Mobile Net Zero

State of the Industry on Climate Action 2022

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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Foreword

As we publish our second annual assessment of the mobile industry's performance against its net zero ambition, we are pleased to see that a growing number of operators and suppliers are accelerating their efforts. Given the urgency of the need to work towards a net zero carbon future[1], it is essential that ambition be followed through with tangible action.

The last 12 months have seen a decoupling of data traffic, electricity use and carbon emissions. While the mobile industry has continued to see double-digit growth in data traffic, our environmental impacts have grown at a much slower pace. This is a positive sign which shows the industry is moving in the right direction. Yet, continued efforts are needed to both prevent emissions rising and to rapidly decrease them.

Improving energy efficiency of networks and realising the potential of 5G will require retiring older, less energy-efficient networks. Increased uptake and investment in renewable energy, which we are starting to witness across the industry, is another priority; one which requires the active support of governments in some parts of the world to ensure fair and equitable access to renewable energy markets.

We are also focusing our attention on a circular economy, enabled by more refurbishment, re-use and recycling of products to reduce waste. In February 2022, the GSMA published a strategy paper on the circular economy of network equipment. Later this year, we will follow up with recommendations for the circularity of consumer devices as the industry moves in this important direction.

Much remains to be done, but there has never been a greater willingness to collaborate across the sector to achieve these ambitious goals. It will take action from all sectors and governments to meet the ambition of keeping warming below 1.5°C.

John Giusti
Chief Regulatory Officer, GSMA

1 IPCC Climate Change Report 2022

Executive Summary

Last year, the GSMA made the first assessment of how the mobile industry is progressing against the ambition to be net zero by 2050. Highlights included being recognised as a 'Breakthrough Sector' by the UN's Race to Zero campaign by achieving more than 20% of mobile network operators by revenue having set net zero targets.

This year, the GSMA is proud to say that the industry continues to align around the 1.5°C decarbonisation pathway. To date, 50 operators representing 63% of the industry by revenue and 44% by connections have committed to rapidly cutting their emissions over the next decade. This is an increase of 19 operators since last year. A considerable proportion of operators have also committed to net zero targets by 2050 or earlier, accounting for 29% of global mobile connections and 38% of global revenue.

In order to help better understand current emissions and begin to reduce them, the mobile industry is seeing higher levels of climate disclosure. This is both in the number of operators and key suppliers disclosing and the level of detail within their disclosures. Of the industry, 66% by connections and 82% by revenue globally disclose their climate impacts. Mobile operators scoring a D or D- the previous year have improved their ratings to C, sometimes even leapfrogging to B.

To boost energy efficiency, the industry is using the latest technologies to help reduce climate impacts. Artificial intelligence, machine learning and virtualisation are optimising power use in equipment, centralising network resources (enabling synergies) and avoiding unnecessary heating or air-conditioning. The mobile industry continues to successfully decouple data traffic travelling over networks with electricity use and carbon emissions. Data traffic was up 31% last year, with electricity up 5% and associated carbon emissions up only 2%.

As well as harnessing operational efficiencies, operators are using more renewable electricity. During 2021, 18% of total electricity consumption was sourced from renewable sources. This figure is up from 14% in 2020.

Supplier engagement continues to be crucial to achieving the industry's decarbonisation pathway. This year, operators have engaged suppliers to start a discussion around moving towards greater circularity through reuse and recycling of network equipment. A new good practice metric has also been developed by the GSMA for the industry to help focus efforts, with several operators already aligning their targets.

Following the progress at COP26 and ahead of this year's COP27, the GSMA continues to call on governments to align their carbon-reduction targets to net zero by 2050 at the latest and to create suitable energy market frameworks for businesses to access renewable electricity at a competitive price. By fostering a twin digital and green transition, countries will be able to reap the benefits of further emission reductions across all sectors of the economy.

1 Net zero ambition

Mobile network operators around the world are taking their commitments to reach net zero carbon emissions seriously. The industry is working collaboratively on the challenge through a comprehensive set of actions. By committing to net zero targets, operators are taking responsibility for the emissions of their whole supply chain, including Scope 3 emissions both upstream and downstream. This is a significant commitment from an industry whose output is increasing month by month, through the provision of improved connectivity in more places, to more people and to more devices.

Figure 1 **Operator targets**

Source: CDP, United Nations Framework Convention on Climate Change and operator websites

Of the industry...

