GSMA

Mobile Net Zero 2024
State of the Industry on Climate Action

GSMA

GSMA Intelligence

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.

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GSMA Intelligence is the definitive source of global mobile operator data, analysis and forecasts, and a publisher of authoritative industry reports and research. Our data covers every operator group, network and MVNO in every country worldwide – from Afghanistan to Zimbabwe. It is the most accurate and complete set of industry metrics available, comprising tens of millions of individual data points, updated daily.

GSMA Intelligence is relied on by leading operators, vendors, regulators, financial institutions and third-party industry players to support strategic decision-making and long-term investment planning. The data is used as an industry reference point and is frequently cited by the media and by the industry itself.

Our team of analysts and experts produce regular thought-leading research reports across a range of industry topics.

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Contents

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Foreword

We entered 2024 against the backdrop of unprecedented climate challenges affecting people and businesses and cascading to all aspects of society.

In response, the collective resolve for change, both in business and society, is more palpable than ever. We are proud of the continuous efforts made by the mobile industry and, since we set our ambitious goal of achieving net zero emissions by 2050 in 2019, mobile operators have taken decisive action. An impressive 70 – or almost half of global mobile connections – have committed to near-term science-based targets.

As we unveil the fourth annual assessment of the industry's progress towards this net zero goal, it is evident that, although challenges remain, significant strides have been made. Despite the global surge in data demand and coverage, emissions from operators fell by 6% between 2019 and 2022. Several regions have witnessed tangible reductions, with Europe leading the charge with a remarkable 50% decrease.

But the journey ahead demands acceleration and replication of success across all regions and sectors. With three-quarters of the mobile industry's carbon emissions stemming from the Scope 3

value chain, engaging suppliers and customers becomes crucial. The necessity of circularity, of boosting reuse, repair and recycling of mobile phones and network equipment, has been underscored by the circularity targets that we announced in June 2023 – and which have already been adopted by 15 operators worldwide.

Importantly, collaboration emerges as the linchpin for success. With 70 operators publicly disclosing their climate impacts and a growing number joining the GSMA Climate Action Taskforce, the industry is witnessing an unprecedented level of collective action and transparency.

Similarly, our engagement with the public sector, governments and international institutions to collaborate on climate action keeps on expanding. At COP28, we joined forces with other digital ecosystem players to raise awareness of the enabling power of connectivity to address climate challenges. We – alongside 120 nations and a resounding chorus of private sector voices – joined the call to triple renewables capacity and double energy efficiency progress by 2030.

We believe that greater collaboration will result in greater opportunities for systemic changes, and we are committed to supporting our members on this journey towards a sustainable digital future.

Alix Jagueneau
Head of External Affairs, GSMA

Executive Summary

Climate action continues to be a key priority for the mobile industry. In 2019, the mobile industry set a goal to reach net zero by 2050, becoming one of the first sectors in the world to set such an ambitious target. This report is the fourth annual assessment of the industry's progress towards this goal and it provides key recommendations for how mobile network operators, suppliers and governments can work together to accelerate progress across the sector.

More mobile network operators joined the GSMA Climate Action Taskforce in 2023. The Taskforce has grown rapidly over the last three years and now has 66 members, with networks in most countries around the world.

MNOs are leaders in proactively committing to voluntary climate targets. Over the past year, eight operators submitted new near-term targets to the Science Based Targets Initiative (SBTi), bringing the total to 70 operators and representing nearly half of global mobile connections. Fifty-three operators have also committed to net zero targets.

A growing number of operators are publicly disclosing their climate impacts. Seventy mobile network operators representing more than half of mobile connections globally disclosed to the CDP in 2023, compared with 67 operators in 2022. In addition, data was gathered from nine large operators' sustainability reports, bringing the total coverage of disclosures to 80% of connections.

The quality of disclosures has improved: a record 19 operators received an A score in 2023. More than a quarter of operators disclosing to CDP received an A, compared with just 1.5% of all companies disclosing to CDP in 2023. Operators also improved the coverage and quality of Scope 3 disclosures – the most difficult to measure – with nearly two-thirds of operators disclosing to the CDP 10 or more Scope 3 categories.

Three-quarters of the mobile industry's carbon emission come from its value chain (Scope 3), highlighting the importance of engaging supply chains and customers. More than 90% of Scope 3 emissions came from just five Scope 3 categories: 1) Purchased goods and services; 2) Capital goods; 3) Fuel- and energy-related activities; 11) Use of sold products; and 15) Investments.

5

Operational emissions fell in most regions between 2019 and 2022, led by a 50% reduction in Europe. In North America, Latin America and Middle East and North Africa, operators reduced their emissions by 20–30%. Achieving the sector's 2030 targets requires the industry's overall emissions, including Scope 3, to fall by around 7% per year to 2030.

Operational emissions have fallen despite surging demand for data and connectivity, thanks to progress on energy efficiency and renewable energy. Between 2019 and 2022, global internet traffic more than doubled and mobile connections rose 7% while combined Scope 1 and 2 (market-based) emissions fell 6%.

High and volatile energy prices over the past three years have increased the urgency of maximising energy efficiency. Information from operators shows that the energy intensity of data transmission fell by an average of 10-20% per year between 2019 and 2022. Globally, the average connection consumed around 30 kWh in 2022, with significant variation between countries.

Renewable energy is already playing a major role in reducing mobile operators' emissions, accounting for a third of reductions between 2021 and 2022. Operators disclosing to CDP purchased 50 TWh of renewable electricity in 2022 – one-third of their purchased electricity, up from 14% in 2019. Without these renewable energy purchases, operational carbon emissions are estimated to have been 15 million tonnes higher in 2022.

Increasing the circularity of mobile phones and network equipment is critical to reducing value chain emissions. In June 2023, the GSMA announced two new circularity targets to reduce the environmental impact of mobile phones by boosting their circularity through reuse, repair and recycling. As of January 2024, 15 operators have signed up to the new targets, representing a billion mobile connections.

Achieving the industry's net zero goal requires concerted action from operators and suppliers, supported by policies and investment from governments. For operators and suppliers, the biggest opportunities are in energy efficiency, renewable energy and circularity. Governments should play a key enabling role across these areas by implementing strong climate policies and ensuring energy markets and regulations encourage investment in renewable energy and grids.

1. Net Zero Ambition

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

In February 2019, the Board of the GSMA made a milestone commitment – to transform the mobile industry to reach net zero carbon emissions by 2050. The mobile industry became one of the first sectors in the world to set such an ambitious target.

This report is the fourth annual assessment of the industry's progress towards net zero by 2050. The report aims to answer three key questions:
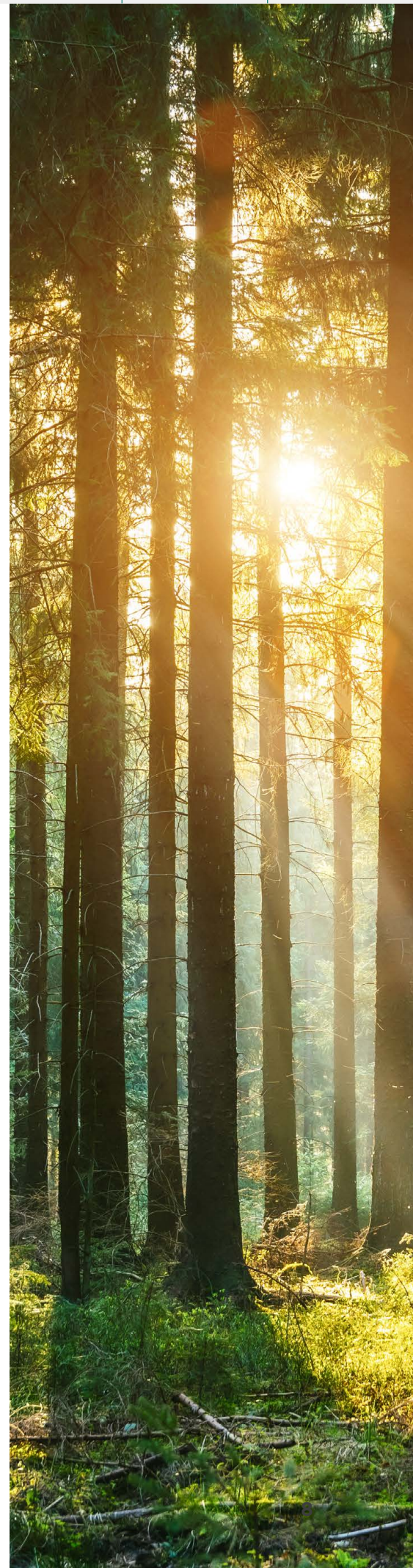
1. What progress did the mobile sector make towards net zero in 2022?

2. Is the sector on track to reach its short- and long-term climate targets?

3. Where is progress being made that could be replicated to achieve net zero?
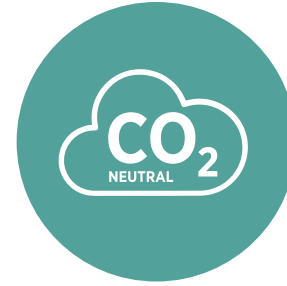
Climate targets

A growing number of mobile network 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 sector to be net zero by 2050.

Net zero targets are corporate commitments to reduce Scope 1, 2 and 3 by 2050 in line with the UN-led Race to Zero Campaign.

Validated net zero targets are net zero targets that have been submitted to the SBTi and validated by a team of technical experts of emissions reduction targets against the qualitative and quantitative corporate criteria.

CASE STUDY
How Telefónica Brazil is Achieving Climate Targets
Find out more

9

Over the past year, eight operators submitted new near-term science-based targets to the Science Based Targets Initiative (SBTi), bringing the global total to 70 operators as of the end of January 2024.
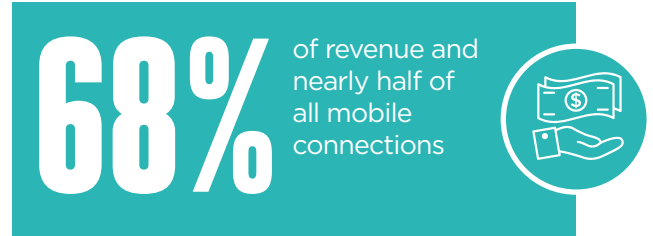
These operators represent nearly half of all mobile connections globally and two-thirds of revenue **(see Figure 1).** Nearly three-quarters of these targets (50) have been validated by SBTi, representing more than 40% of all mobile connections.

In addition to these near-term targets, 53 operators have also set longer-term targets to achieve net zero (**see Table 1**). Twelve net-zero targets were validated over the past year, bringing the industry total to 16.
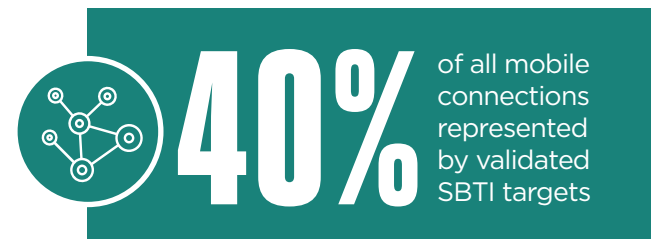
For information explaining how to set science-based targets for mobile network operators, see the GSMA's step-by-step guide on Setting Climate Targets[1].

70 mobile operators have committed to science-based targets (SBTs) as of January 2024, accounting for...

