach**



Spend-based methods are more common than supplier-specific methods for categories 1 and 2, indicating the need for supplier-specific emission factors

Note: Analysis based on disclosures of 77 operators to CDP.

Source: GSMA analysis based on latest CDP disclosures.

Key supplier groups are setting climate targets, but tower companies are lagging behind

For a typical operator, around two-thirds of Scope 3 emissions come from upstream suppliers. Most of these emissions come from a relatively small number of key suppliers to the industry.

Based on the top supplier lists of more than 20 operators and analysis of industry supply chains, the GSMA identified 100 key industry suppliers across five supplier groups:

- Network equipment and customer premises equipment (CPE) manufacturers (30 companies)
- Mobile phone manufacturers (20)
- Tower companies (25)
- Cloud and IT service providers (15)
- Other (10)[40]

These 100 companies include many of the largest companies in the world and have a combined market capitalisation of around USD 25 trillion (as of May 2026).

40 "Other" includes key suppliers not included in the other categories (e.g. wire/cable manufacturers), as well as key upstream suppliers such as chip suppliers and fabs.

Of these 100 companies, 68 disclosed to CDP in 2025, 17 of which received an A rating. 20 companies disclosed Scope 1 and 2 emissions data through public reports.

Half of the 100 suppliers have validated near-term SBTs. 80% of the cloud and IT service providers analysed have validated SBTs, as do 53% of the network equipment and CPE manufacturers analysed (**Figure 21**).

Of the top 20 mobile phone manufacturers globally, covering around 98% of the global market by unit sales, 10 have validated near-term SBTs.

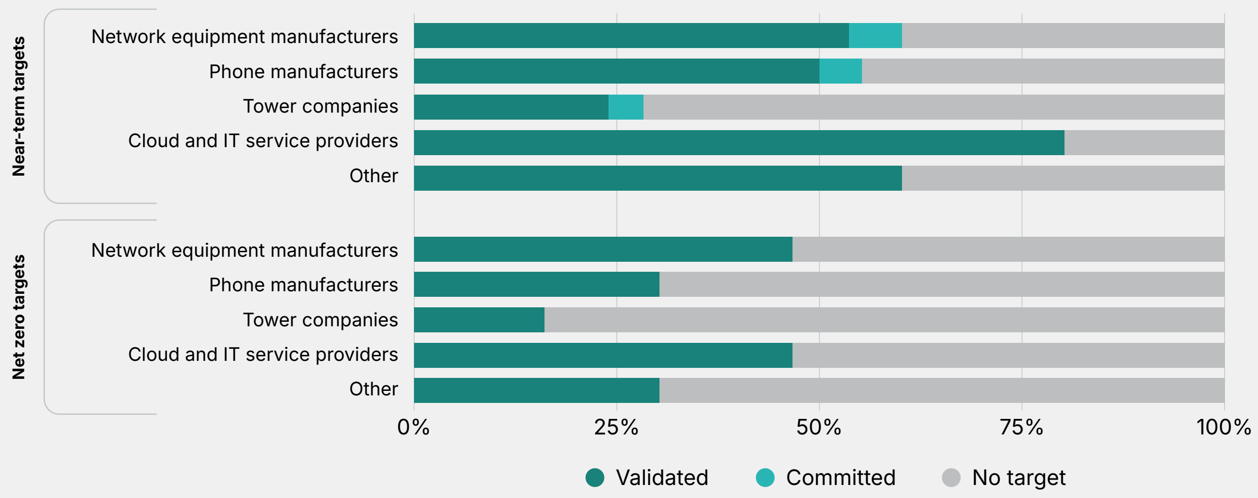
Case Study:
EDOTCO – Building Sustainable Supplier Ecosystems

As a supplier group, tower companies had the lowest CDP disclosure rate (36%) and just six of the top 25 tower companies[41] (24%) have validated near-term SBTs.

60% of other suppliers analysed, including key upstream suppliers such as fabless chip suppliers and semiconductor fabs, have validated near-term SBTs.

Case Study:
Ericsson - Accelerating Supply-Chain Climate Action

Figure 21 **Key suppliers with science-based targets, by supplier type**



More than half of key network equipment suppliers, mobile phone manufacturers, and cloud and IT service providers have validated near-term science-based targets

Note: Analysis covers 100 key suppliers extracted from top supplier lists from mobile operators and GSMA analysis of industry supply chains, including 30 of the largest manufacturers of network equipment and customer premises equipment, the top 20 mobile phone manufacturers by market share (covering about 98% of mobile phone sales globally), the top 25 tower companies by tower count (excluding tower companies wholly owned or controlled by a single mobile operator), and 15 of the largest cloud and IT service providers.

Source: GSMA analysis based on SBTi.

41 Based on tower counts from TowerXchange, excluding tower companies wholly owned by a single operator.

Deep dive on tower companies

Mobile operators still have ownership stakes in most towers globally, but ownership structure varies significantly by region

The top 100[42] tower companies operate around 4 million sites, covering approximately two-thirds of the global tower base. This analysis of towers focuses on these 4 million towers.

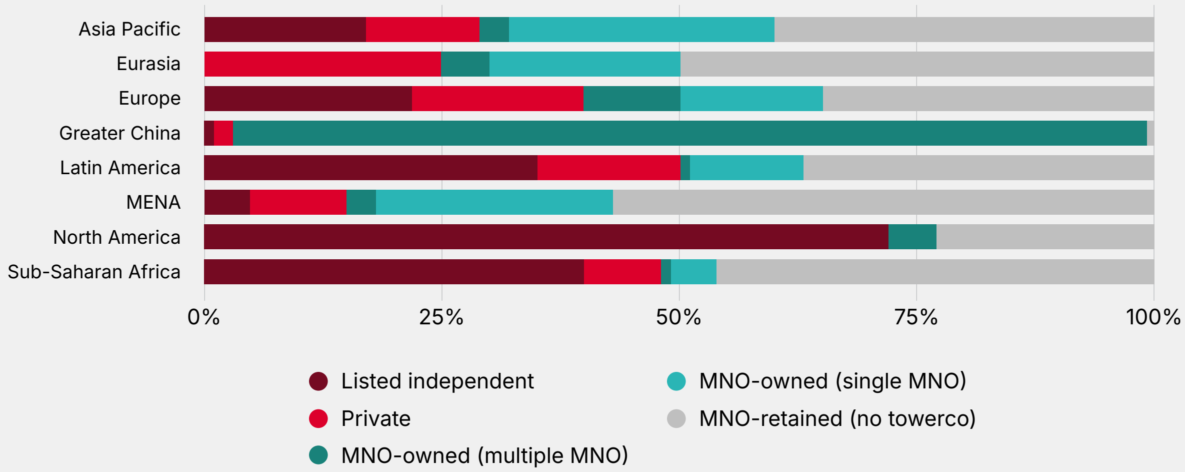
Although some of the largest mobile network operators (MNOs) have divested their tower businesses over the past two decades, MNOs still maintain full or majority ownership of around three-quarters of the 4 million towers covered in this analysis. 70% of these MNO-owned towers sit under structures jointly owned by two or more operators, including China Tower and Indus Towers. For these towers, no single tenant has unilateral authority to commit to decarbonisation investments.

The remaining 25% of towers are either owned by listed independent companies (e.g. American Tower, Cellnex, Crown Castle, SBA Communications, Helios Towers) or privately held companies backed by infrastructure funds, private equity or other investors (e.g. Altius, Phoenix Tower International).

The predominant type of ownership structure varies by region (**Figure 22**). For example, in Greater China, nearly all the towers are owned by China Tower, which is jointly owned by three major operators (China Mobile, China Telecom, China Unicom) and the State-owned Assets Supervision and Administration Commission of the State Council (SASAC). In the Middle East and North Africa region, around 90% of all towers are also owned by operators.

Regions with a significant share of towers owned by independent tower companies face particular decarbonisation challenges, particularly in regions with poor grid access and reliability such as Sub-Saharan Africa, South Asia and Southeast Asia. Contractual arrangements in these markets tend to create split incentives that discourage switching from diesel to renewables, and emissions disclosures from privately owned tower companies are very low.

Figure 22 **Tower ownership mix by region, 2024**



Regions with a high share of towers owned by independent companies – particularly those with poor grid access and reliability – may face bigger challenges in disclosure and decarbonisation

Note: Private includes tower companies backed by private equity, infrastructure funds, or other private investors. MNO = mobile network operator.

Source: GSMA analysis based on TowerXchange, corporate sustainability and annual reports, Dgtl Infra, SEC and national regulatory filings, and ITU.