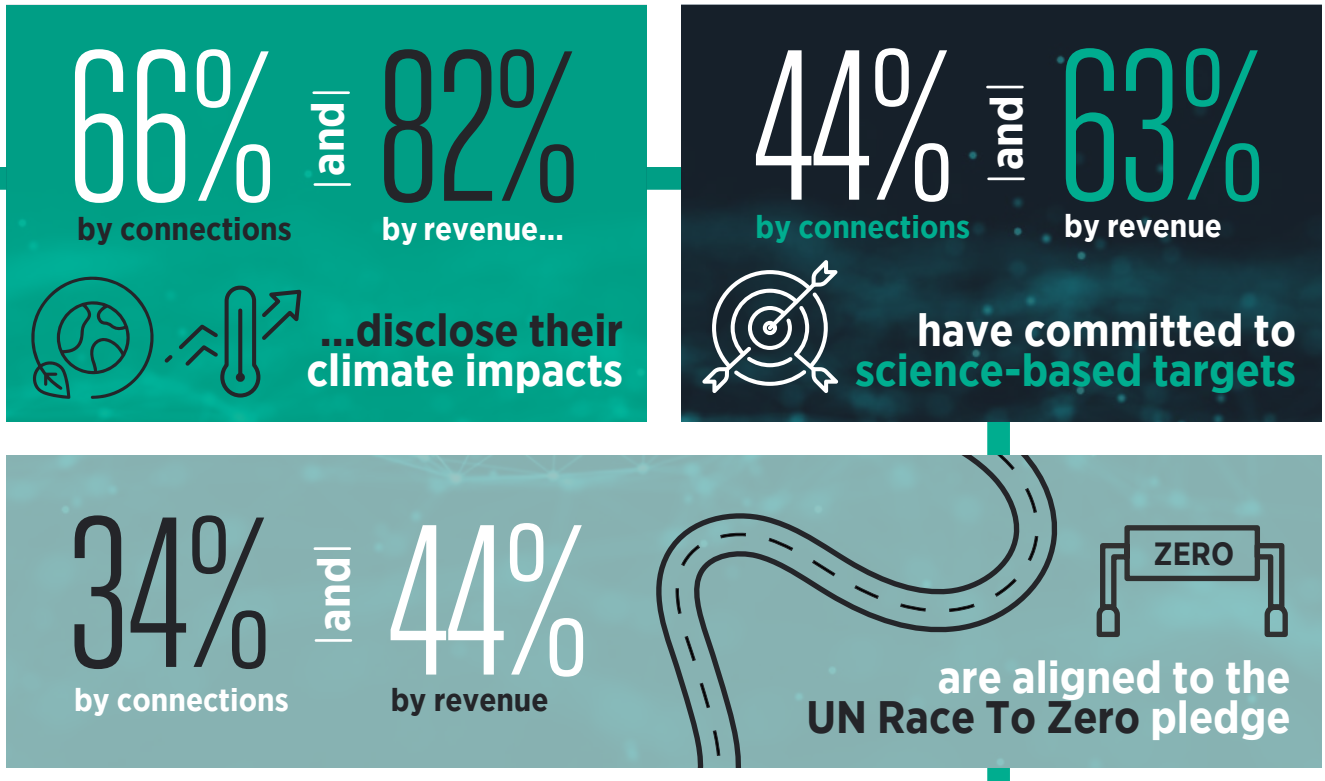

Figure 2 **Climate targets by operator**

Source: SBTI, UNGC and operator websites

COMPANY	SCIENCE -BASED TARGETS	CARBON NEUTRAL TARGET YEAR	RACE TO ZERO TARGET
2degrees	Committed		
A1	Targets set: 1.5°C	2014	
Altice	Committed		2050
América Móvil	Targets set: 1.5°C		2050
AT&T	Targets set: 1.5°C	2035	
Axiata	Committed		2050
BCE	Committed	2025	
Bharti Airtel	Targets set: 1.5°C		2050
British Telecom	Targets set: 1.5°C	2030	2040
Chunghwa Telecom	Committed		
CK Hutchison	Committed		
Deutsche Telekom	Targets set: 1.5°C	2025	2040
Elisa	Targets set: 1.5°C	2020	
Far EasTone	Targets set: 2°C		
Globe Telecom	Committed		2050
Iliad	Committed	2035	
JT Group	Targets set: well below 2°C*	2030	
KDDI	Targets set: 1.5°C	2030	
KPN	Targets set: 1.5°C	2015	2040
LG Uplus		2030	
Liberty Global	Targets set: 1.5°C		
Magyar Telekom	Targets set: 1.5°C	2016	2050
Millicom	Committed		2050
MTN	Committed		2040
NTT DOCOMO	Targets set: 1.5°C	2030	
Orange	Targets set: 1.5°C		2040
Proximus	Targets set: 1.5°C	2016	2040
Reliance Jio	Targets set: 1.5°C		
Safaricom	Targets set: well below 2°C		2050
Singtel	Targets set: well below 2°C		2050
SK Telecom	Targets set: 1.5°C*	2050	
SoftBank	Targets set: 1.5°C	2030	
Spark	Targets set: 1.5°C		
STC	Committed		2050