68% of revenue and nearly half of all mobile connections

40% of all mobile connections represented by validated SBTI targets

Figure 1 | Mobile operators' near-term science-based targets

	2021	2022	2023
Number of operators	50	62	70 operators representing 48% of connections 68% of revenues
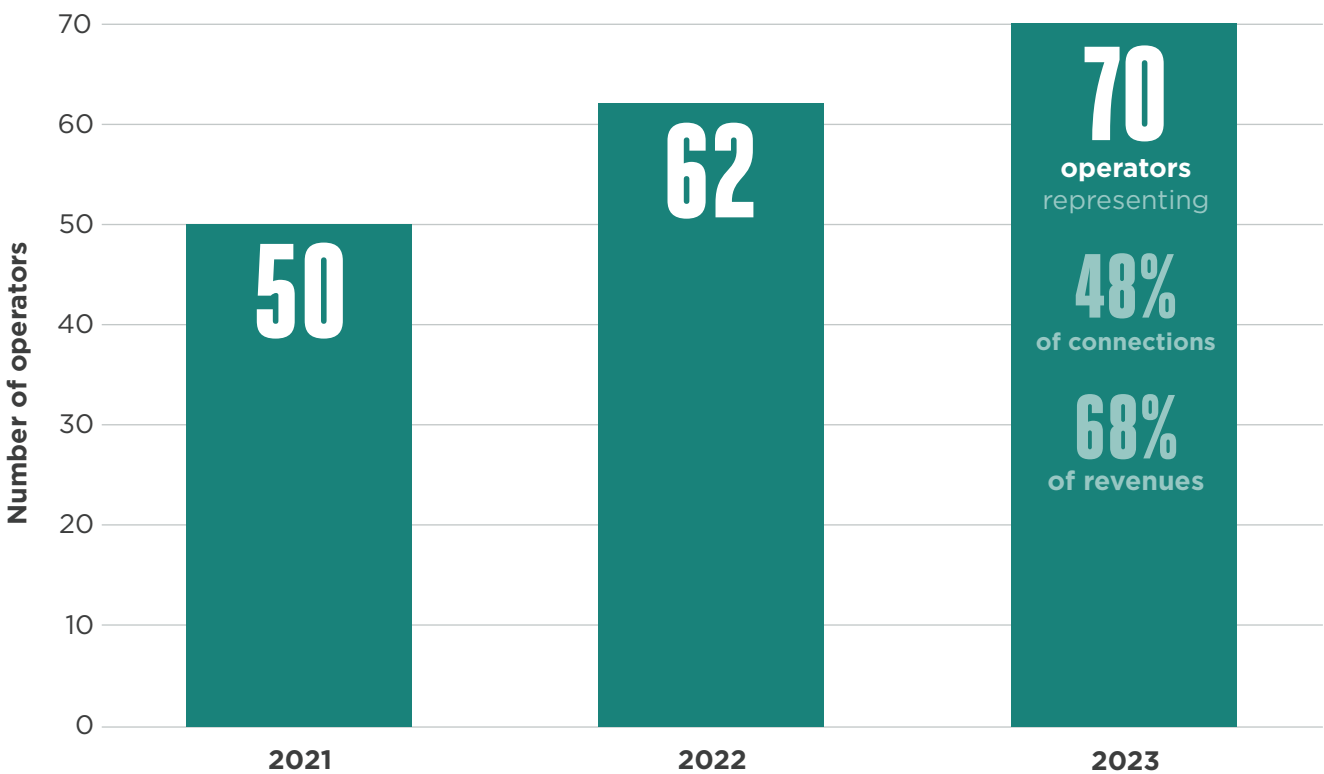
Source: GSMA analysis based on SBTi (2023)

1   https://www.gsma.com/betterfuture/resources/setting-climate-targets

Table 1 | Operators' climate targets

As of 31 January 2024

COMPANY	NEAR-TERM SCIENCE-BASED TARGET	NET ZERO TARGET
2degrees	1.5°C	
A1	1.5°C	2050
Algar Telecom	Committed	
Altice	Committed	2050
América Móvil	1.5°C	2050
AT&T	1.5°C	
Axian	Committed	
Axiata	Committed	2050
Bell Canada	1.5°C	2050
Bharti Airtel	1.5°C	2050
Bouygues Telecom	1.5°C	
BT Group	1.5°C	2041
CelcomDigi	Committed	2050
Chunghwa Telecom	1.5°C	2050
CK Hutchison	1.5°C	2050
Deutsche Telekom	1.5°C	**2040**
Elisa	1.5°C	**2040**
e&	1.5°C	
Far EasTone	1.5°C	2048
Globe	Committed	2050
GO Malta	Committed	2050
Iliad	1.5°C	2050
JT Group	Well below 2°C	
KDDI	1.5°C	2050
KPN	1.5°C	2040
LG Uplus	Committed	
Liberty Costa Rica	Committed	
Liberty Global	1.5°C	
M1	1.5°C	
Magyar Telekom	1.5°C	2050
Millicom	1.5°C	2050
MTN	1.5°C	2040
NOS	1.5°C	2050
NTT Docomo	1.5°C	2040
Orange	1.5°C	2040
PPF	Committed	

COMPANY	NEAR-TERM SCIENCE-BASED TARGET	NET ZERO TARGET
Proximus	1.5°C	**2040**
Rakuten	Committed	
Reliance Jio	1.5°C	2050
Rogers	Committed	2050
Safaricom	Well below 2°C	2050
Saudi Telecom Company	1.5°C	**2050**
Singtel	1.5°C	**2045**
SK Telecom	1.5°C	2050
SoftBank	1.5°C	2050
Spark New Zealand	1.5°C	
StarHub	1.5°C	**2050**
Swisscom	1.5°C	**2035**
T-Mobile Nederland	Committed	2050
T-Mobile USA	1.5°C	**2040**
Taiwan Mobile	1.5°C	**2050**
TDC NET	1.5°C	**2030**
Tele2	1.5°C	**2035**
Telecom Liechtenstein	1.5°C	
Telefónica	1.5°C	**2040**
Telenet	Committed	2050
Telenor Group	1.5°C	2045
Telia Company	1.5°C	**2040**
Telkom SA	Committed	2050
Telstra	1.5°C	2050
TELUS	1.5°C	2050
TIM	1.5°C	2040*
TPG Telecom	1.5°C	**2050**
True Corporation	Committed	2050
Turkcell	1.5°C	
Verizon	1.5°C	
Virgin Media O2	1.5°C	**2040**
Vodafone Group	1.5°C	**2040**
Vodafone Ziggo	1.5°C	2050
Zain	Committed	2050

* Europe Markets
Bold Validated net zero target

GSMA Climate Action Taskforce

Progress towards net zero has been strengthened and accelerated through collaboration between operators across the sector. To provide a forum for this collaboration, the GSMA created a Climate Action Taskforce in 2019. The Taskforce has grown rapidly over the last three years and now has 66 members, with networks in most countries around the world.

The Climate Action Taskforce has four main purposes:

• To promote and encourage leadership on climate action to move the 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 net zero transition.
• To share best practices on climate action so operators support each other and raise their ambitions.
• To create thought leadership and research on how mobile technologies support climate mitigation and adaptation.

Through knowledge-sharing and industry collaboration, the Climate Action Taskforce also supports operators on:

• Improving energy efficiency in networks and buildings.
• Advocating for increased access to, and use of, renewable electricity.
• Engaging with mobile industry suppliers on Scope 3 emissions and setting science-based targets.
• Improving the environmental sustainability of mobile devices, network equipment and waste management practices.
• Using mobile connectivity to reduce carbon emissions through green digital solutions.

The Climate Action Taskforce welcomes new mobile network operator members. Please contact the GSMA at **betterfuture@ gsma.com** if you would like to join.

If you are not a mobile network operator but would like to follow the latest industry climate updates, please subscribe to the **GSMA Better Future newsletter.**

2. Tracking progress on climate action

The latest data from operators shows strong progress in most regions, demonstrating how operators in other markets can take action to reduce emissions.

Understanding climate risks and opportunities

Public disclosure of climate impacts is vital for transparency and understanding progress towards net zero. The CDP provides the most widely used global disclosure system for investors, companies, cities, states and regions. In 2023, more than 23,000 companies reported environmental data through the CDP – a 24% increase from 2022.

In 2023, 70 mobile network operators disclosed to the CDP, compared with 67 operators in 2022 and 63 in 2021 **(see Figure 2)**. Although the number of disclosing operators increased in the most recent reporting year, the share of global mobile connections and revenues disclosed each fell by 11 percentage points because two large operators in China and Russia – who disclosed in 2022 – did not disclose in 2023. To address this shortfall, the

GSMA collected additional high-level emissions data from the sustainability reports of nine large non-CDP disclosing operators.

The highest disclosure rates were observed in North America and Latin America, with more than 90% of mobile connections represented by CDP disclosures. The majority of mobile connections in Europe (81%), Asia Pacific (58%) and Sub-Saharan Africa (53%) were represented in CDP disclosures. Only 24% of mobile connections in Greater China were represented in the disclosures, and no operators in Eurasia disclosed to the CDP in 2023. However, some operators that did not disclose to the CDP have published some emissions and energy data in their annual sustainability reports, which has been used to help create this report.

Figure 2 | CDP disclosures
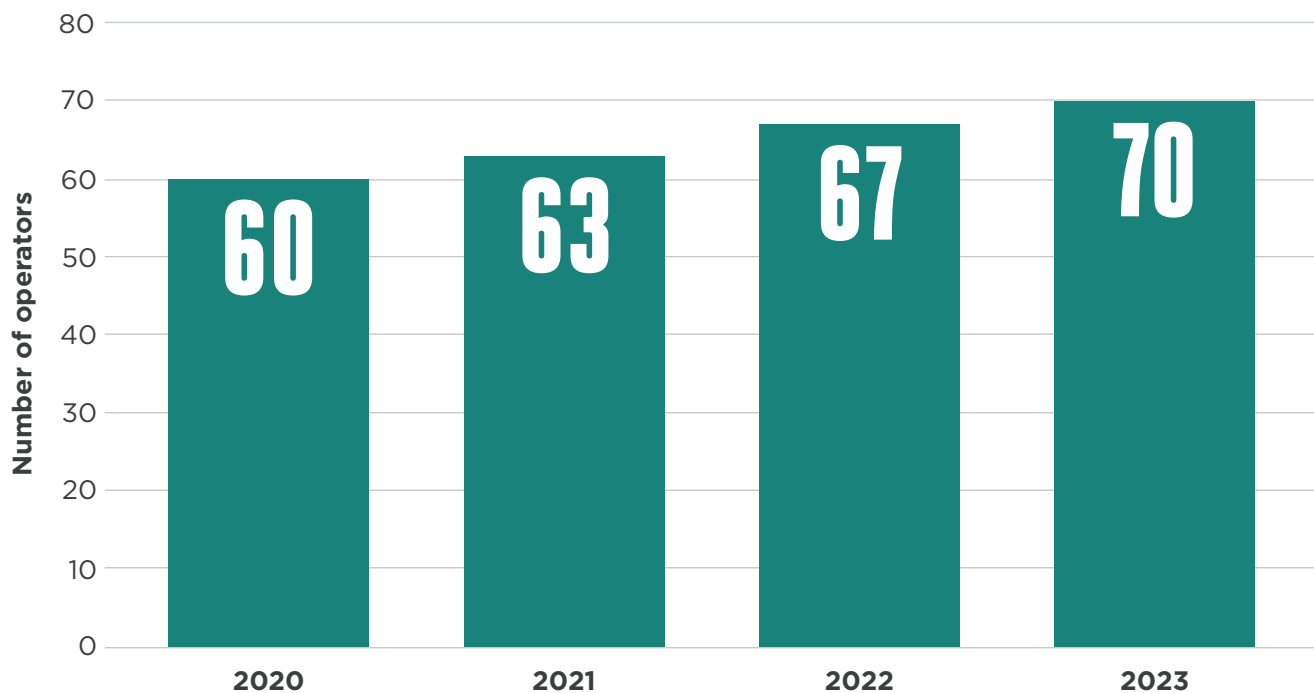
Source: GSMA analysis of CDP (2023)

The GSMA recommends mobile network operators and key industry suppliers disclose to the CDP and/or publicly report carbon emissions. This assures stakeholders that climate action is being taken and helps to track progress towards carbon reduction targets. It also provides data for industry analysis, such as this report.
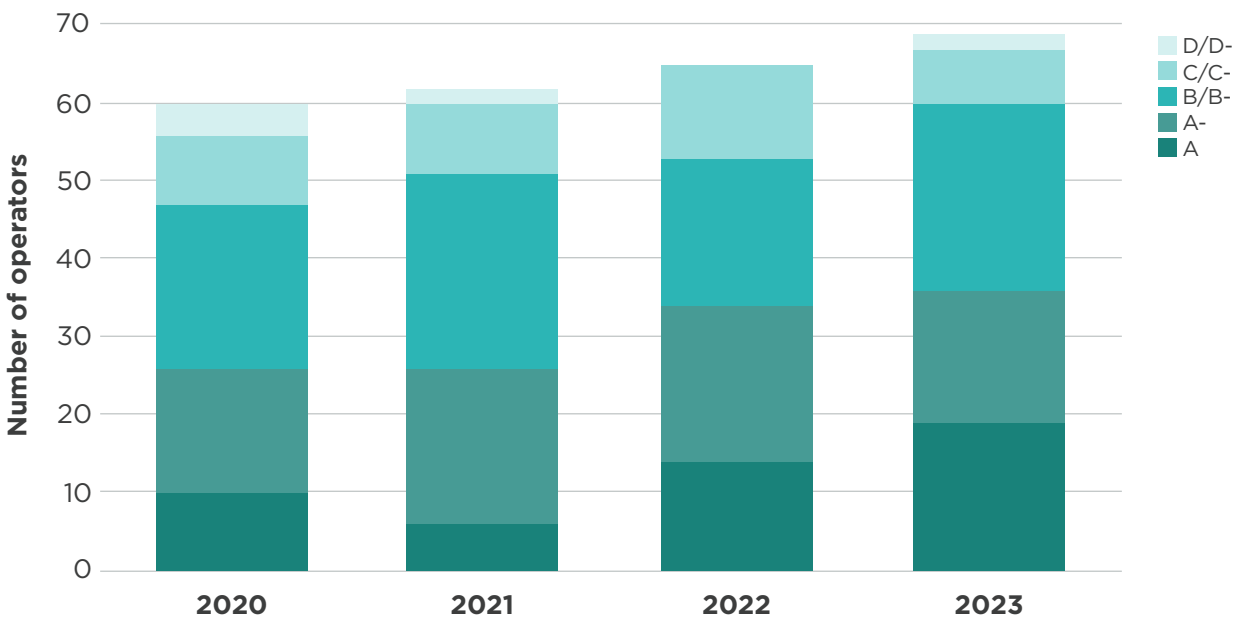
The quality of disclosures has steadily improved since 2020, with 36 operators receiving a Leadership score (A or A-) in 2023 (see Figure 3). These 36 operators represent one-quarter of global mobile connections.