42 Based on tower counts from TowerXchange data.

Deep dive on tower companies

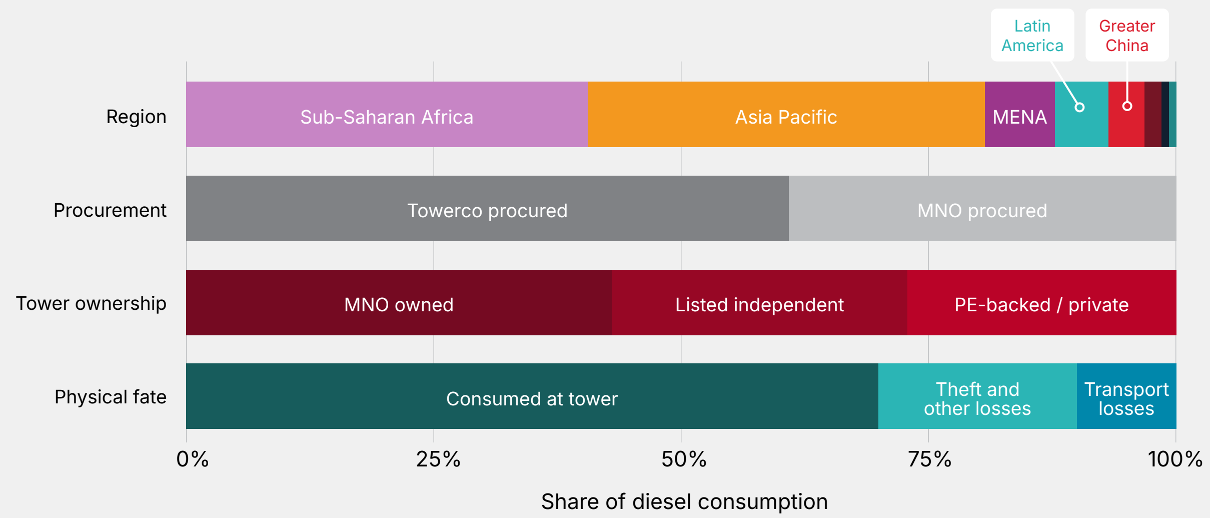
Mobile towers consumed around 4 billion litres of diesel in 2024, more than half of which was by tower companies

Only a quarter of the top 100 tower companies analysed disclosed their emissions in public reports in 2025. This means that emissions from roughly 1.1 million towers – around a sixth of all towers – may not appear in public emissions disclosures, appearing neither in a tower company's Scope 1 and Scope 2 nor in a tenant operator's Scope 3. The problem is most acute in Sub-Saharan Africa and South Asia, precisely the regions with the highest diesel consumption intensity, the weakest grids and the largest decarbonisation opportunity.

Based on available data and modelling, mobile towers consumed an estimated 4 billion litres of diesel in 2024, with more than half procured by tower companies (**Figure 23**).

Although listed independent, private equity-backed and other private tower companies only account for around a quarter of the overall tower count, they consume almost half the total diesel, in part because these companies tend to operate in markets with poor grid access and reliability. Around 80% of diesel was consumed in Sub-Saharan Africa and Asia Pacific (mostly India). Around 10% of all diesel consumed was lost, mainly through theft and transport losses.

Figure 23 **Global mobile tower diesel consumption, 2024**



Around 4 billion litres of diesel was consumed by towercos and mobile operators in 2024, with around 80% of total diesel consumed in Sub-Saharan Africa and Asia Pacific

Source: GSMA analysis based on corporate sustainability reports and government data and reports.

Deep dive on tower companies

Contractual arrangements between operators and tower companies largely determine whether incentives for decarbonisation are aligned

For operators that no longer own their passive infrastructure, tower companies can be an important contributor to their Scope 3 emissions, particularly if the it procures site energy on behalf of the operator.

The contractual arrangement between operators and tower companies dictates who procures the fuel or electricity, who owns and operates the energy assets (generators, solar, batteries) and how emissions are allocated between the parties and disclosed (**Table 1**).

The contractual arrangement also determines who captures the savings from a renewable or battery retrofit – affecting the strength of the split incentive that can block decarbonisation. In the landlord-tenant model, the tower company pays for energy, so it is incentivised to reduce the energy bill by switching to renewables.

Arrangements that face higher barriers to decarbonisation are those in which the party paying the energy bill is not the party controlling the power asset. If the operator pays for diesel, but the tower company owns the generator and site power system, the operator captures the operating cost savings from reduced diesel use, while the tower company must fund the retrofit. The business case therefore depends on contractual terms, not purely on the technical economics of solar, batteries or grid connection.

In advanced markets with reliable grids, the dominant arrangement is a basic **landlord-tenant model**, in which incentives for both energy efficiency and renewable energy are closely aligned.

In emerging and developing markets, especially those with poor grid access and reliability, **power-as-a-service** (PaaS) arrangements are more common. In a fixed-fee arrangement, tower companies are incentivised to switch to renewables since it captures all the cost savings, but the MNO is not incentivised to be more energy efficient since energy costs are fixed. For indexed fee arrangements, the barriers to switching to renewables depend on the indexing mechanism – whether it is linked to diesel prices or a consumer price index.

PaaS with pass-through arrangements create severe split incentives that are major barriers to the switch to renewables and decarbonisation. With the operator paying the energy bill but the tower company owning the generator, the tower company is not incentivised to invest in capital-intensive solar or batteries since the operational cost savings would be passed on to the operator. These models are primarily found in Sub-Saharan Africa, India, Latin America and Southeast Asia.

In weak grid markets, an increasingly common[43] arrangement is for third-party **energy service companies (ESCOs)** to procure energy for the tower company or MNO. These can be found in some Sub-Saharan African markets (e.g. Jaza Energy with IHS Towers, Camusat with Orange) and South Asia.

43 Bauer, G.K. (4 September 2024). *"Why and how mobile operators are looking to renewables to power networks across Africa"*. *GSMA Mobile for Development Blog*.

Deep dive on tower companies

Table 1 Common arrangements between mobile operators and tower companies

Arrangement	Energy procurement and billing	Emissions disclosure	Barriers to switching to renewables
MNO-retained / self-operated • MNO owns site, power system and radios • ~30% of global towers • Common in MENA, Asia Pacific and parts of Sub-Saharan Africa	MNO procures all energy directly	MNO: Scope 1 (diesel) and Scope 2 (grid)	**Low** – MNO controls capital expenditure (capex) and operational expenditure (opex) and captures all savings
Landlord-tenant (basic lease) • Tower company owns passive layer and MNO owns active equipment • ~25% of global towers • Common in Western Europe and Latin America	Separate supply contracts or submetered active load	Tower company: Scope 1 and 2 (passive) MNO: Scope 1 and 2 (active) or MNO Scope 3 Category 8 if submetered by tower company	**Low** – Tower company pays the energy bill and captures cost savings, recouping costs through lower operating expenditures
Power-as-a-Service (PaaS) • Tower company owns passive and power system • ~10% of global towers • Common in Sub-Saharan Africa	Tower company procures all energy and bills MNO a flat per-site fee or price linked to diesel or consumer price index	Tower company: Scope 1 (diesel) and Scope 2 (grid) MNO: Tower company emissions reported in Scope 3 Category 8 via tenant allocation	**Low/Medium** – For fixed fee arrangements, tower company captures all cost savings from switching to renewables, but reduces incentive for MNO to be more energy efficient. For indexed fee arrangements, barriers depend on how it is indexed but are generally higher due to the tower company not capturing 100% of savings.
PaaS with pass through • Tower company owns passive and power system • ~15% of global towers • Common in Sub-Saharan Africa, India and Latin America	Tower company procures all energy and recharges actual cost to MNO with no margin	MNO: Scope 1 (diesel) and Scope 2 (grid) because MNO is the procuring party in substance	**High** – MNO pays the energy bill so any savings accrue to the MNO, but the tower company controls the asset and would have to fund the solar retrofit. Misaligned: cost bearer cannot install equipment and there is no upside for the asset controller.
Third-party energy service company (ESCO) • ESCO owns the power system, tower company owns the tower structure and MNO owns radios • 3–5% of global towers • Common in Francophone West Africa	ESCO sells power to tower company or directly to MNO under a PPA, typically 10+ years	ESCO: Scope 1 (diesel) Tower company (if involved): Scope 2 (grid) MNO: Scope 2 (for PPA) or Scope 3 (Category 1 or 8) via tower company	**Low/Medium –** ESCO specialises in the renewable build and bears the capex, while the buyer (tower company or MNO) captures the diesel-replacement saving once the PPA tariff is set below the previous fuel cost. Incentives are well aligned for the initial build; barriers arise where PPA tariffs are hard to negotiate, sites are too remote for ESCO economics to work or contract length is shorter than the asset's payback period.
Full outsourcing (active and passive) • Tower company owns and operates both passive and active layers • ~3% of global towers • Usually rural areas	Tower company procures all energy and MNO acts as a service consumer	Tower company: Scope 1 and 2 MNO: Tower company emissions captured in Scope 3 Category 1	**Low –** Tower company bears all energy capex and operating risk, and captures all savings. Risk shifts entirely to the tower company subject to its capital structure and tariff agreement.

Contractual arrangements such as power-as-a-service with pass through face higher barriers to decarbonisation due to split incentives

Source: GSMA analysis based on desk research and industry interviews

Deep dive on tower companies

Tower companies should play the leading role in decarbonisation, but operators can also incentivise the disclosure and decarbonisation of tower companies

Tower companies can play a leading role in tower decarbonisation, including better disclosures, setting climate targets and investing in clean energy:

- Disclose key energy and emissions data such as diesel consumption and Scope 1, 2 and 3 emissions to help track progress and contribute to improved Scope 3 inventories of MNOs. The European Wireless Infrastructure Association (EWIA) recently published its *Guidance for Carbon Footprint Accounting in the TowerCo Industry* to help clarify and align tower companies on accounting procedures.
- Set 1.5°C aligned targets, ideally focused on absolute targets rather than intensity targets.
- Invest in solar-hybrid retrofits and battery storage in weak-grid and off-grid areas to achieve rapid, real-world emission reductions in towers.
- Share relevant data with energy developers and development organisations such as the World Bank to support grid extensions and solar mini-grid projects.

Operators can incentivise the disclosure and decarbonisation of tower companies in several ways:

- Leverage master service agreements (MSAs)[44] by including requirements in new and renewed MSAs such as data disclosures (e.g. diesel consumption in litres, site-level electricity use, Scope 1 and 2 emissions).
- Consider restructuring energy arrangements as landlord-tenant agreements to remove the split incentives that hinder tower decarbonisation.
- For towers operated by multi-MNO joint ventures, MNOs should coordinate decarbonisation commitments and actions with their co-shareholders.
- Share relevant data with energy developers and development organisations such as the World Bank to support grid extensions and solar mini-grid projects.