* Submitted to SBTI for validation

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COMPANY	SCIENCE -BASED TARGETS	CARBON NEUTRAL TARGET YEAR	RACE TO ZERO TARGET
Swisscom	Targets set: 1.5°C	2020	2050
Taiwan Mobile	Targets set: well below 2°C		
TDC	Targets set: 1.5°C	2028	2050
Tele2	Targets set: 1.5°C	2020	
Telefónica	Targets set: 1.5°C	2025**	2040
Telenor Group	Targets set: 1.5°C	2030***	
Telia Company	Targets set: 1.5°C	2020	2040
Telkom	Committed		2050
Telstra	Targets set: 1.5°C	2020	2050
Telus	Targets set: 1.5°C	2030	2050
TIM	Committed	2025	2040
T-Mobile US	Targets set: 1.5°C		
TPG	Committed		2050
Turkcell	Committed		
Verizon	Targets set: 1.5°C	2035	2040
Vodafone	Targets set: 1.5°C	2030	2040
Vodacom	Targets set: 1.5°C	2030	2040

** Main markets - Spain, Germany and Brazil
*** Nordic operations

Definitions

Science-based targets (SBTs)
Defined by the Science-Based Targets Initiative (SBTi) to set carbon-reduction targets in line with limiting global warming to below 2°C. First an organisation commits to a target, then it sets the target level. For more information, please see gsma.com/betterfuture/setting-climate-targets.

Carbon-neutral target
Refers to reducing and offsetting carbon emissions from a company's own operations (Scope 1 and 2 emissions). For operators, the largest sources of Scope 1 and 2 emissions are electricity use for networks and diesel fuel used for transport and generators.

Race To Zero target
Committing to achieving net zero carbon emissions by 2050 at the latest, as part of the UN-led Race To Zero campaign with businesses, cities, regions, investors and financial and educational institutions. According to the criteria used by the campaign, a net zero target includes reductions in Scope 3 emissions across the whole value chain. For more information, please see unfccc.int/climate-action/race-to-zero-campaign.

Case study: Axiata

Axiata's diverse group of businesses is well-positioned to take action to reduce our carbon footprint and advocate for inclusive climate action. Our net zero commitment, affirmed by our pledge to the Science-Based Targets Initiative (SBTi) Net Zero Standard, is our response to the urgent call to act by reducing our carbon footprint and supporting climate mitigation and adaptation efforts.

Axiata's Net Zero Carbon Roadmap is intended to be used to communicate our approach to reaching net zero to our stakeholders. It outlines our net zero carbon goals, baseline carbon emissions profile and areas we are working as part of Axiata's Advancing to Zero ambition. It encompasses strategies that support our response to the Intergovernmental Panel on Climate Change's call to limit global warming to 1.5°C.

Our strategic approach aligns to a carbon mitigation hierarchy, covering priority areas for carbon reduction across our operational footprint first, followed by value chain emissions. Concurrently, we will continue to empower positive change to enable carbon avoidance and removal across our region, with an inclusive all-of-society approach towards combating climate change and social challenges leveraging digital connectivity and modernisation as key enablers for this change.

This approach will enable us to engage on current and future solutions to focus on and collaboratively form partnerships towards meeting the global climate action agenda. Axiata is committed to achieving net zero carbon emissions no later than 2050 and to reach halfway by 2030 with a near-term target to reduce operational carbon emissions by 45% from a 2020 baseline.

> We will continue to empower positive change to enable carbon avoidance and removal across our region, with an inclusive all-of-society approach towards combating climate change and social challenges

Advancing to zero
Net zero carbon roadmap

Our net zero carbon pathway to reach our goal encompasses a three-objective strategy, including **carbon emissions reduction** and **carbon emissions avoidance and removal**.