Nineteen operators – more than a quarter (27%) of operators disclosing to CDP – received the highest score (A). This compares with just 1.5% of all companies disclosing to CDP on climate receiving an A in 2023.[2]

More broadly, ESG (Environmental, Social and Governance) data and analysis have become increasingly important for investors to identify risks and opportunities. In an effort to harmonise broad ESG reporting across mobile operators, the GSMA published the first voluntary ESG mobile industry reporting framework[3] in 2022. In December 2023, the GSMA published initial insights from early adopters[4].

Figure 3 | CDP scores

Source: GSMA analysis of CDP (2023)

2 https://www.cdp.net/en/companies/companies-scores
3 https://www.gsma.com/betterfuture/esg-metrics-for-mobile
4 https://www.gsma.com/betterfuture/resources/esg-metrics-for-mobile-insights-from-early-adopters

Mobile industry emissions

Measuring and reporting emissions
The greenhouse gas (GHG) emissions of nearly all companies globally are reported using the GHG Protocol Corporate Accounting and Reporting Standard[5]. Companies report three types or 'scopes' of emissions:

- **Scope 1:** direct emissions from owned and controlled sources, including fuel combustion, company vehicles and fugitive emissions. For a mobile operator, this could include emissions from its vehicle fleet for network maintenance or diesel generators to operate base stations.

- **Scope 2:** indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by the reporting company. For an operator, most Scope 2 emissions come from the electricity used in network base station sites, data centres and other buildings.

- **Scope 3:** all other indirect emissions which the organisation 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 make use of them. For operators. Scope 3 is the largest type of emissions and the hardest to measure accurately.

Scope 1 and 2 emissions are typically referred to as a company's 'operational emissions' because these are primarily within the control of the company. Although companies are not directly responsible for Scope 3 emissions, these emissions are considered part of the industry's overall emissions footprint.

For Scope 3 emissions, a higher margin of error should be factored into estimates given the greater complexity and difficulty in gathering and processing data. There are also methodological constraints and a lack

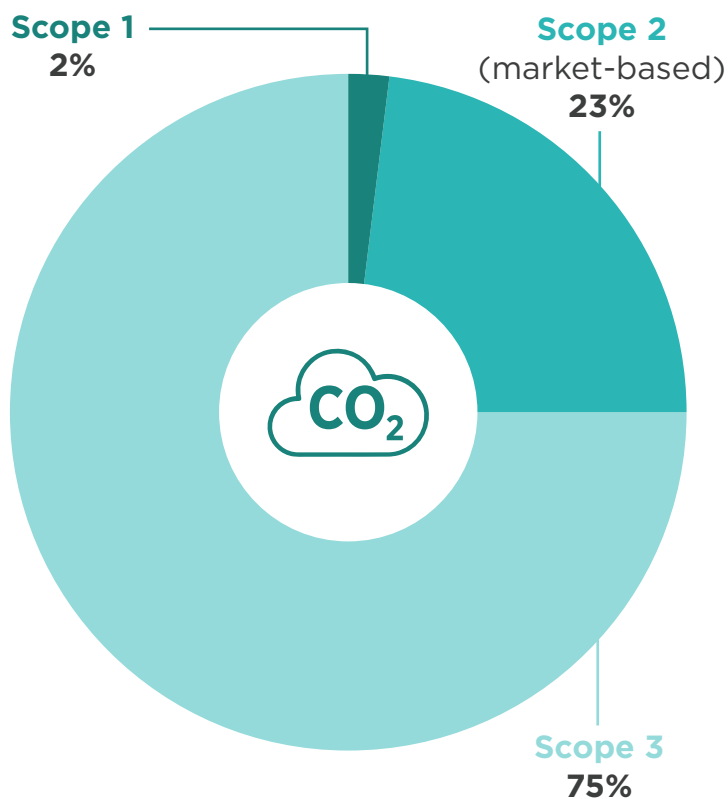5   https://ghgprotocol.org/corporate-standard

of Scope 3 accounting harmonisation. To address this challenge, the GSMA, GeSI and the ITU jointly published Scope 3 Guidance for Telecommunications Operators[6] in June 2023, harmonising methods for operators to assess their Scope 3 emissions to increase coverage and transparency.

Emissions from the mobile industry

Based on the GSMA's analysis of data disclosed to the CDP (55% of connections) and corporate reports (25% of connections), the mobile industry's operational emissions (Scope 1 and Scope 2 market-based) were an estimated 140 million tonnes (Mt) CO_2e in 2022, equivalent to around 0.3% of global GHG emissions. Operational emissions account for one-quarter of the industry's global carbon footprint.

Value chain emissions (Scope 3) were an estimated 420 $MtCO_2e$, or three-quarters of the total emissions of the industry **(see Figure 4)**. More than 90% of Scope 3 emissions came from five categories: 1) Purchased goods and services; 2) Capital goods; 3) Fuel- and energy-related activities; 11) Use of sold products;

Figure 4 | Mobile industry emissions by scope, 2022

Scope 1 — 2%
Scope 2 (market-based) — 23%
Scope 3 — 75%

Source: GSMA analysis based on CDP (2023) and corporate sustainability reports

6   https://www.gsma.com/betterfuture/resources/scope-3-guidance

and 15) Investments. Value chain emissions are discussed in further detail in Chapter 4.

Methodological details of the industry-level results are discussed in the Annex.

Regional trends

These latest estimates show positive progress since 2019, when the GSMA Board committed to reaching net zero by 2050.

Operational emissions globally fell 6% between 2019 and 2022, with substantial reductions in most regions (see Figure 5). Emissions in Europe fell by half, with several operators achieving even deeper reductions, including Tele2, Telefónica, Telenor, Telia and Vodafone.

Emissions from North American operators fell by around 30% over the same period. Operators in Latin America reduced emissions by 22%, led by TIM's Brazil

operations and Telefónica. Operational emissions from the Middle East and North Africa (MENA) fell by around a fifth, led by Turkcell. Emissions from operators in Greater China rose 3% while those from Asia Pacific rose 10%.

Tracking progress towards net zero

To reach the targets set out by the science-based pathway for the mobile sector (45% below 2020 by 2030), the industry's emissions – including Scope 1, 2 and 3 – need to fall by an average rate of around 7% per year to 2030.

While this appears challenging, recent progress shows this is within reach. The target reduction rate has been exceeded over the past three years for operational emissions in Europe (21% per year), North America (11%), Latin America (8%) and MENA (8%). Improved data and further analysis are needed to better understand Scope 3 trends.

Figure 5 | Regional changes in operational emissions, 2019-2022
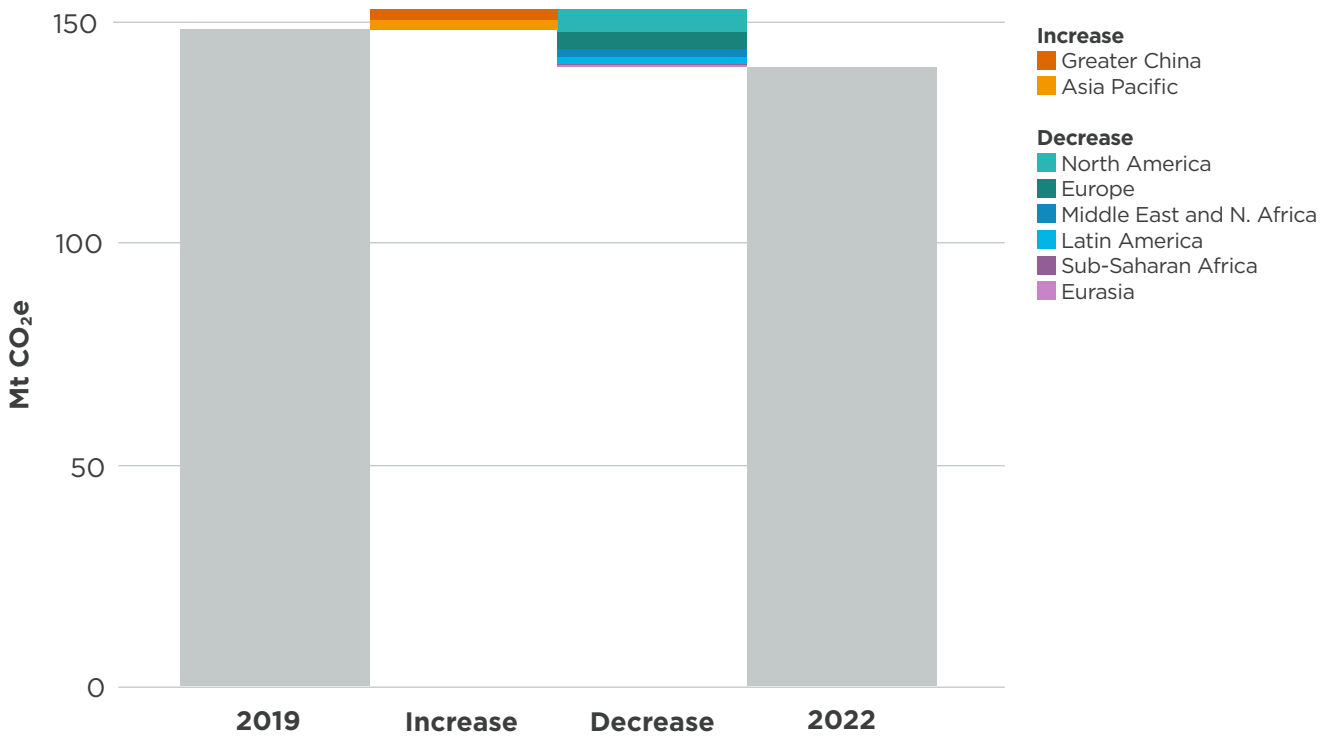
Source: GSMA analysis based on CDP (2023) and corporate sustainability reports

CO₂

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3. Emissions from mobile operators