Case Study:
Helios Towers – Solar rollout in Ghana

44 Master service agreements (MSAs) are overarching commercial contracts between operators and tower companies setting out standard terms for the long-term relationship, including lease terms and pricing, service levels (e.g. uptime guarantees, response times), energy arrangements, allocation of responsibilities and reporting and data-sharing obligations.

While industry average emission factors show steady progress, analysis of the emissions intensity of individual suppliers shows significant variation

Most operators are using spend-based methods to calculate emissions from Category 1 and 2 (**Figure 20**), using industry average emission factors across different purchased goods and services.

Industry average emission factors typically show a steady decline across key supplier groups (**Figure 24**, blue lines). However, analysis of company-level emission factors shows significant variation in both emission intensity and recent trends (**Figure 24** grey lines).[45]

In other words, if an operator uses industry average emission factors to calculate its Scope 3 emissions, it may be either under- or over-counting its Scope 3 emissions. With some suppliers making faster progress than others, using industry average values also obscures which suppliers are improving and which are not.

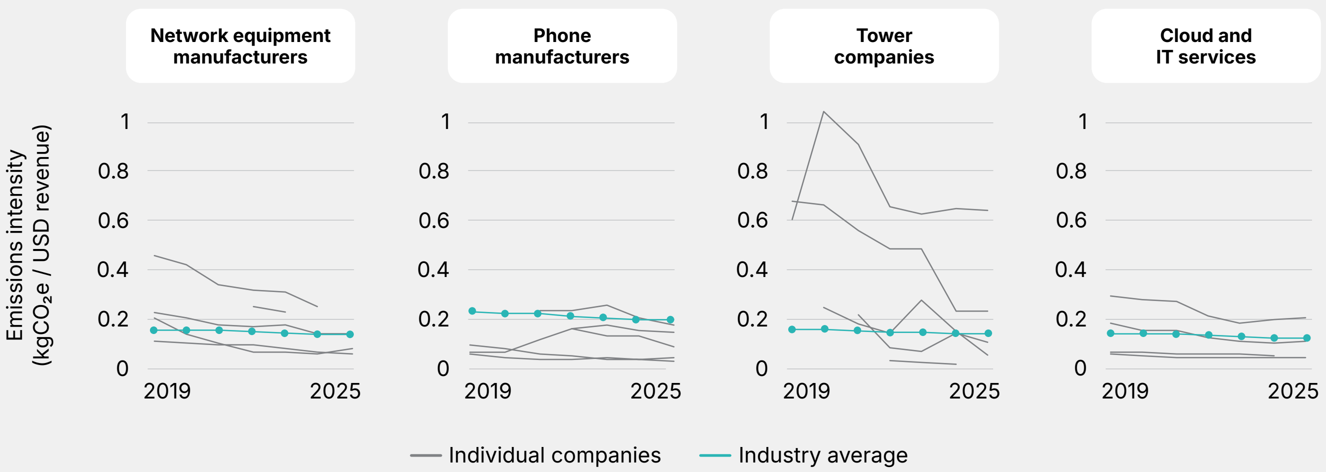
For example, most network equipment manufacturers analysed show declining carbon intensities – aligned with the industry average factor, but manufacturers of CPE tend to be more carbon-intensive per unit of revenue compared with other network equipment manufacturers.

All four phone manufacturers analysed had lower emissions intensity than the industry average. In this case, using industry average factors would result in an overestimation of Scope 3 emissions from purchased mobile phones. Using product-level data would result in a much more accurate inventory.

Tower companies show a very wide range of carbon intensities. Tower companies operating in regions with poor grid access and reliability have much higher emissions per unit of revenue due to their reliance on diesel and relatively lower revenues.

A key challenge in using supplier-specific emission factors is data availability. While most of the top 100 suppliers analysed disclose Scope 1 and 2 emissions in annual reports, fewer than 20 companies disclosed category-level Scope 3 data publicly. Obtaining the required data will require operators to engage through supply chain disclosure initiatives such as CDP or the new GSMA Scope 3 Assessment Tool, or engage directly with suppliers to obtain the necessary data.

Figure 24 **Industry average vs. supplier-specific emission factors, 2019-2025**



Using supplier-specific emission factors can result in more accurate Scope 3 emissions and track real-world progress by suppliers

Note: Emissions intensity calculated by dividing the sum of Scope 1, Scope 2 (market-based if available, otherwise location-based), and Scope 3 upstream categories by revenue (in USD).

Source: GSMA analysis based on latest CDP disclosures and and annual reports.

45 Only companies disclosing at least two years of Scope 1, Scope 2 and Scope 3 upstream categories are included in the company-level analysis in the charts.

Smartphone embodied carbon has fallen since 2019, but recent higher-end devices are more carbon intensive due to on-device AI hardware

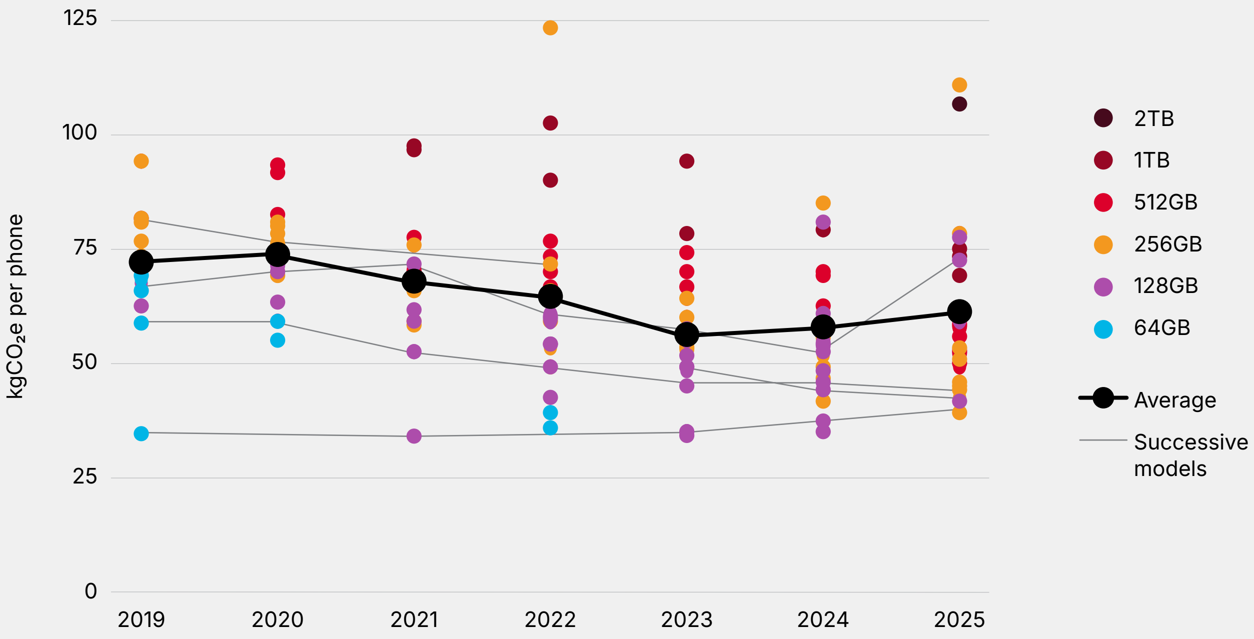
Mobile phones today have a relatively small carbon footprint per device (around 50 $kgCO_2e$), but their aggregate impact is significant. More than 1.2 billion new phones were sold in 2025,[46] emitting more than 60 $MtCO_2e$ from manufacturing alone. Materials and manufacturing account for 70–90% of the life-cycle emissions of a typical smartphone.[47]

The storage capacity of mobile phones has climbed steadily over the past decade, with many mainstream models now having a base capacity of 128 GB or 256 GB, compared with around 64 GB in 2019 and 32 GB in 2016.[48] This trend persists despite widespread access to cloud service and backup, which also carries a carbon footprint, albeit small (1–2 $kgCO_2e$ per year for 100 GB).[49]

Storage capacity has a major impact on embodied carbon because integrated circuit production accounts for the largest share of life-cycle energy and emissions. A typical smartphone with 512 GB of storage has around one-third higher embodied carbon than an equivalent 128 GB model.[50]

Despite these pressures, analysis of published life-cycle assessments (LCAs) and product environmental footprints from major smartphone manufacturers shows that the average embodied carbon across seven major brands and more than 145 models and configurations fell by 20% between 2019 and 2023 (**Figure 25**).

Figure 25 **Production-related emissions from selected smartphones, 2019-2025**



Average production-related emissions for smartphones fell steadily from 2019 to 2023, but have since trended upward

Note: Production-related emissions include emissions from materials acquisition, manufacturing, and transportation. Average value is not weighted based on sales, and year indicates when the phone was first launched. Therefore, sales-weighted average of smartphones sold in each year are likely to be lower than the average values shown in this figure.