Despite huge growth in demand for data and connectivity, operational emissions of the industry have been relatively flat since 2019, thanks to progress on energy efficiency and renewable energy.
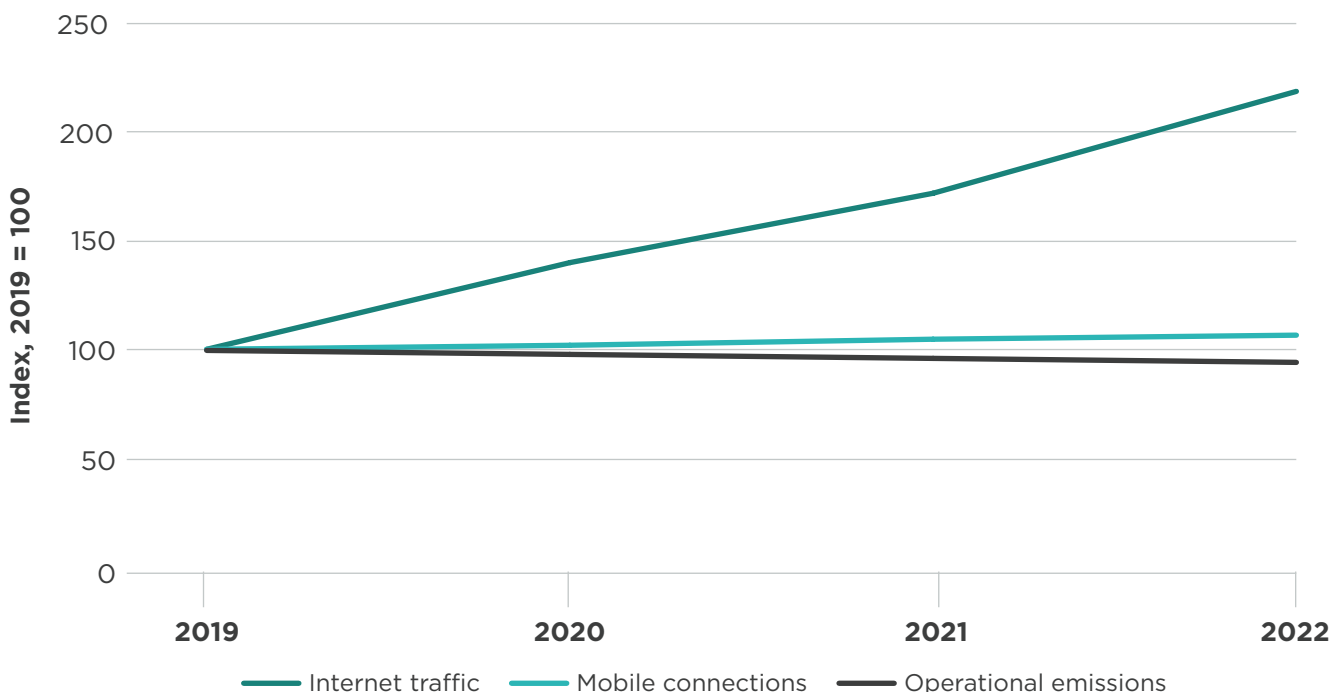
Operational emissions

Operational emissions of the industry – combined Scope 1 and 2 (market-based) emissions – fell 6% between 2019 and 2022. Over the same period, the number of mobile connections globally rose 7% and global internet traffic more than doubled **(see Figure 6)**.

Operators disclosing to the CDP collectively reported a 5% reduction in operational emissions between 2021 and 2022, with nearly two-thirds of operators reporting a decrease in operational emissions, while 35% reported an increase. More than half of the reported decrease was driven by energy efficiency efforts in networks, data centres and offices, as well as the electrification of fleets and generators. Around 30% of the reported decrease in operational emissions was

driven by increased renewable energy consumption. Changes in methodology, mostly related to changes in emission factors, accounted for 8% of the net decrease.

Nearly 60% of the net increase in operational emissions was driven by growth in activity and output (e.g. growth in customer base, data traffic and expansion of networks) followed by changes in boundary (21%) (e.g. inclusion of a subsidiary).

Figure 6 | Operational emissions, 2019-2022

Source: GSMA analysis. Mobile connections data from GSMA Intelligence; internet traffic data from IEA (2023) based on Cisco (2015, 2019) and Telegeography (2022, 2023).

Electricity use

The majority of operational emissions came from generated and purchased electricity. Operators consumed around 320 terawatt-hours (TWh) of electricity in 2022, or around 1.3% of global electricity use. This includes electricity used to power mobile and fixed networks, data centres, offices, stores, electric fleet vehicles and other operations.

Electricity use in 2022 was around 10% higher than in 2019, driven by strong demand growth in China, where electricity growth increased by almost 30% **(see Figure 7)**. The Greater China region also accounted for the largest share of electricity use globally in 2022 (42%), followed by North America (16%), Asia Pacific (15%) and Europe (12%).

There is significant variation in electricity intensity both between and within regions. The average electricity intensity in North America (75 kilowatt-hours [kWh]/connection) was 60% higher than the next highest region (Greater China) and more than twice as high as the global average (30 kWh per connection). The relatively

low population density of North America, high data traffic rates, high 5G penetration and growth in fixed wireless access services may be contributing to the region's higher energy use per connection.

These figures do not include the electricity consumed by tower companies that are not subsidiaries of telecom operators. For example, American Tower, one of the largest tower companies operating more than 200,000 sites, consumed 3.6 TWh in 2022, of which two-thirds were generated on-site from fossil fuels. IHS Towers, operating nearly 40,000 towers, used around 4 TWh in 2022, of which more than 90% was supplied by on-site diesel generators.

"Operators used around 320 TWh of electricity in 2022, equivalent to around 1.3% of global electricity use"

Figure 7 | Electricity use by region
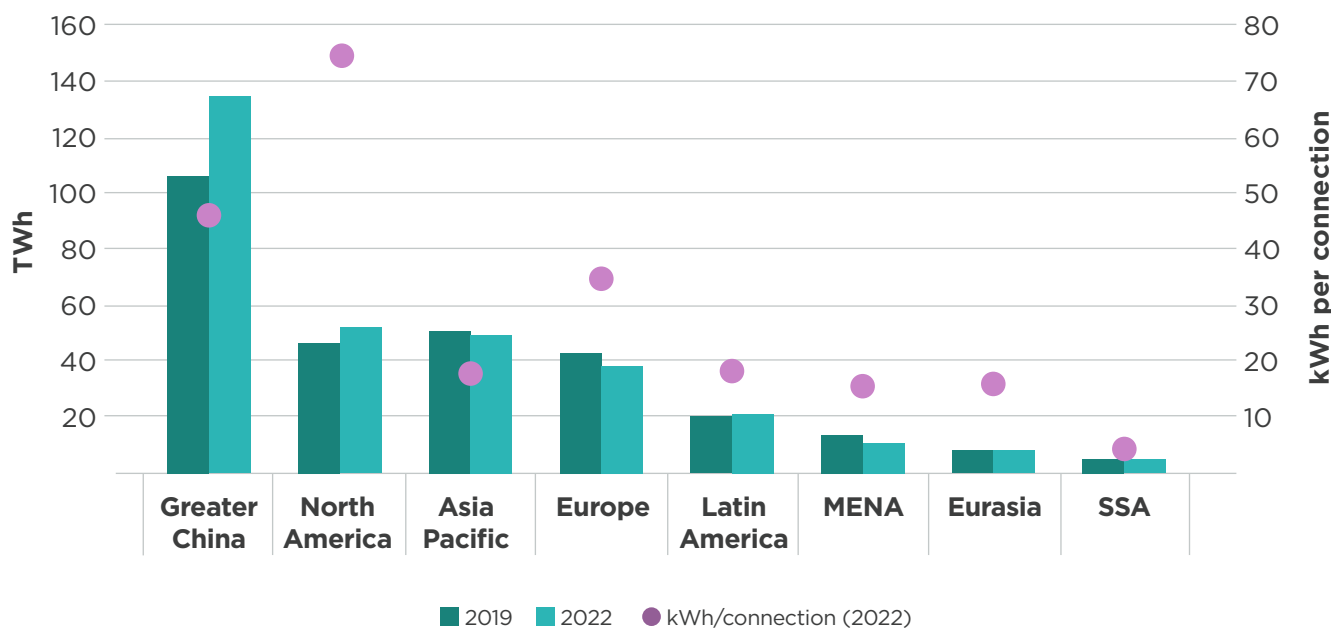
Note: Connections include mobile, fixed broadband and fixed voice.

Source: GSMA analysis based on CDP (2020; 2023) and corporate sustainability reports

Helios Towers, operating more than 13,000 sites, used around 920 GWh. Increased disclosures from other tower companies can improve the quality and completeness of this analysis.

More than 30 operators, primarily from Asia Pacific and Europe, disclosed disaggregated data regarding the sources of Scope 2 emissions, a proxy for electricity use by end use (e.g. networks, data centres and/or buildings).

For nearly all operators disclosing this data – except for those with major data centre operations – networks accounted for more than three-quarters of Scope 2 emissions (see Figure 8). For operators that further disaggregated network-related emissions,

mobile networks typically accounted for 60–85% of network-related emissions (15–40% for fixed).

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

CASE STUDY
Globe's Net Zero Programme
Find out more

Figure 8 | Scope 2 emissions by end use, select operators

Legend: Networks | Data centres | Other

Note: 'Other' includes offices, other building operations and electric vehicles.

Energy efficiency

Energy efficiency is a strategic priority for mobile network operators. Energy is an important share of operational costs and fossil fuel prices have been highly volatile over the past three years, increasing the urgency of maximising energy efficiency.

There are different ways to measure the energy efficiency of networks. For mobile networks, measurement methodologies are defined in the international standard ITU-T L.1331[7] and European standard ETSI ES-203-228 (V.1.4.1)[8].

The most common 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.

Data from operators shows that the energy intensity of data transmission fell by an average of 10-20% per year between 2019 and 2022 **(see Figure 9)**. However, there is significant variation between operators,

Figure 9 | Energy intensity of data transmission, select operators
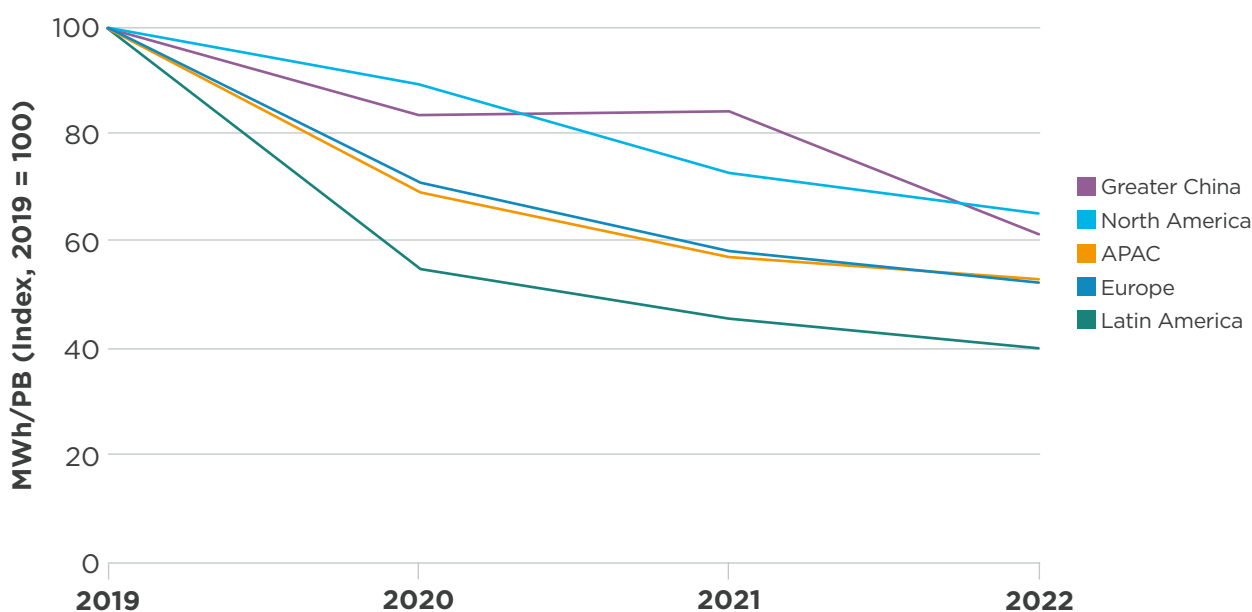
Note: The data shown are averages across a limited number of operators disclosing this data and are intended to show indicative trends.

Source: GSMA analysis of corporate sustainability reports of mobile network operators

7   https://www.itu.int/rec/T-REC-L.1331
8   https://www.etsi.org/deliver/etsi_es/203200_203299/203228/01.04.01_60/es_203228v010401p.pdf

both in terms of their absolute energy intensities (30-500 MWh/PB in 2022) as well as average annual improvement rates since 2019 (0-36%).

The average electricity use per connection also varies significantly between operators and regions. At the global level, the average energy use per connection has been flat since 2019 at around 30 kWh per connection in 2022.

These indicators can provide useful insights into overall industry-level progress on energy efficiency or a specific operator's progress on energy efficiency over time. However, it is not appropriate to use these figures to compare the relative energy efficiency of different networks and operators, or to use them as thresholds for what is considered 'energy-efficient'. This is because there are large differences in energy intensity[9] (per unit data or per subscription[10]) between different networks, partly driven by factors beyond the control of operators, such as population distribution, geography, topography, customer behaviour, network type and network maturity. Some of the differences also stem from substantial differences in energy intensity[11] between fixed and mobile networks – both in terms of energy per data[12] and energy per subscription[13].

Despite the higher energy efficiency of 5G per unit of data transmitted, the greater densification of towers means there is expected to be an increase in electricity consumption of mobile networks over the near term. This increase can be mitigated by the retirement of older, less energy-efficient 2G and 3G networks, by the switch from copper to fibre for fixed networks, and through the deployment of energy-efficiency features of 5G such as AI-optimised sleep modes.

The energy-efficiency implications of Open RAN are still uncertain. Virtualisation offers better energy-efficiency through capacity aggregation and cloudification, and can also be upgraded, set up and authenticated remotely, reducing emissions from transportation.

CASE STUDY

Energy Efficiency with Deutsche Telekom
Find out more

ZTE Hibernation in 5G Base Stations
Find out more

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9   https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=74384072&file=280223-Going-Green-Second-Edition.pdf
10 https://www.ngmn.org/publications/green-future-networks-kpis-and-target-values-for-green-network-assessment.html
11 https://www.aramis.admin.ch/Default?DocumentID=67656&Load=true
12 https://www.traficom.fi/en/news/first-study-energy-consumption-communications-networks
13 https://www.mdpi.com/2071-1050/14/5/2637

Renewable energy

Renewable energy is already playing a major role in reducing mobile operators' emissions, accounting for nearly one-third of operational emission reductions between 2021 and 2022.

Operators disclosing to the CDP, representing 55% of mobile connections, purchased a combined 50 TWh of renewable electricity in 2022 – equivalent to the annual electricity demand of Qatar or Singapore. Among those disclosing to CDP, the share of electricity use from purchased renewables has increased from 14% in 2019 to 33% in 2022 **(see Figure 10)**.

About half of the purchased renewables came from unbundled energy attribute certificates (EACs), and one-quarter each from power purchase agreements (PPAs) and green tariffs with electricity suppliers.

These figures exclude non-purchased renewable and low-carbon sources from grid electricity, which varies significantly between countries. While it is difficult to calculate a combined figure for purchased and grid renewable electricity due to an overlap between the two, it is possible to state that without these renewable energy purchases by operators, operational emissions are estimated to have been 15 $MtCO_2e$ (26%) higher in 2022.

Operators also generated more than 700 GWh from on-site renewables, helping to displace generation and emissions from diesel generators. 700 GWh of electricity generated from diesel generators would have emitted around 900 $ktCO_2e$, in addition to harmful air pollutants including particulate matter and sulphur dioxide.

On-site solar and batteries are an important solution to increasing energy security and sustainability for operators in developing countries, particularly in Sub-Saharan Africa, where operators face huge challenges in accessing clean and reliable electricity. These challenges and potential solutions are explored in the GSMA report on Energy Challenges for Mobile Networks in Sub-Saharan Africa[14].

Figure 10 | Purchased renewable electricity in CDP disclosures

Legend: ■ Purchased renewables (TWh) ● Share of electricity use
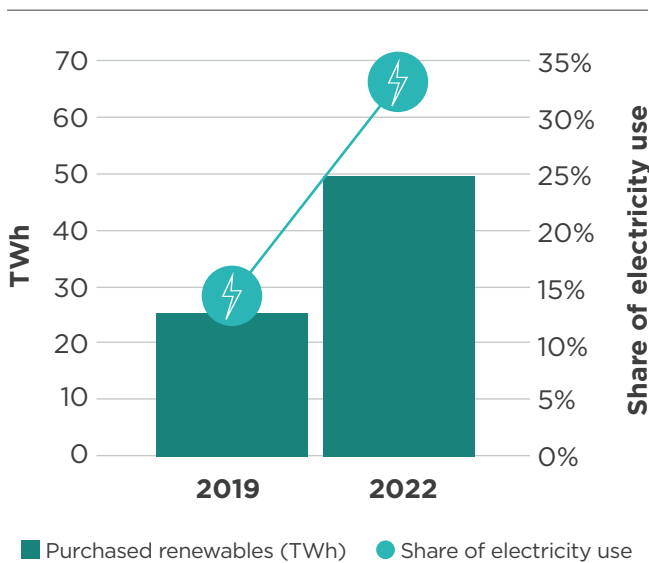
Note: Data are for operators disclosing to the CDP.

Source: GSMA analysis based on CDP (2020; 2023)

CASE STUDY

Energy Savings in Base Stations with KDDI
Find out more

Solarisation at Reliance Jio
Find out more

Turkcell's Greensite Project
Find out more

14   https://www.gsma.com/betterfuture/resources/energy-challenges-ssa

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4. Emissions from supply chains and customers

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

Scope 3 emissions

Nearly all operators (97%) disclosing to the CDP in 2023 disclosed Scope 3 emissions in 2023, including nearly 40 operators disclosing 10 or more categories **(see Figure 11)**. More than a third of operators reported emissions from all five key Scope 3 categories (1, 2, 3, 11 and 15) which account for more than 90% of the industry's Scope 3 emissions.
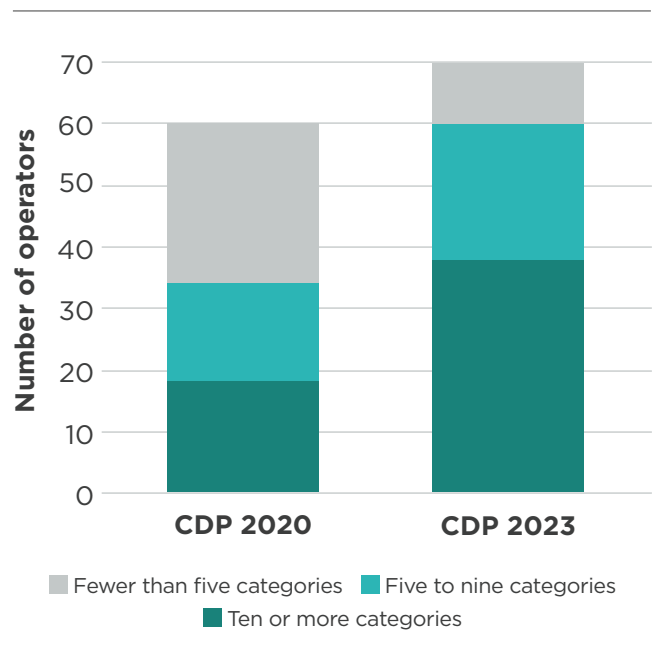
The relative shares of Scope 3 emissions from different categories can differ substantially between operators and regions **(see Figure 12)**. Some of these differences may stem from actual differences in their businesses (e.g. large conglomerate with large operators in other sectors vs. a company that only operates mobile networks), while others may come from methodological differences or a lack of data.

To help align methodologies and advise on data sources, the new GSMA Scope 3 Guidance for Telecommunication Operators[15] was launched last year and has already been used by some operators. Wider adoption will improve future measurement.

Scope 3 emissions may also differ over time for a given company 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.

Figure 11 | Scope 3 disclosure coverage

Number of operators (y-axis 0–70)

CDP 2020   CDP 2023

■ Fewer than five categories   ■ Five to nine categories
■ Ten or more categories

Source: GSMA analysis based on CDP (2020; 2023)