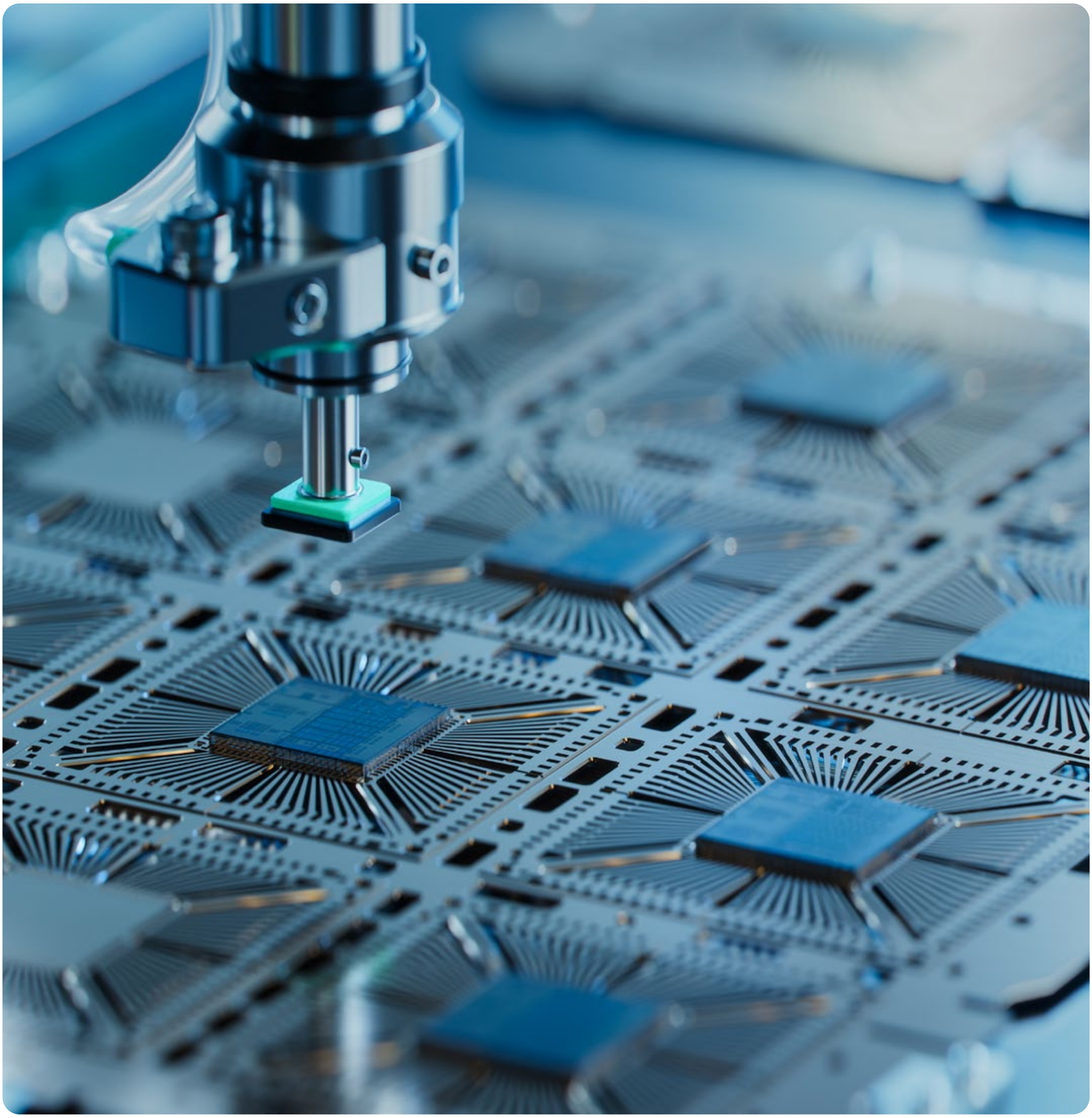
Source: GSMA analysis based on publicly disclosed life cycle assessments and product environmental reports of 145 smartphones models.

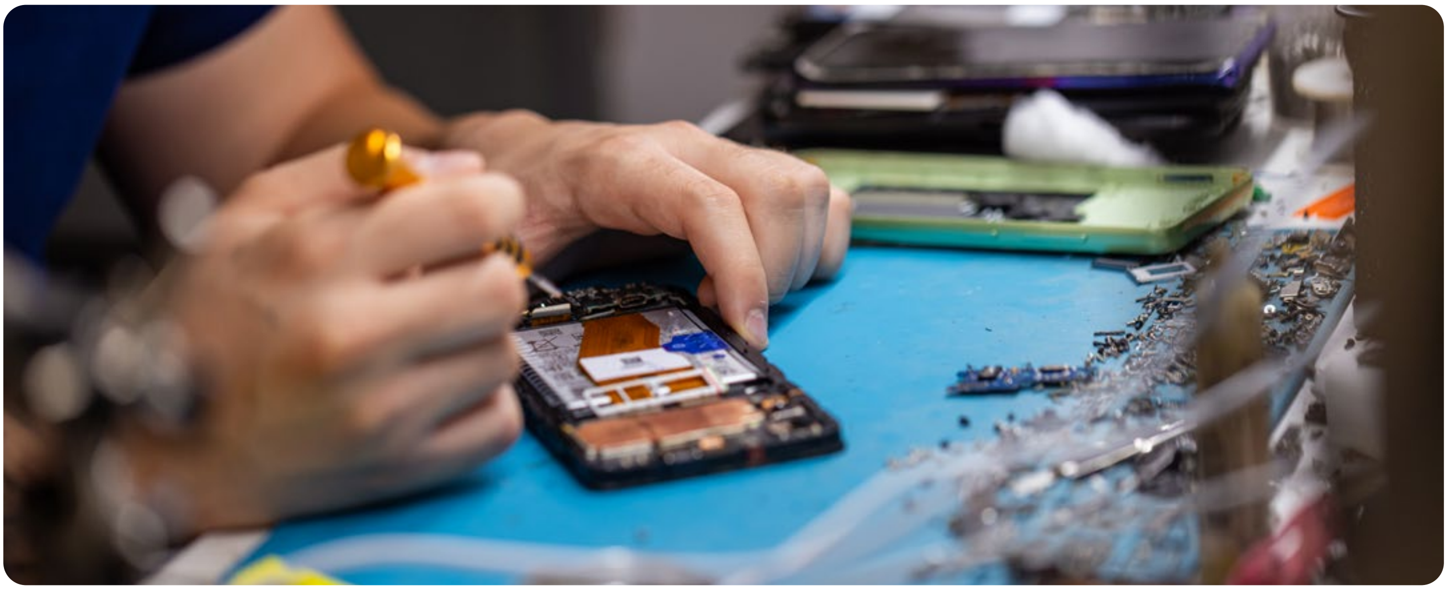
46 GSMA analysis based on IDC (2026) and Omdia (2026).
47 GSMA. (2025). *Rethinking Mobile Phones: The business case for circularity*.
48 Counterpoint. (2019). *Average Storage Capacity in Smartphones to Cross 80GB by End-2019*.
49 GSMA analysis based on storage energy assumptions in Shehabi et al. (2024).
50 GSMA analysis based on Eco Rating (2024) and product environmental reports from popular smartphone models.

This has been driven primarily by clean energy, both from manufacturers supporting renewable energy in their supply chains as well as rapid growth in renewables in key manufacturing countries. The use of recycled materials by some manufacturers and removal of in-box power adapters have also played a role.

Since 2023, however, average embodied carbon has increased. In addition to growing storage capacities, the use of on-device AI hardware may have played a role in this reversal. Higher-end phones now have neural processing units (NPUs) and more RAM to support on-device AI – both of which are highly carbon intensive to manufacture. Another trend creating upward pressure on embodied carbon is book-type foldable phones, which can be around 50% more carbon intensive than an equivalent non-foldable version.

Case Study:
Honor - Alpha Plan: Smart Manufacturing and Terminal Energy Efficiency





Circularity is key to address Scope 3 emissions, and ongoing memory shortage could accelerate the shift to refurbished devices

Circularity is a vital way to reduce upstream Scope 3 emissions. Materials and manufacturing typically account for 70–90% of the life-cycle emissions of a smartphone.[51] This means that longer device lifespans, including through reuse, repair and refurbishment, can deliver substantial emission reductions and cost savings for operators and consumers.

The memory crisis is having a major impact on smartphone pricing and new phone sales. Surging memory demand from AI data centres has resulted in manufacturers shifting production away from the typical memory used in consumer electronics – a critical component in smartphones. As a result, handset manufacturers are shifting their limited supply of memory to higher-end devices where profit margins are higher. Since memory makes up a large share of a budget phone's production cost, prices of low- and mid-tier devices are likely to see the biggest relative cost increase,[52] with cost-conscious customers in this segment likely to delay purchases or opt for pre-owned.

Industry analysts now expect new smartphone shipments to drop by around 15%[53] in 2026 as a result, while the secondary market (used and refurbished) is projected to grow by around 8% annually[54] over the next few years.

Case Study:
Jazz - From Takeback to Trade-in: Jazz's Circular Approach to Sustainable Devices

Even prior to the memory crisis, there was growing consumer interest in refurbished phones. The *GSMA Global Consumer Survey on Circularity* of more than 13,000 consumers showed that 45% of consumers globally were likely to consider refurbished for their next phone purchase. However, refurbished devices still represent less than 10% of overall phone sales in most countries. Consumer confidence remains a key challenge due to inconsistent grading and labelling and limited information for consumers. The GSMA is conducting research on potential opportunities to develop industry guidance on refurbished labelling.

Refurbished devices and other circular products and services can also play an important role in digital inclusion by improving the affordability of devices. The GSMA is actively working on this topic with key stakeholders through the *Handset Affordability Coalition*. The *GSMA Innovation Fund for Green Transition for Mobile* also includes a focus on circularity, providing grants and technical assistance to small and growing enterprises working to advance device circularity, reduce value-chain emissions and improve handset affordability.

Increasing the circularity of network equipment and CPE are also critical to Scope 3 emission reductions. The GSMA has developed guidance – *Quantifying the Carbon Savings of Circularity: Mobile Phones and Network Equipment* – to help operators align on methods and approaches to calculate the carbon savings of repair and refurbishment.