15   https://www.gsma.com/betterfuture/resources/scope-3-guidance

Figure 12 | Scope 3 emissions by category for select operators, by region
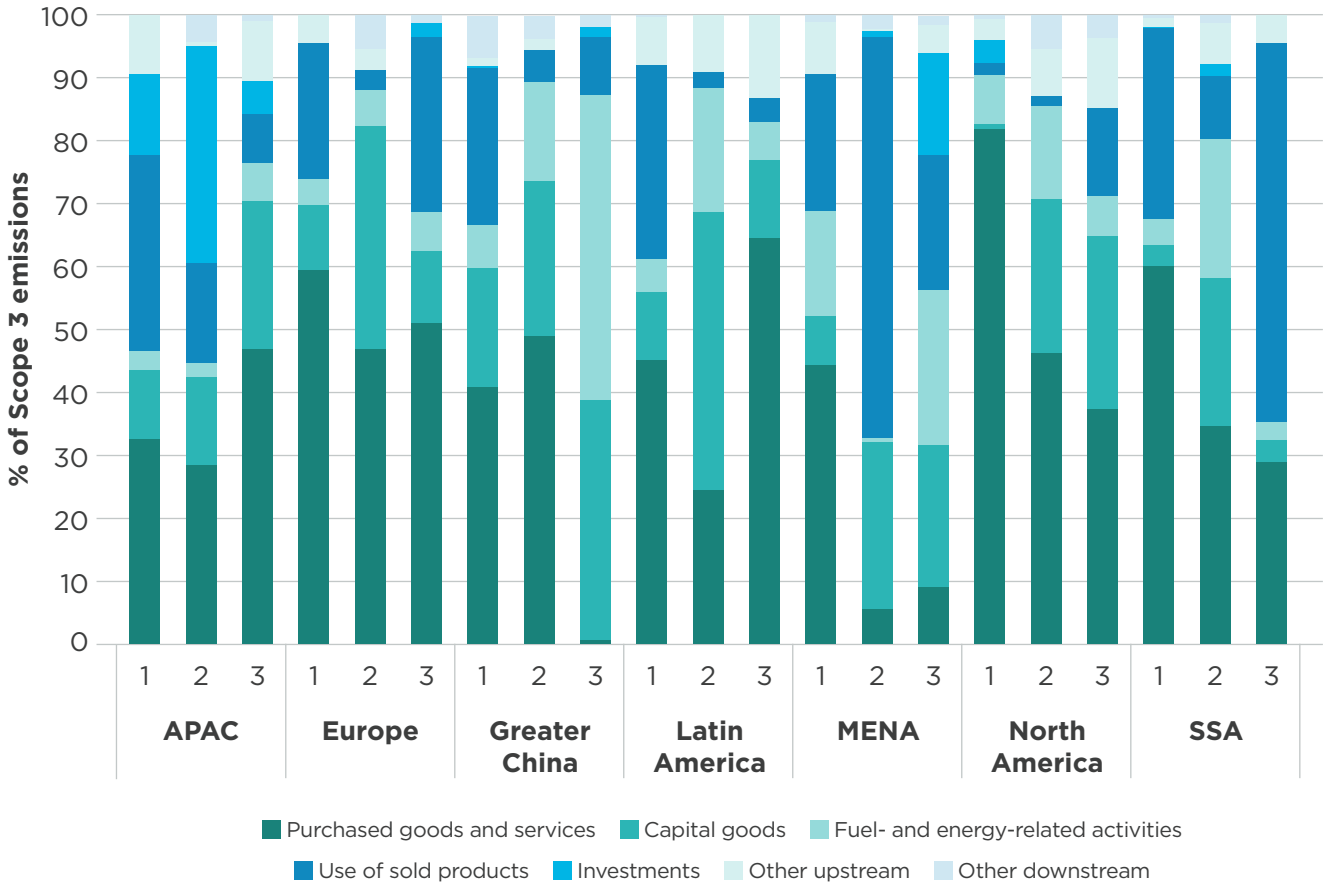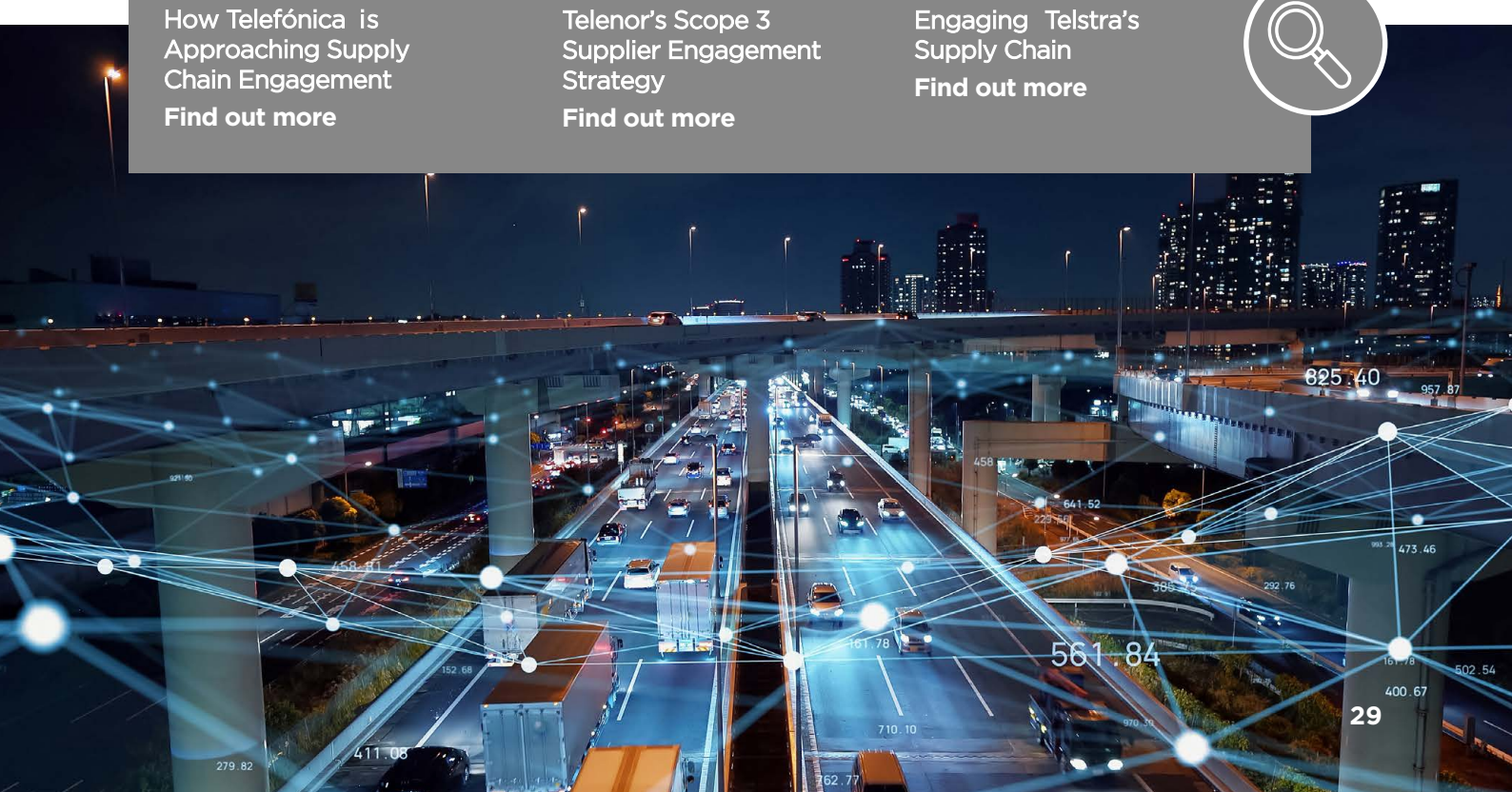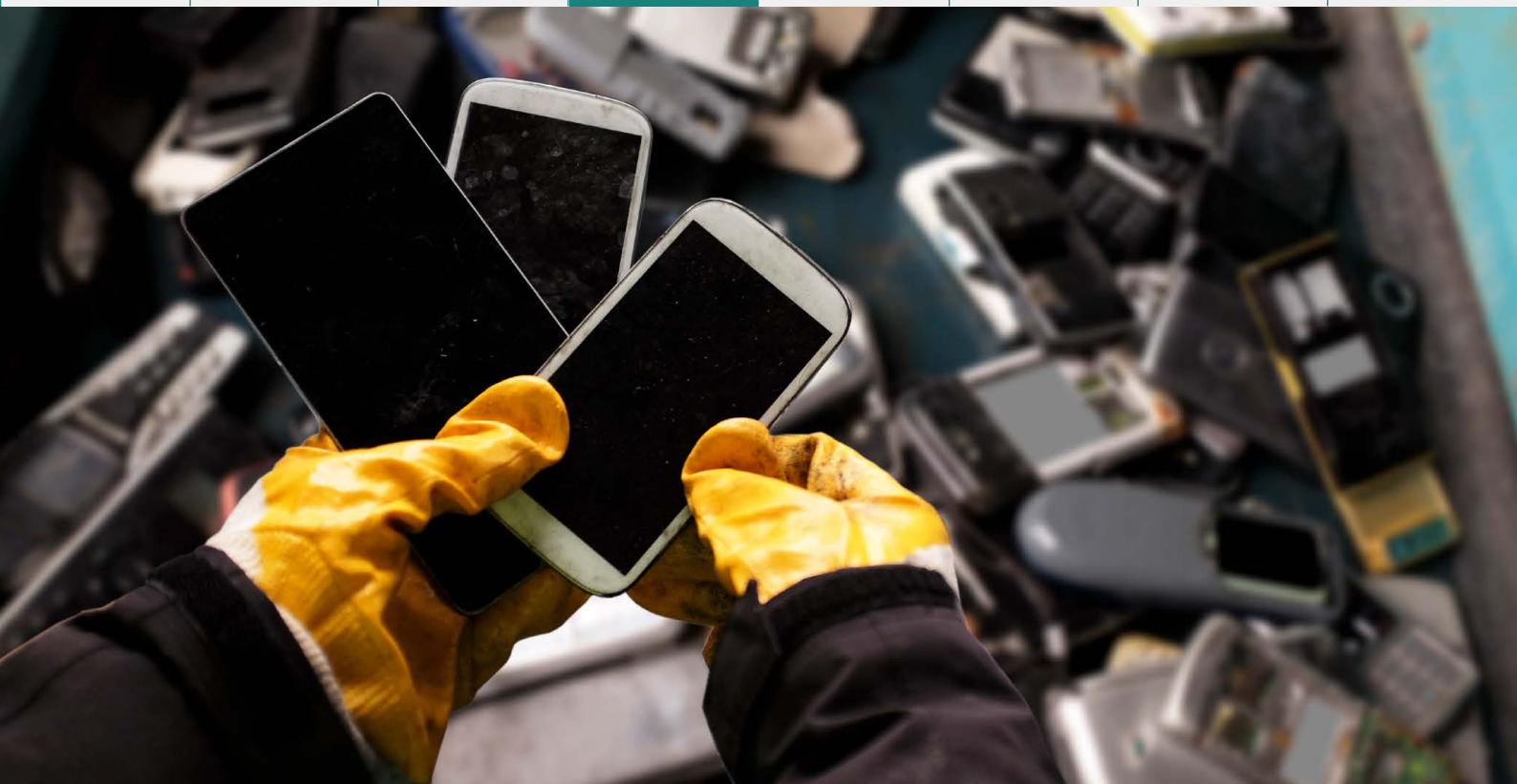

Source: GSMA analysis based on CDP (2023)

CASE STUDY

How Telefónica is Approaching Supply Chain Engagement

Find out more

Telenor's Scope 3 Supplier Engagement Strategy

Find out more

Engaging Telstra's Supply Chain

Find out more

Circular economy

New circularity targets for mobile phones
The GSMA conducted new research[16] that estimated there are more than five billion mobile phones lying dormant around the world. These phones could contain more than 50,000 tonnes of copper, 500 tonnes of silver and 100 tonnes of gold. There is also enough cobalt in them for 10 million electric vehicle batteries.

To help avoid wasting these precious resources, in June 2023 the GSMA announced that leading operators had committed to two new targets to reduce the environmental impact of mobile phones by boosting their circularity through reuse, repair and recycling.

16   https://www.gsma.com/betterfuture/wp-content/uploads/2023/06/Research-Methodology-2023.pdf

Do you have an old phone in a drawer?

Globally, there are more than

5bn

inactive used phones
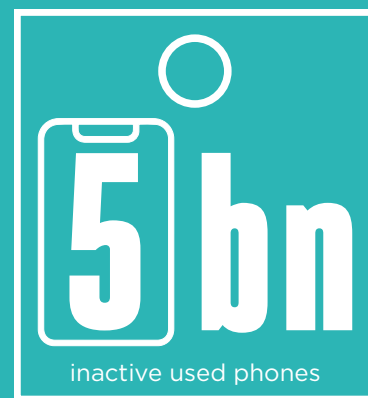
Stretched in a line, these phones could go around the planet

17 TIMES

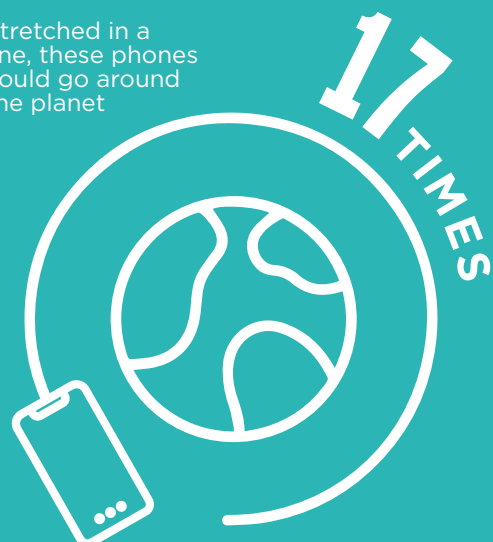The two targets aim to increase the take-back of mobile phones and prevent them from being sent to landfills or incineration:

- By 2030, the number of used mobile devices collected through operator take-back schemes should amount to at least 20% of the number of new mobile devices distributed directly to customers.

- By 2030, 100% of used mobile devices collected through operator take-back schemes will be repaired, reused or transferred to controlled recycling organisations.

As of January 2024, the following operators have signed up to the circularity targets, representing a billion connections:

- BT Group
- Deutsche Telekom Group
- Globe Telecom
- GO Malta
- Iliad
- KDDI
- NOS
- Orange
- Proximus
- Safaricom
- Singtel
- SoftBank
- Tele2
- Telefonica
- Telenor

The GSMA invites all mobile network operators to consider aligning to these targets to help expand the industry's efforts to move towards a more circular economy.

For more information, please contact **betterfuture@gsma.com**

How can you reduce the impact of your next phone?

Reusing a phone saves
100%
of the climate impact of a new phone

Refurbishing a phone saves
87%
of the climate impact of a new phone

What critical minerals could be recovered from five billion phones?

50,000 TONNES
COPPER

500 TONNES
SILVER

100 TONNES
GOLD

The cobalt in them could help make batteries for
10m
ELECTRIC CARS

RRR

Mobile operators are recovering more phones for reuse, refurbishment and repair.

What part can you play?

—

5. Adaptation and resilience

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

Enhancing the climate resilience of networks

The mobile industry and all other sectors must reduce emissions rapidly to net zero by 2050 to avoid the worst impacts of climate change. However, as all countries are experiencing, the impacts of climate change are already here and are getting worse. This means that we must reduce emissions while also preparing and adapting to a changing climate. Mobile network infrastructure and other critical infrastructures must become more climate-resilient to continue operating and supporting our societies.

More frequent and intense extreme weather events could damage telecommunication networks more frequently, resulting in service interruptions for customers and greater financial risks for operators. Network operators are especially exposed to climate-related financial risks because their valuable assets (base stations) are scattered everywhere, including areas at the highest risk.

Many operators have already undertaken short- or long-term climate change risk and opportunity analysis. Based on data provided by the operators to the CDP, around 60% of operators by connections and revenue have started or are planning their climate change risk and opportunity analysis.

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

60% of operators are planning their **climate change risk** and **opportunity analysis**
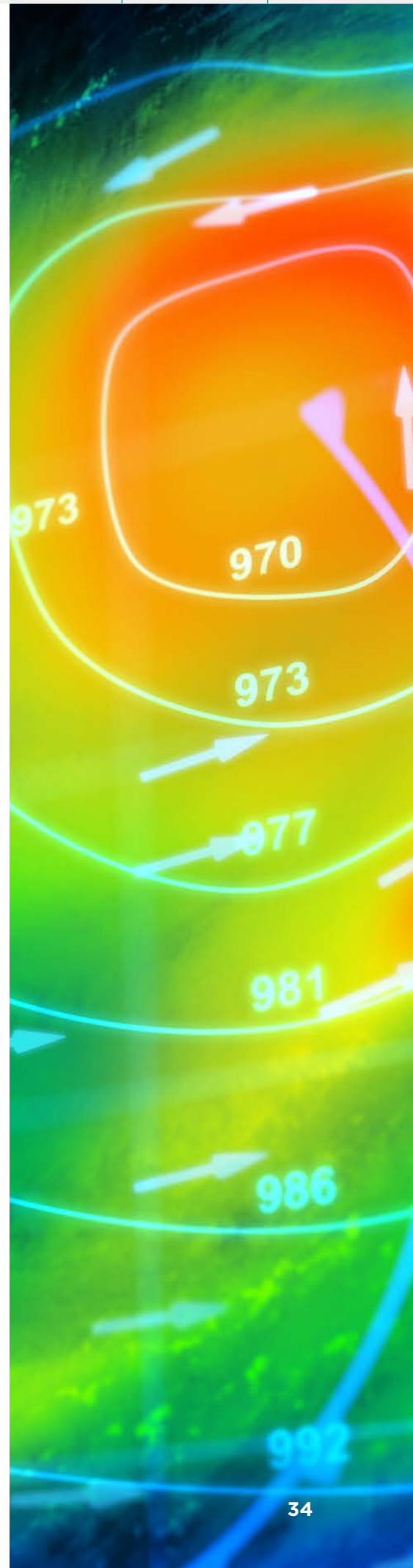
Enabling climate resilience

Digital technologies can also enhance our resilience to growing climate impacts. For example, satellite data and geographic information systems (GIS) can aid in hazard mapping as well as 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.

"Artificial intelligence and the Internet of Things can improve our ability to predict disasters and provide early warnings to populations"
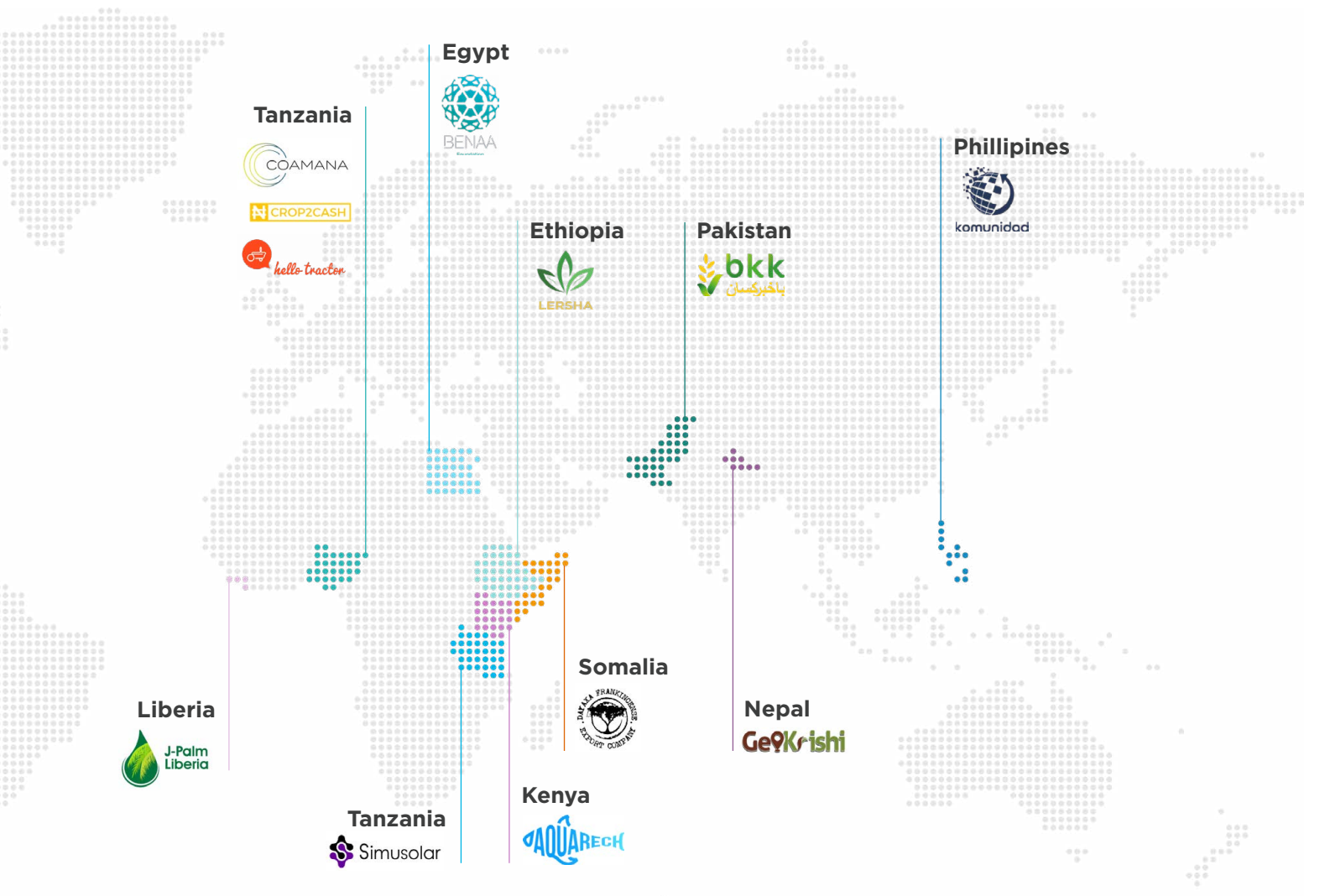
Artificial intelligence and the Internet of Things can improve our ability to predict disasters and provide early warnings to populations. Early warning systems save lives, and just 24 hours' notice of an impending hazardous event can cut the ensuing damage by 30%[17]. In 2022, the United Nations Secretary-General announced an ambition for everyone in the world to be protected by an early warning system by 2027. The GSMA is supporting work across all four of the initiative's pillars of action and sits on the high-level Advisory Board.

Early warning systems save lives, and just 24 hours' notice of an impending hazardous event can cut the ensuing damage by **30%**

17   https://www.gsma.com/mobilefordevelopment/blog/saving-lives-through-mobile-based-early-warning-systems/

34

The GSMA Innovation Fund for Climate Resilience and Adaptation 2.0

The GSMA Innovation Fund for Climate Resilience and Adaptation 2.0[18] was announced at the GSMA Mobile World Congress event in February 2023, supported by the UK Foreign, Commonwealth and Development Office (FCDO) and the Swedish International Development Cooperation Agency (Sida).

Building on the first Innovation Fund launched in 2021, where 12 successful start-ups from 10 countries were selected[19], the fund aims to help accelerate the testing,

adoption and scalability of digital innovations that enable the world's most vulnerable populations to adapt, anticipate and absorb the negative impacts of climate change or strengthen biodiversity.

Successful projects will receive grant funding of between £100,000 and £250,000 over 15 to 18 months, plus tailored technical assistance including mentoring and expert advice, networking and showcasing opportunities, facilitating relevant partnerships and monitoring and evaluation support.

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18   https://www.gsma.com/mobilefordevelopment/the-gsma-innovation-fund-for-climate-resilience-and-adaptation/
19   https://www.gsma.com/mobilefordevelopment/resources/the-gsma-innovation-fund-for-climate-resilience-and-adaptation-portfolio-overview/

6. Enabling climate action

Digital technologies and services can help reduce emissions from all sectors and make our systems and infrastructure more climate-resilient.

Enabling emission reductions

Digital technologies, including mobile connectivity, are key enablers of climate action. Several reports, including the GSMA's Enablement Effect 2019[20] and 2021[21], have shown how smart and connected technologies can help reduce emissions across the economy, including in services, transportation, manufacturing and energy.

For example, teleworking and video conferencing services can help reduce emissions by substituting for physical travel. In the transport sector, intelligent and connected mobility can improve the efficiency of transportation systems, while also shifting people and goods to lower carbon modes of transport. Smart and connected factories can improve productivity, lower energy consumption and reduce CO_2 emissions. AI and machine learning can accelerate innovation in clean materials and catalysts – for example, in electric vehicle battery design and performance.

One of the biggest enablement opportunities lies in electricity systems, which account for nearly a third of global GHG emissions. Smart energy systems are becoming a reality, with record sales of electric vehicles (EV), widespread smart meter adoption and variable tariffs becoming more common. Smart EV charging and vehicle-to-grid were highlighted as one of five key opportunities in the GSMA report on Smart Energy Systems.[22]

"Intelligent and connected mobility can improve the efficiency of transportation systems, while also shifting people and goods to lower carbon modes of transport"

20   https://www.gsma.com/betterfuture/resources/the-enablement-effect
21   https://www.gsma.com/betterfuture/wp-content/uploads/2022/04/The-Enablement-Effect-2021.pdf
22   https://www.gsma.com/betterfuture/resources/smart-energy-systems-connectivity-for-a-zero%E2%80%91emissions-future

European Green Digital Coalition

At the EU level, there has been growing interest in understanding the relationships between the green and digital transitions, and particularly in how digital options can accelerate climate action and help to deliver the goals of the European Green Deal.

European network operators were founding members of the European Green Digital Coalition (EGDC)[23], which aims to harness the enabling emission-reducing potential of digital solutions to all other sectors. EGDC members and partners have worked together to develop science-based methods to estimate the net environmental impact of real-life digital solutions across six priority sectors:

- Energy/power

- Transport

- Smart cities

- Construction/buildings

- Manufacturing

- Agriculture

[23] https://www.greendigitalcoalition.eu/

7. Recommendations to accelerate progress

Achieving the industry's goal of net zero emissions by 2050 requires strong and concerted action from operators and suppliers, supported by policies and investment from governments.

Moving the whole mobile industry to net zero emissions by 2050 will require concerted effort and action by all key stakeholders.

Over the past year, the GSMA has worked with operators to support this journey with the immediate focus being on the rapid cuts needed by 2030.

The following outlines key recommended actions to accelerate progress towards net zero:

Operators

- Assess and publicly disclose carbon emissions and climate risks and opportunities – for example, through the CDP.

- Set science-based and net zero targets aligned with a 1.5°C pathway.

- Optimise energy use of networks by adopting energy-efficient hardware and best practices and retiring legacy networks.

- Purchase and use renewable energy.

- Reduce fossil fuel use in fleets and diesel generators.

- Develop circular economy initiatives for network equipment, mobile phones and customer premises equipment.

- Engage suppliers on climate action and integrate climate requirements into procurement.

Suppliers

- Assess and disclose carbon emissions, climate risks and opportunities through the CDP.

- Set science-based and net zero targets aligned with a 1.5°C pathway.

- Develop more energy-efficient equipment and devices.

- Purchase and use renewable energy and recycled materials.

- Develop circular economy initiatives for network equipment, mobile phones and customer premises equipment.

- Engage supply chains on climate action, including operators.

Governments and policymakers

- Prioritise a just transition to economy-wide net zero emissions by 2050 at the latest, including strengthening countries' nationally determined contributions and 2030 targets in line with a 1.5°C trajectory.

- Implement and enhance national climate, energy and industrial policies to enable the achievement of these targets.

- Support the private sector in their decarbonisation efforts, including through policies and incentives to reward companies' low-emissions strategies.

- Encourage action on energy-efficiency, including supporting the retirement of 2G/3G legacy networks where possible and encouraging innovation for more efficient technologies.

- Ensure electricity markets and regulations encourage renewables and actively engage in dialogue with the private sector where there is a lack of access for the private sector.

- Recognise the enablement effect of the digital transformation and foster innovation and investment in green digital technologies and solutions.

The GSMA Climate Policy[24], updated in December 2023, provides additional details and recommendations for governments to help accelerate the mobile industry's transition to net zero.

To support governments around the world in better understanding the intersection of climate change and the mobile industry, the GSMA has developed a new Capacity Building course[25] for policymakers and regulators.
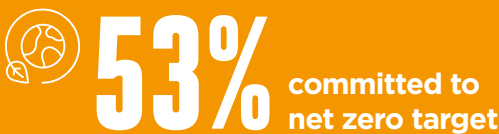
24   https://www.gsma.com/betterfuture/resources/gsma-climate-policy
25   https://www.gsmatraining.com/course/climate-change-and-the-mobile-industry/

8. Regional Insights

Asia Pacific

A varied region
The Asia Pacific region is highly diverse, with a range of economies, network operations and energy and climate contexts.

Aiming for net zero
Nearly 60% of operators (by connections) disclosed to the CDP in 2023, while more than half have committed to near-term and net zero climate targets.

Rise and fall
Operational emissions per connection rose by around 6% between 2019 and 2022, while electricity use per connection fell by 6%.

Expanding the options
The share of purchased renewables remains relatively low at around 10%, due primarily to the lack of options for companies to purchase renewables in many countries in the region. The Asia Clean Energy Coalition[26], established in 2022, aims to accelerate the demand and supply of renewable energy across Asia.

Increasing access to renewable energy
More ambitious climate and energy policies, changes to electricity markets and regulations to increase investment in clean energy and a further build out of regional grid infrastructure in South East Asia are all crucial to help operators in the region access renewable energy and reduce their emissions.

The domino effect
Given the importance of the region in mobile industry supply chains, decarbonising the region will help to reduce Scope 3 emissions for operators around the world.