Case Study:
Cisco - Achieving Circular Design Goal Through Collaboration and Operational Integration

51 GSMA. (2025). *Rethinking Mobile Phones: The Business Case for Circularity*.
52 GSMA analysis based on IDC (2025).
53 GSMA analysis based on IDC (2026), Counterpoint (2026), Gartner (2026), and Omdia (2026).
54 GSMA analysis based on CCS Insight (2025), Counterpoint (2026) and IDC (2025).

Figure 26 **The growing market for refurbished phones**

-15%

15% drop in new phone sales in 2026 due to the memory shortage

+8%

8% growth in used and refurbished phone sales

90%

90% lower environmental footprint when repairing or refurbishing a phone vs. manufacturing new

45%

45% consumers considering refurbished for next phone purchase according to GSMA Global Consumer Survey

$150BN

$150 billion market for refurbished mobile phones and repair services in 2027

There are strong business, consumer, and environmental benefits of circular products and services, and the ongoing memory crisis is pushing more consumers to these options

Source: GSMA analysis based on CCS Insight, Counterpoint, IDC, and Omdia.

New GSMA analysis identifies water impact hotspots in the value chain

Water systems globally are under increasing stress, prompting greater expectation of companies in all sectors – including operators – to understand, disclose and manage their water dependencies and impacts. Just 15% of operators that disclosed to CDP in 2025 indicated they had assessed water risks in both their direct operations and value chains, compared with more than 80% that had assessed climate-related risks.

Findings from a new GSMA report, *Water Impacts of the Telecommunications Sector*, show that direct operational water use for most telecommunications companies (telcos) is generally low. A potential operational hotspot is telco-owned data centres, but most use air-based cooling technologies, suggesting direct cooling-related water consumption is generally limited.

With telcos consuming around 300 TWh of electricity, indirect impacts from electricity generation are a hotspot, particularly for operators in regions relying on thermal generation that require water for cooling.

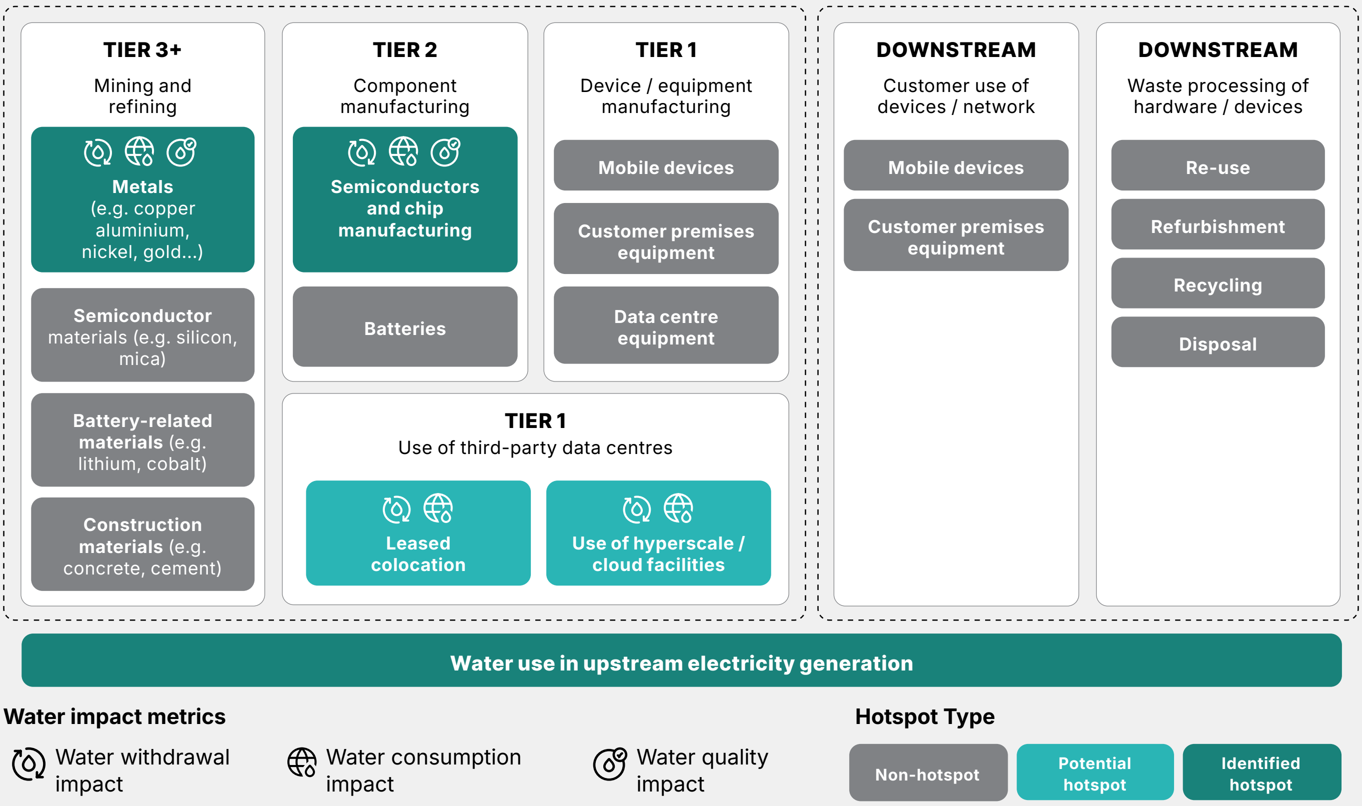
A comprehensive assessment across the telecoms sector value chain finds that the most significant water impacts associated with telecommunications are upstream and systemic (**Figure 27**).

Semiconductor manufacturing and copper mining are notable hotspots, reflecting the combination of high water use or pollution intensity, widespread deployment across telecommunications supply chains and concentration in water-stressed regions.

Although telecommunications account for only a small share of global demand for these inputs, the inherent features of these upstream activities and their tendency to be based in water-constrained basins make them relevant.

Case Study:
Fairphone - Launching First Of Its Kind Nature Report: Treat Biodiversity Loss As a Core Business Risk

Figure 27 **Water impacts of the telecommunication value chain**



The operational water consumption of mobile operators is low, but there are key hotspots in the sector's value chain, notably mining and semiconductor manufacturing

Source: GSMA (2026), Water Impacts of the Telecommunications Sector

05

Building climate resilience

Mobile network infrastructure and other critical infrastructures must become more climate resilient to continue operating and supporting societies in a changing climate.

Mobile network infrastructure must become more climate resilient to ensure operations support societies in increasingly extreme conditions

The mobile industry, like all sectors, must continue to reduce emissions rapidly while also adapting to the growing physical impacts of climate change. Acute and chronic climate risks[55] are already affecting the conditions in which telecoms networks operate, making adaptation and resilience an increasingly urgent priority for operators.

More frequent and intense flooding, drought, hurricanes, wildfires and temperature variability put network assets like base stations and data centres directly at risk, while indirect risks can arise through operators' reliance on energy systems, water and complex supply chains.

The financial implications of climate threats include infrastructure damage, higher rebuild and insurance costs, service downtime, customer disruption and broader reputational and business impacts. Yet current approaches to assessing and quantifying these risks vary across the industry.

This makes it increasingly important for operators to improve how they assess, report and respond to climate risk. By identifying vulnerabilities, quantifying financial impacts and consolidating best practice in resilience planning, the mobile industry can support smarter investment, improve climate-related disclosures and build stronger networks that are better prepared for a changing climate.

Case Study:
KDDI - Enhancing Climate Resilience in Japan: KDDI's Strategies and Contributions

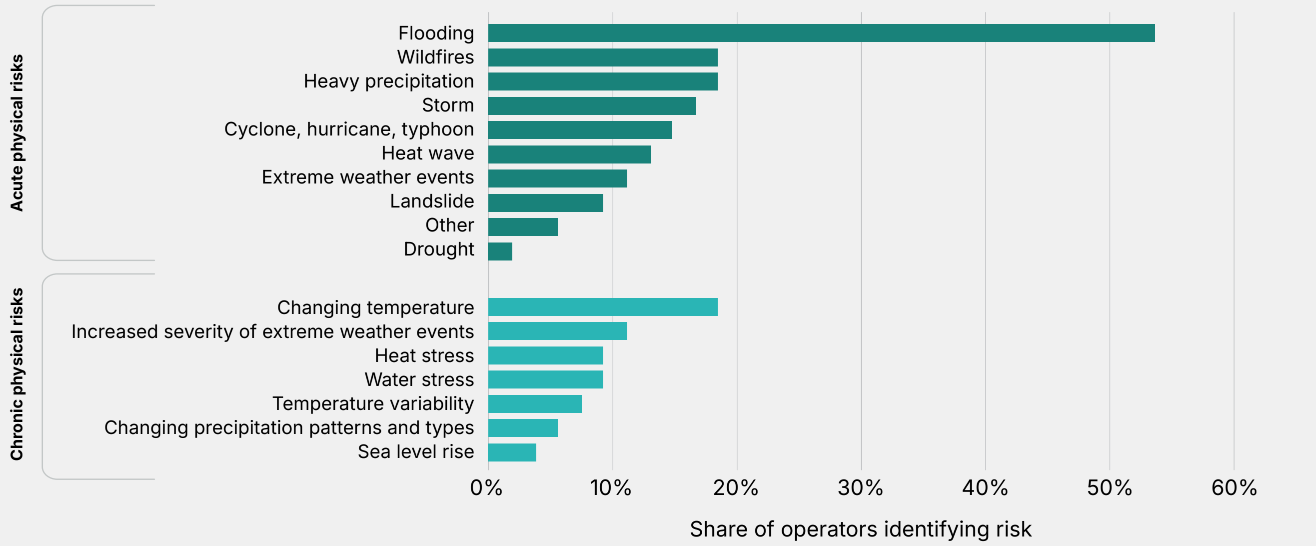
Case Study:
Axiata Group - Efforts to Strengthen Climate Resilience of Networks

55 Acute climate risks are short-term, event-driven physical hazards (e.g. floods, cyclones, wildfires), while chronic climate risks are longer-term shifts in climate patterns (e.g. temperature rise, sea-level rise).