Disclosures and targets
(% regional connections)

58% disclosed to CDP

54% set science-based targets

53% committed to net zero target

Energy and emissions
(% change, 2019-22)

-6% Change in electricity use per connection

+6% Change in operational emissions per connection

26   https://asiacleanenergycoalition.com/en/

⌖ Europe

Disclosures and targets
(% regional connections)

82% disclosed to CDP

84% set science-based targets

76% committed to net zero target

Energy and emissions
(% change, 2019-22)

-15% ⚡
Change in electricity use per connection

-53% ☁
Change in operational emissions per connection

Leadership and progress
Operators in Europe are leading the way on climate action. Between 2019 and 2022, operational emissions per connection fell by more than half, with several operators achieving reductions of more than 80%.

Supply and demand
Electricity use per connection fell despite increasing demand for data and connectivity, thanks 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.

Major impact
The larger reduction in operational emissions compared with electricity use shows the impact of renewable energy purchases. Operators disclosing to the CDP purchased a record 22 TWh of renewable electricity or around 40% of the global total. This means that around three-quarters of electricity came from purchased renewables – the highest share of any region.

Next steps
Given the strong policy environment for renewables in Europe, operators are encouraged to further increase their impact by opting for power purchase agreements over green tariffs and certificates (where available) and consider moving towards matching their renewable energy purchases to account for both time and location.

On the horizon
Given the strong progress on operational emissions, operators in Europe should increasingly shift their attention to engaging supply chains to reduce their Scope 3 emissions.

44

📍 Greater China

Disclosures and targets
(% regional connections)

24% disclosed to CDP

2% set science-based targets

2% committed to net zero target

Energy and emissions
(% change, 2019-22)

+21% ⚡ Change in electricity use per connection

-2% ☁ Change in operational emissions per connection

Clarity and sustainability
Two of the three major Chinese operators did not disclose to the CDP, but did disclose key energy and environmental data through their annual sustainability reports.

Expansion and improvements
Energy use increased by almost 30% between 2019 and 2022, but strong reductions in Scope 1 emissions and higher renewable energy purchases helped to moderate growth in operational emissions.

A mixed picture
Despite world-leading deployments of clean energy in China, the electricity grid remains dependent on fossil fuels, which account for about two-thirds of the electricity mix. The share of low-carbon sources has increased from 22% in 2012 to 35% in 2022.

Looking to the future
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.

45

📍 Latin America

Disclosures and targets
(% regional connections)

91% disclosed to CDP

84% set science-based targets

72% committed to net zero target

Energy and emissions
(% change, 2019-22)

-5% ⚡ Change in electricity use per connection

-28% ☁ Change in operational emissions per connection

Target commitments
More than 80% of operators (by connection) in Latin America have committed to near-term science-based targets.
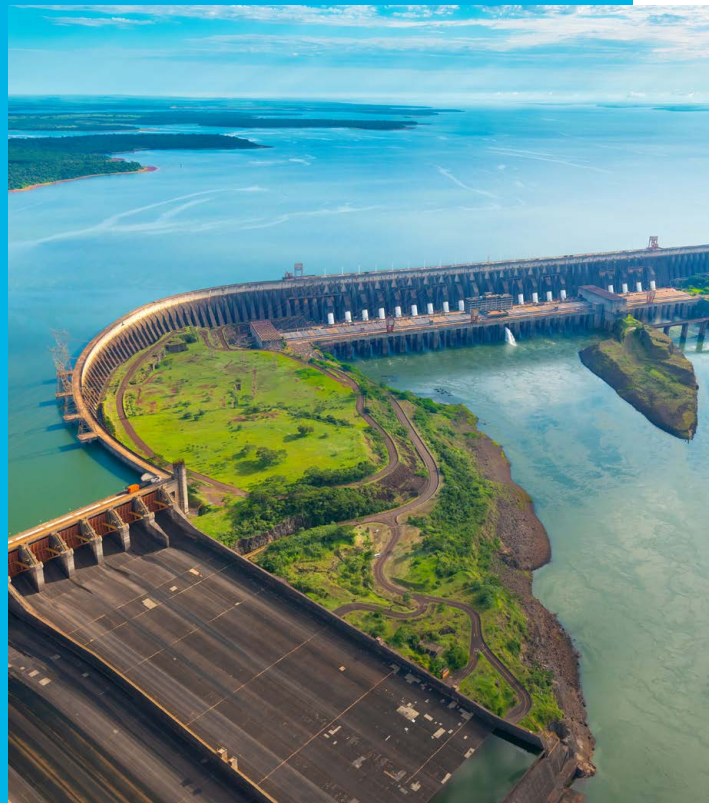
Reductions in the region
Operators in the region have also made major strides in reducing emissions over the past few years, reducing operational emissions per connection by nearly 30%.

Low-emission connections
Operators disclosing to the CDP purchased nearly 5 TWh of renewables or around 40% of their overall electricity use. Given the relatively high share of renewables on the grid, this means that operational emissions per connection in Latin America are among the lowest in the world.

Helping hands
Further policy support is needed across all countries in the region to increase access to renewable energy.

📍 Middle East and North Africa

A promising start
More than 40% of operators (by connections) in the MENA region disclosed to the CDP in 2023 and have committed to climate targets.

Excellent progress
Although the number of connections in the region increased by more than 10% between 2019 and 2022, total operational emissions and electricity use fell.

Rapid growth
Renewable energy purchases increased strongly between 2019 and 2022, rising from less than 1% of electricity use to 18% for operators disclosing to the CDP.

Opportunities within reach
Scope 1 emissions account for a relatively high share (22%) of operational emissions compared with most other regions, partly as a result of a 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.
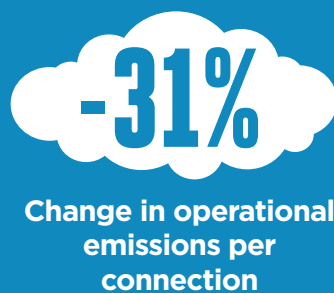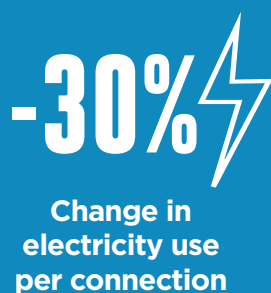
Disclosures and targets
(% regional connections)

47% disclosed to CDP

42% set science-based targets

30% committed to net zero target

Energy and emissions
(% change, 2019-22)

-30% ⚡ Change in electricity use per connection

-31% Change in operational emissions per connection

North America

Disclosures and targets
(% regional connections)

92% disclosed to CDP

92% set science-based targets

35% committed to net zero target

Energy and emissions
(% change, 2019-22)

-1% Change in electricity use per connection

-37% Change in operational emissions per connection

Leading the way
Nearly all North American operators disclose to the CDP and have committed to climate targets.

Improvements in efficiency
This strong level of ambition is matched by action, with operational emissions per connection falling by more than 35% between 2019 and 2022, thanks in part to progress on energy-efficiency and renewable energy.

A major share
Mobile operators collectively purchased nearly 15 TWh of renewable electricity in 2022, or around 40% of their total electricity use.

Next steps
One area for further progress 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.

⚲ Sub-Saharan Africa

Disclosures and targets
(% regional connections)

53% disclosed to CDP

52% set science-based targets

49% committed to net zero target

Energy and emissions
(% change, 2019-22)

-29% ⚡ Change in electricity use per connection

-29% ☁ Change in operational emissions per connection

Recent successes
Operators in Sub-Saharan Africa have made strong strides in climate disclosure, target-setting and emission reductions over the past few years.

An incomplete picture
Operational emissions and energy use per connection both fell by nearly 30% between 2019 and 2022. However, these figures do not include energy use and emissions from tower companies, which may have increased over this period.

The balance of power
One of the biggest challenges in the region is access to 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 2022.

Significant potential
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 on Energy Challenges for Mobile Networks in Sub-Saharan Africa[27].

27 https://www.gsma.com/betterfuture/resources/energy-challenges-ssa

49

Annex: Methodology

Data sources

This analysis relies primarily on data from 70 mobile network operators disclosed to the CDP Climate Change 2023 Questionnaire[28]. These operators represent approximately 55% of mobile connections globally. We conducted data quality checks 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.

For operators not disclosing to the CDP in the 2023 cycle, we gathered key emissions and energy data from corporate reports (e.g. integrated annual reports, ESG reports), if available. Data from nine large operators was collected via public reports, covering approximately a quarter of global mobile connections.

Scope 1 and 2 emissions and energy data for the remaining operators were extrapolated at a regional level based on the reported data from other operators in each region (e.g. average Scope 1 emissions per connection). Scope 3 emissions for non-reporting operators were extrapolated at the global level using average emissions per connection of operators disclosing at least four of the five key categories (1, 2, 3, 11 and 15).

Energy and emissions data sources, by region

Share of mobile connections (%)

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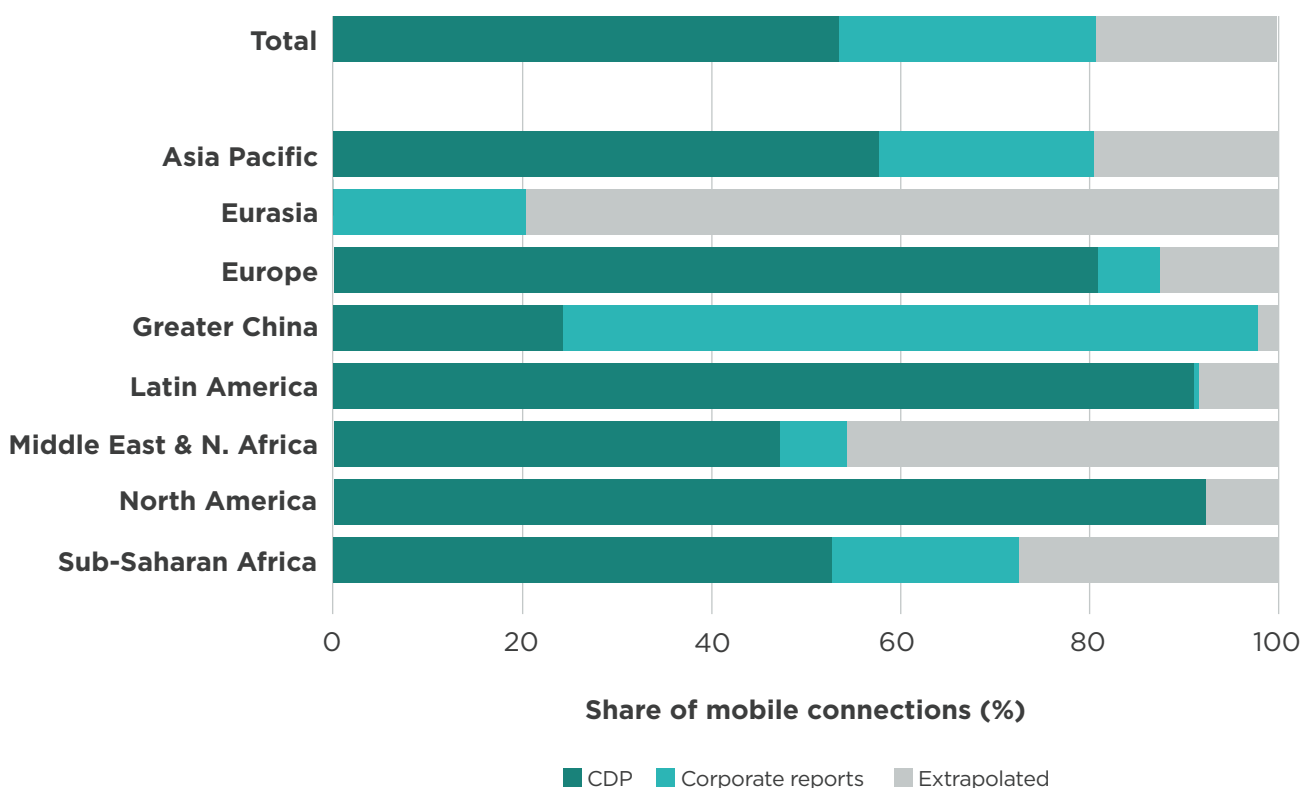
Note: Corporate reports include integrated annual reports, ESG and sustainability reports, and other publicly disclosed data.

Source: GSMA analysis based on CDP (2023) and corporate sustainability reports

28 https://guidance.cdp.net/en/guidance?cid=46&ctype=theme&idtype=ThemeID&incchild=1&microsite=0&otype=Questionnaire&tags=TAG-13071%2CTAG-605%2CTAG-599

GSMA