Many operators have already undertaken short- or long-term climate change risk and opportunity analysis. 54 operators (70%) disclosing to CDP in 2025 identified at least one climate-related risk in their direct operations or value chains. The types of risks identified vary significantly between operators due to location-specific risks (**Figure 28**), with flooding most frequently identified as an acute physical risk.

40 operators quantified the financial impacts of these risks, estimating potential impacts of up to USD 11 billion, with around 60% from long-term risks.

Figure 28 Physical risks identified by operators in CDP disclosures, 2025



Flooding was most frequently identified as a key acute physical risk, while changing temperature was the most frequently identified chronic physical risk

Note: Share of operators based on 54 operators identifying at least one climate-related physical risk.

Source: GSMA analysis of CDP disclosures.

Leading operators are using Climate Transition Plans to implement their net zero strategy and deliver a whole-of-organisation transformation

Climate Transition Plans (CTPs) are essential for organisations to implement their net zero targets. They offer a clear blueprint for strategic delivery and coordinated action across a company. This ensures that senior leaders and teams in all business functions are synchronised in their effort to meet climate targets.

By disclosing ambitions and actions across three core channels, a CTP articulates how the organisation is decarbonising, how it is responding to climate-related risks and opportunities and how it is contributing to an economy-wide transition.

This information is also valuable to customers, policymakers and investors who are interested in understanding how services, critical infrastructure and investments will adapt as the economy transitions to net zero. Importantly, a CTP can also provide internal stakeholders and investors with the information they need to finance the transition.

Disclosure of a CTP is required under the International Sustainability Standards Board (ISSB)'s IFRS S2, within the new SBTi Corporate Net-Zero Standard V2 and is becoming part of mandatory sustainability-related financial disclosures around the world.[56]

Case Study:
Turk Telekom - Pioneering Sustainable Finance in the Turkish Telecommunications Sector

56 International Transition Plan Network. (2026). Interactive Map.

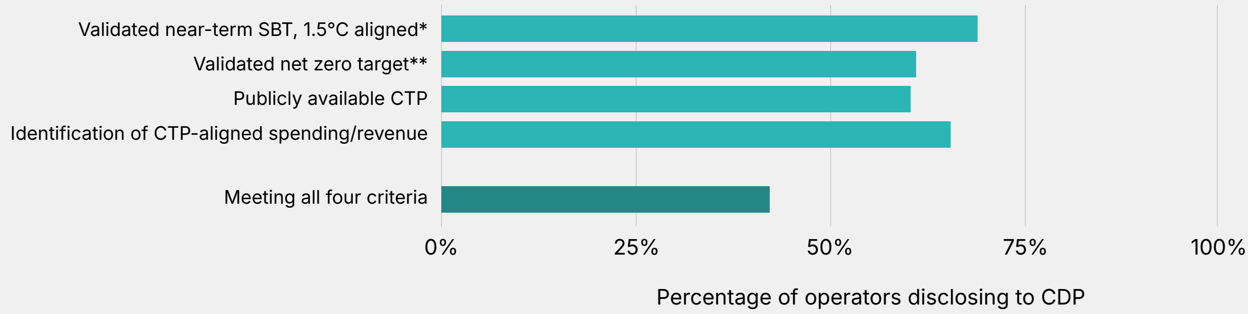
Aligned with guidance from the Transition Plan Taskforce (TPT), several operators have published a stand-alone transition plan. Meanwhile, some operators have cross-referenced information about their transition plan with their Integrated Annual Assessments, according to IFRS S1 (para. B45–47). Based on disclosures to CDP in 2025, more than 40% of operators met four minimum criteria that can be used to determine the credibility of a CTP (**Figure 29**).

Existing transition plans vary in their scope and completeness. In 2025, the GSMA published *Climate Transition Planning Guidance for Telecommunication Companies*[57] to provide a complementary, telco-specific interpretation of the TPT Disclosure Framework, to harmonise operators on their approach to transition planning.

As of May 2026, 15 operators[58] have committed to publishing their next CTP in alignment with the GSMA guidance. In May 2026, AXIAN Telecom (Yas) published its first GSMA-aligned CTP.[59]

Case Study:
Axian - Developing a new climate transition plan

Figure 29 Operators meeting key criteria of a credible climate transition plan



Based on CDP disclosures in 2025, over 40% of disclosing operators have met key criteria for credible climate transition plans

Note: *The criteria for near-term SBTs includes coverage of all three scopes. **The criteria for validated net zero targets include a requirement to cover the entire organisation and a net zero target by 2050 or sooner. According to the CDP Technical Note on Reporting on Climate Transition Plans, the criteria for credible transition plans include a possible 57 indicators, eleven direct and 46 supporting. A selection of crucial, direct indicators is analysed here.

Source: GSMA analysis of CDP disclosures.

57 GSMA. (2025). *Climate Transition Planning Guidance for Telecommunication Companies*.
58 For the latest list of committed operators, see *Climate Transition Planning Guidance for Telecommunication Companies*.
59 AXIAN Telecom. (2026). *Climate Transition Plan*.

Mobile and digital technologies can enhance resilience to growing climate impacts

Mobile and digital technologies hold enormous potential to help people and businesses become more climate resilient – helping to better anticipate and prepare for natural disasters, limit damage during disasters and accelerate response and recovery.

For example, satellite data and geographic information systems (GIS) can aid in hazard mapping and assessing damage after disasters have occurred. In the event of a disaster, mobile text alerts can help communicate emergency information to populations quickly and effectively. Virtual and mixed reality can also play an important role in visualising climate impacts and promoting adaptation strategies. AI and the Internet of Things (IoT) can strengthen the ability to predict disasters and provide early warnings to populations. Early warning systems save lives, and just 24 hours' notice of an impending hazardous event can cut the ensuing damage by 30%.[60]

In 2022, the United Nations Secretary-General launched the Early Warnings for All (EW4All) Initiative to ensure that everyone in the world is protected by an early warning system. The mobile industry has played a crucial role in the development and implementation of early warning systems for decades.

The GSMA is playing a leading role[61] in the initiative by profiling industry leadership, hosting multistakeholder convenings, providing technical assistance to members and publishing demand-driven research. An example of technical assistance is recent work in the Pacific Islands region to support a regional partnership model with operators, governments and other stakeholders to advance scalable, mobile-based early warning systems, including assessing cell broadcast readiness and strengthening cross-country coordination.

As part of this work, the GSMA supported the Solomon Islands to conduct the first live cell broadcast test in the Pacific. Using this as a blueprint, the GSMA, along with partners, is now supporting more countries to implement CB across the region.[62] GSMA research includes a series of case studies[63] on the role of operators in early warning systems and guidance[64] on how to make risk alerts inclusive for all.

In support of the EW4All Initiative and to demonstrate the vital role of the mobile industry, the GSMA and ITU announced an Industry Pledge at COP28. All operators are encouraged to join the pledge to leverage and promote the lifesaving power of mobile networks.

Figure 30 **Mobile Industry Pledge: Early Warnings for All**

The mobile industry has longstanding experience in the development and implementation of early warning systems, and is committed to the ambition of the Early Warnings for All Initiative for everyone to be protected by 2027

Source: GSMA (2026), Mobile-Enabled Early Warning Systems

60 GSMA. (2024). *Saving lives through Mobile-based Early Warning Systems*.
61 GSMA. (2024). *Mobile-Enabled Early Warning Systems: The GSMA and the Early Warnings for All Initiative*.
62 GSMA. (2026). *Advancing Mobile Early Warnings at Scale: A regional partnership model for the Pacific Islands*.
63 GSMA. (2026). *Japan's Early Warning System: The Role of Mobile Network Operators*; GSMA. (2026). *France's FR-Alert: The Role of Mobile Network Operators in Early Warning Systems*; GSMA. (2025). *Chile's Emergency Alert System: The Role of operators in Early Warning Systems*.
64 GSMA. (2025). *Making Early Warnings Work for All: People Centred Design*.

06

Recommendations to accelerate progress

Achieving the mobile industry’s goal of net zero emissions by 2050 while enhancing climate resilience requires strong and concerted action from operators and suppliers, supported by enabling policies and investment from governments.

Recommended actions

Transitioning the entire mobile industry to net zero emissions by 2050 requires concerted effort and action by all stakeholders. Over the past year, the GSMA has worked with operators to support this journey, with an immediate focus on the rapid cuts needed by 2030.

Table 2 outlines recommended actions to enhance climate resilience and accelerate the industry's progress towards net zero.

Table 2 Recommendations

Area of action	Operators	Suppliers	Governments
Climate disclosure	Assess and publicly disclose energy and emissions data and climate risks and opportunities, for example through CDP Harmonise measurement approaches and data reporting with other operators in the country/region Calculate Scope 3 emissions using supplier-specific and/ or product-specific emission factors where possible	Assess and disclose carbon emissions and climate risks and opportunities, including all data needed by operators to provide accurate Scope 3 emissions inventories Publish LCAs or product carbon footprints of devices and equipment	Consult with operators to harmonise and simplify reporting of key energy and emission indicators Standardise LCA methodologies to improve comparability of ICT devices and services[65] Implement regulations that require climate disclosure (e.g. ISSB IFRS S2, EU CSRD)
Climate targets and strategy	Set science-based and net zero targets aligned with the 1.5°C pathway under the SBTi ICT Sector Guidance[66] Develop a CTP aligned with the GSMA's Climate Transition Planning Guidance for Telecommunication Companies[67]	Set science-based and net zero targets aligned with a 1.5°C pathway Develop a CTP that clearly outlines the ambitions, actions and accountability needed to meet climate targets, supporting a whole-of-organisation transformation	Prioritise a just transition to economy-wide net zero emissions by 2050 at the latest, including strengthening countries' nationally determined contributions (NDCs) and 2030 targets in line with a 1.5°C trajectory Implement and enhance national climate, energy and industrial policies to achieve these targets Support the private sector in their decarbonisation efforts, including through policies and incentives to reward companies' low-emissions strategies (e.g. carbon pricing, supporting energy policies)

65 This work is already underway in ETSI (ETSI ES 203 199) and ITU (ITU-T L.1410).
66 SBTi. (2020). Guidance for ICT Companies Setting Science Based Targets.
67 GSMA. (2025). Climate Transition Planning Guidance for Telecommunication Companies.

Area of action	Operators	Suppliers	Governments
Energy efficiency and electrification	Optimise energy use of networks by adopting energy-efficient hardware, software and best practices, such as AI/ML-driven optimisation (e.g. sleep modes) Retire 2G/3G and copper-based legacy networks where possible Electrify fleet vehicles	Develop more energy-efficient equipment, devices and systems Develop improved energy reporting metrics at the equipment level	Support innovation for the development and deployment of more efficient technologies Support the retirement of 2G/3G and copper-based legacy networks in consultation with industry Expand grid infrastructure in off-grid and weak-grid areas in LMICs to reduce reliance on diesel generators
Clean energy	Purchase and use clean and renewable energy, prioritising additionality and impact (e.g. On-site generation, PPAs) Assess and invest in on-site renewables and/or battery storage to reduce operating costs and emissions while increasing resilience	Purchase and use clean and renewable energy in operations, prioritising additionality and impact (e.g. On-site generation, PPAs) Tower companies: switch from diesel generators to solar and batteries Advocate for energy policies and regulations that support renewable energy access	Ensure electricity markets and regulations encourage renewables and actively engage in dialogue with companies where there is a lack of access for the private sector Facilitate electricity market designs that incentivise load shifting to support grid operations and increased renewable energy integration Remove fossil fuel subsidies and streamline renewable energy permitting
Supply chain and circularity	Engage suppliers on climate action and integrate climate requirements in procurement Develop circular economy initiatives for network equipment, mobile phones and CPE Engage customers on circular products and services (e.g. refurbished phones, repair services)	Incorporate eco-design and circularity principles in devices and equipment Provide longer software and security support, along with access to spare parts at a reasonable cost Engage supply chains on climate action, including encouraging suppliers to use renewable energy and recycled materials Develop circular economy initiatives for network equipment, mobile phones and CPE	Implement eco-design and right-to-repair regulations Implement laws and regulations that ensure used mobile phones can be recovered and recycled responsibly

Area of action	Operators	Suppliers	Governments
Water and nature	Begin measuring and disclosing water impacts in operations and supply chains If already reporting water, improve maturity by overlaying operational water use with site-specific or basin-level data Set nature and water targets and build metrics into materiality assessments (e.g. biodiversity, soil pollution, flood control)	Assess and disclose water and nature impacts across operations and supply chains aligned with the Taskforce on Nature-related Financial Disclosures (TNFD) and CDP For water, as a minimum, disclose water withdrawal, consumption and discharges	Support the conditions for public private partnerships to protect local ecosystems and catchments, with large companies acting as off-takers for the ecosystem services provided
Adaptation and resilience	Integrate climate risk assessment in network planning, investment and technology deployment decisions Deploy clean backup power solutions (e.g. solar, batteries) Disclose physical climate risks and opportunities aligned with ISSB and TCFD	Design equipment for greater operational resilience in a wider range of future operating conditions Provide climate scenario specifications (e.g. heat tolerances) for equipment to support operator resilience planning Disclose physical climate risks aligned with TCFD/ISSB	Recognise mobile networks as critical infrastructure in climate adaptation planning and establish emergency operating protocols (e.g. priority grid restoration, emergency spectrum access) Facilitate cross-sector collaboration to address interdependencies during climate-related disasters Work with operators to finance and develop early warning systems Support operators in responding to climate disasters
Climate finance	Align capital and operational expenditure with climate targets, including dedicated capex and opex for decarbonisation and use of internal carbon pricing Use sustainable finance instruments where appropriate (e.g. sustainability-linked loans/bonds, green bonds)	Align R&D and capital investment with climate targets, prioritising development of energy-efficient and circular products Use sustainable finance instruments where appropriate (e.g. sustainability-linked loans or bonds)	Mobilise public finance to support sector decarbonisation, including concessional finance for grid infrastructure and clean energy access in LMICs Establish credible sustainable finance taxonomies and disclosure requirements (e.g. EU Taxonomy, transition finance frameworks) that channel private capital to decarbonisation

07

Regional insights

Operators around the world are making progress on climate action while navigating diverse regional contexts to achieve the mobile industry's net zero goal.

Regional Insights

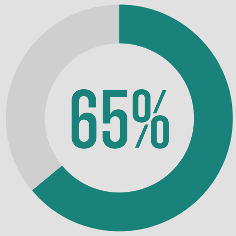
Asia Pacific

- **The Asia Pacific region is highly diverse with a range of economies**, network operations and energy and climate contexts.
- **Operators in the region have made strong progress on disclosure and target setting.** Nearly two-thirds of operators (by connections) disclosed to CDP in 2025, while 56% have validated near-term SBTs. 38% of connections are covered by validated net zero climate targets, up from 20% last year.
- **Operational emissions per connection fell 12% while electricity use per connection rose 1%.** Operators in Japan collectively reduced their emissions by more than 40%. However, other parts of the region saw large increases driven in part by rapid growth in 5G and connectivity.
- **Operators in the region face challenges in accessing renewable energy.** The share of purchased renewables remains relatively low at around 14% due primarily to the lack of options for companies to purchase renewables in many countries in the region. The GSMA is working with operators and key partners in the region to advocate for policies that increase access to renewable energy for operators.
- **Governments and the energy sector can play a key role in enabling renewable energy across the region.** More ambitious climate and energy policy, changes to electricity markets and regulations to increase investment in clean energy and a build-out of regional grid infrastructure in Southeast Asia are all crucial to help operators in the region access renewable energy and reduce their emissions. Given the importance of the region in mobile industry supply chains, decarbonising the region will also help to reduce Scope 3 emissions for operators around the world.

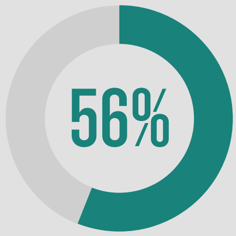
Disclosures and targets

(% of regional connections)

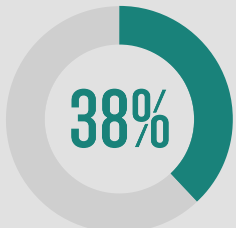
Disclosed to CDP



Validated SBTs



Validated net-zero target



Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection +1%

Change in operational emissions per connection -12%

Regional Insights

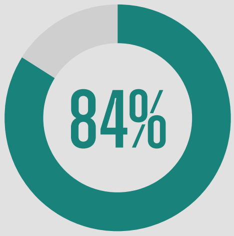
Europe

- **Operators in Europe are leading the way on climate ambition and action.** More than 80% of mobile connections in the region are covered by validated near-term SBTs and nearly 70% by validated net-zero targets.
- **Operational emissions per connection fell by 57%** between 2019 and 2024, with several operators achieving absolute reductions of more than 75%, including Tele2, Telefónica, Telenor, Telia and Vodafone.
- **Electricity use per connection fell despite increasing demand for data and connectivity.** This is due to energy-efficiency improvements from the retirement of older, less energy-efficient 2G and 3G networks and the switch from copper to fibre for fixed networks.
- **Operators purchased or generated 22 TWh of renewable electricity, or one-third of the global total.** This means that around 70% of electricity came from purchased or generated renewables, the highest share of any region.
- **Operators are encouraged to have an even greater impact by opting for PPAs** over green tariffs and certificates where available and consider moving towards matching their renewable energy purchases to account for both time and location.
- **Given the strong progress on operational emissions, operators should increasingly shift their attention to engaging with supply chains** to reduce their Scope 3 emissions.

Disclosures and targets

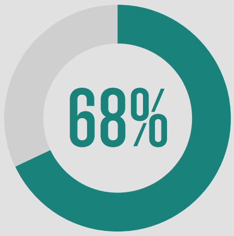
(% of regional connections)

Disclosed to CDP



Validated SBTs

Validated net-zero target



Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection -18%

Change in operational emissions per connection -57%

Regional Insights

Greater China

- **Nearly all connections in the Greater China region were represented by public disclosures** of energy and environmental data. Operators are encouraged to disclose to CDP.
- **Surging demand for connectivity and data has led to increased electricity demand.** Electricity use increased by one-third between 2019 and 2024, but strong reductions in Scope 1 emissions and higher renewable energy purchases helped to moderate growth in operational emissions.
- **Renewables purchases in Greater China quadrupled in 2024 to almost 7 TWh**, but the share remains low at 6% compared with around a third from the grid.
- **Given the presence of many mobile industry supply chains in Greater China**, decarbonising the electricity mix in the region will also help reduce emissions from raw materials and manufacturing.

Disclosures and targets

(% of regional connections)

Disclosed to CDP 2%

Validated SBTs 2%

Validated net-zero target 2%

Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection +12%

Change in operational emissions per connection -20%

Regional Insights

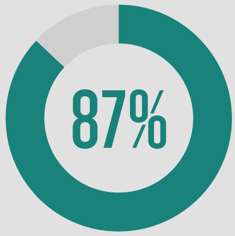
Latin America

- **Operators in Latin America are leaders in disclosure and setting climate targets.** More than 80% of operators (by connections) have validated near-term SBTs.
- **Operators in the region have also made major strides in reducing emissions** over the past few years, reducing operational emissions per connection by more than 50%.
- **Latin America is also a leader in renewable energy.** operators purchased or generated more than 6 TWh of renewables, or more than 40% of their overall electricity use. Algar Telecom, Telefónica (Brazil, Chile, and Peru) and TIM Brazil have achieved 100% renewable electricity.
- **Operational emissions per connection in Latin America are among the lowest in the world,** due to the relatively high share of renewables on the grid.
- **Further policy support is needed across all countries in the region** to increase access to renewable energy.

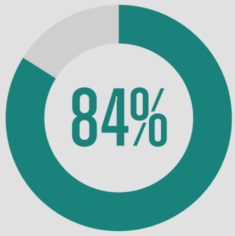
Disclosures and targets

(% of regional connections)

Disclosed to CDP



Validated SBTs



Validated net-zero target

Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection -8%

Change in operational emissions per connection -51%

Regional Insights

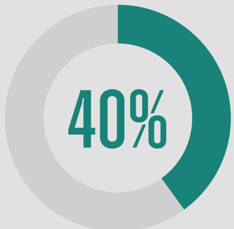
Middle East and North Africa

- **Operators in the Middle East and North Africa have made strong progress on climate action.** 40% of connections in the Middle East and North Africa region are covered by CDP disclosures in 2025, while 37% have validated near-term SBTs.
- **Operational emissions per connection have fallen by over 20% since 2019,** while electricity use per connection rose 5%. Turkcell had the largest reduction in emissions among operators in the region thanks to their renewable energy purchases.
- **Renewable energy purchases increased strongly between 2019 and 2024,** with operators buying or generating 2.7 TWh in 2024.
- **The region holds significant potential to scale up on-site solar generation.** Scope 1 emissions account for a relatively high share (21%) of operational emissions compared with most other regions, partly due to reliance on on-site diesel generators. With excellent solar resources across the region, operators are encouraged to install on-site solar and batteries to reduce Scope 1 emissions.

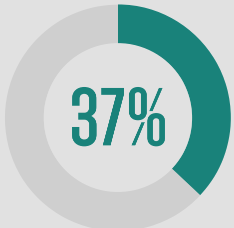
Disclosures and targets

(% of regional connections)

Disclosed to CDP



Validated SBTs



Validated net-zero target

Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection +5%

Change in operational emissions per connection -23%

Regional Insights

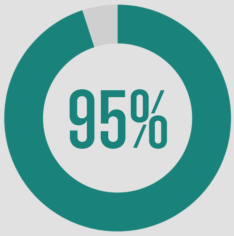
North America

- **Operators in North America are leaders in disclosure and setting targets.** Nearly all North American operators disclose to the CDP and have committed to climate targets.
- **This strong level of ambition is matched by action,** with operational emissions per connection falling by nearly 60% between 2019 and 2024, thanks to strong progress on energy efficiency and renewable energy.
- **Operators collectively purchased or generated 18 TWh of renewable electricity in 2024,** or half of their total electricity use. T-Mobile US matched 100% of their electricity use with renewable energy, leading to a 95% reduction in operational emissions. AT&T and Verizon also achieved strong reductions due to progress on energy efficiency and renewable energy.
- **One area needing more work is fleet electrification.** Vehicle fleets account for a relatively high share of operational emissions compared with other regions, highlighting the significant potential emission and fuel savings from switching to electric vehicles. Government policies and incentives for fleet electrification can help operators accelerate this transition.

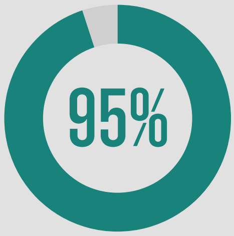
Disclosures and targets

(% of regional connections)

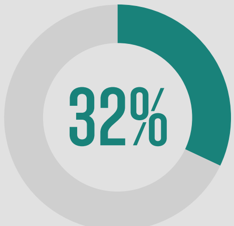
Disclosed to CDP



Validated SBTs



Validated net-zero target



Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection -14%

Change in operational emissions per connection -58%

Regional Insights

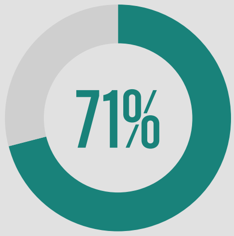
Sub-Saharan Africa

- **Operators in Sub-Saharan Africa have made significant strides in climate disclosure, target-setting and emission reductions** over the past few years.
- **Operational emissions per connection fell by nearly half** between 2019 and 2024, led by substantial reductions from Vodacom, Safaricom and MTN.
- **One of the biggest challenges in the region is access to reliable and clean electricity,** resulting in a heavy reliance on costly and emissions-intensive diesel generators. The lack of reliable grids has resulted in Scope 1 emissions – primarily from diesel generators – to increase by more than 60% between 2019 and 2024.
- **Policymakers in the region should implement policies and regulations that encourage private-sector investment in renewable energy and grid infrastructure.** Additional recommendations are highlighted in the GSMA report, *Energy Challenges for Mobile Networks in Sub-Saharan Africa*.

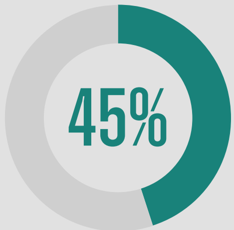
Disclosures and targets

(% of regional connections)

Disclosed to CDP



Validated SBTs



Validated net-zero target

Energy and emissions

(% change, 2019–2024)

Change in electricity use per connection +6%

Change in operational emissions per connection -46%

Annex

Methodology

Data sources

This analysis relies primarily on data from 77 operators that disclosed to CDP Climate Change 2025 Questionnaire. These operators represent 52% of mobile connections globally.

For operators that did not disclose to CDP in the 2025 cycle, key emissions and energy data were gathered from corporate reports (e.g. integrated annual reports, sustainability reports), if available. Data from 39 operators were collected via public reports, covering 34% of global mobile connections.

Data quality checks were conducted to flag potential anomalies in the data (e.g. unit errors), including checking year-over-year changes in emissions and energy use, intensity metrics (e.g. emissions and electricity use per connection, Scope 2 emissions per unit electricity consumed) and comparing any outliers with publicly reported data.

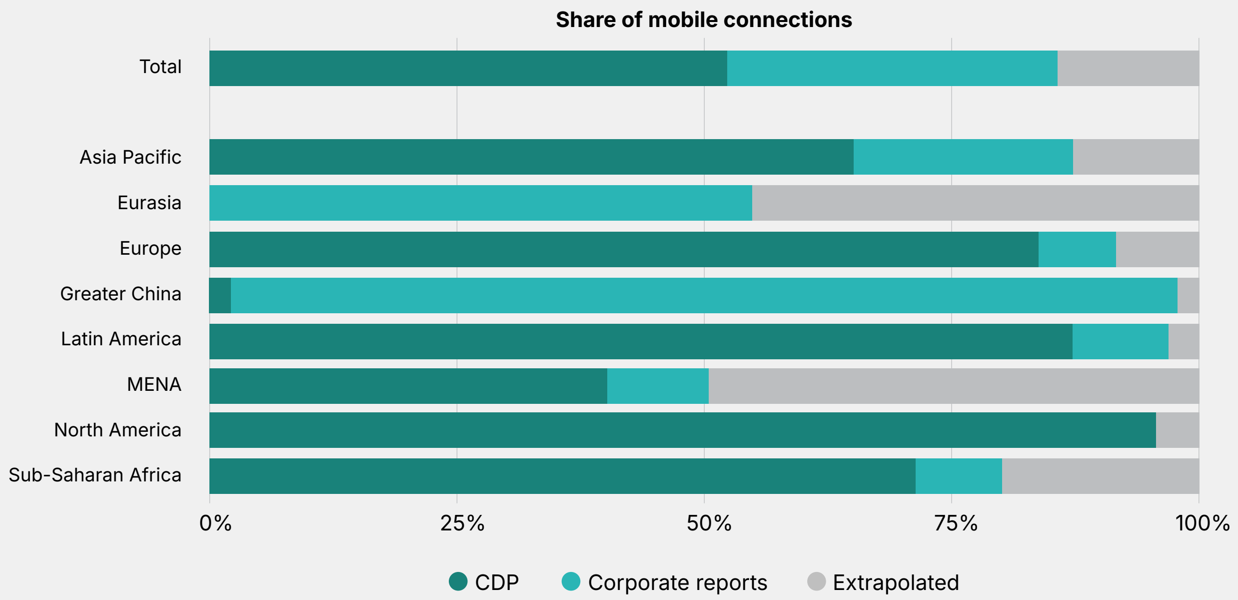
Modelling approach

Scope 1 and 2 emissions and energy data for nondisclosing operators were extrapolated at a country or regional level based on the reported data from other operators in each country or region (e.g. average Scope 1 emissions per mobile connection).

Scope 3 emissions for nondisclosing operators were extrapolated using the average emissions per connection of operators that disclosed all four key categories (1, 2, 3, 11) in each region.

This report updates historical estimates presented in previous editions of this report to ensure comparability, increase data coverage from corporate reports and update the extrapolation approach.

Figure 31 Energy and emissions data sources, by region



The industry-level totals have been estimated using all available data sources

Note: Corporate reports include integrated annual reports, ESG and sustainability reports, and other publicly disclosed data.

Source: GSMA analysis

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