Accelerate decarbonisation of our network operations

Target: Reduce our operational network emissions (Scope 1 and 2) by 45% from a 2020 baseline by 2030

Approach:

- Reduce network energy consumption by enhancing energy efficiency
- Increase network renewable energy consumption from self-generation or purchased electricity

Accelerate transformation of our value chain

Target: Reduce value chain emissions (Scope 3) from our indirectly controlled sources

Approach:

- Contribute to positive climate impact across our value chain
- Include tracking our suppliers' operational carbon emissions (as our main focus) as we progress

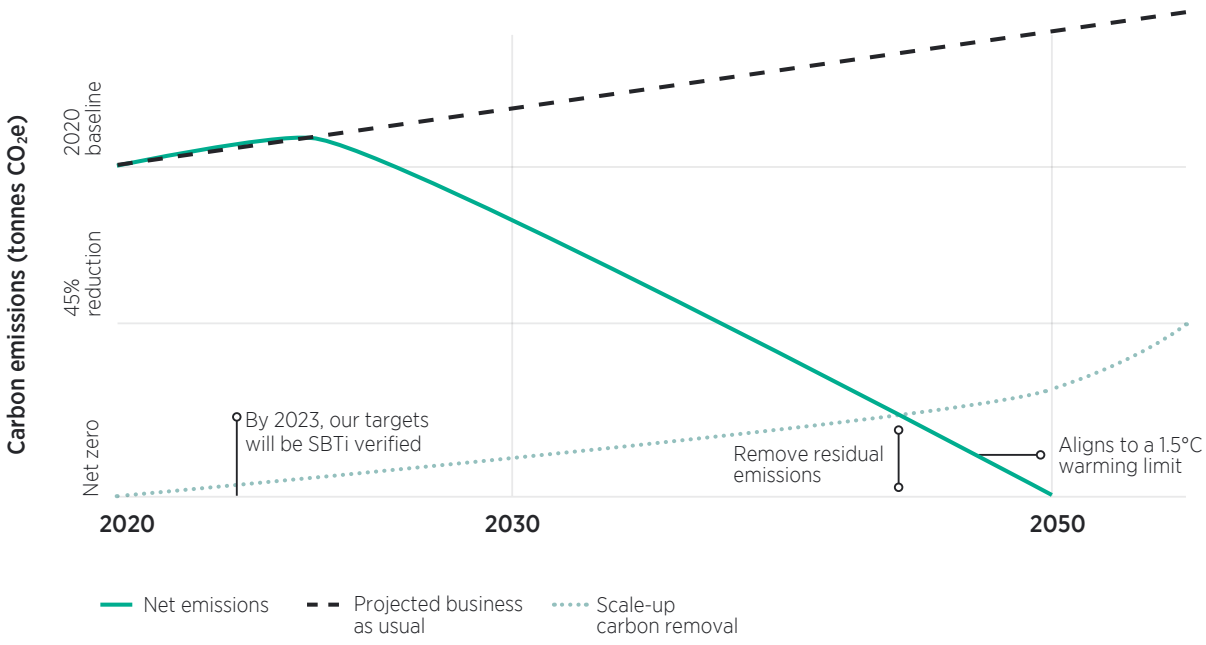
Deliver an inclusive climate agenda

Target: Contribute to positive climate action through carbon removal and enabling avoidance through technology and digitisation

Approach:

- Remove carbon emissions through natural or technological solutions
- Contribute to decarbonisation solutions by enabling efforts across society

NET ZERO BY 2050



2 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 53 members, with networks in most countries around the world.

The 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 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 to raise their ambition.
- 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 supports operators on:

- Improving energy efficiency in networks and buildings
- Increasing access to, and use of, renewable electricity
- Engaging with mobile industry suppliers on climate action
- Improving the environmental sustainability of mobile devices and equipment
- Adapting infrastructure and managing extreme weather events in a rapidly changing climate
- Using mobile connectivity to reduce carbon emissions through smart technologies.

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

3 Understanding climate risks and opportunities

The journey to leadership in environmental transparency

Since it was founded in 2000 as the Carbon Disclosure Project (CDP), the CDP has created a global reporting system for greenhouse gas emissions and the detailing of climate risks and opportunities. As of April 2022, more than 13,000 companies, cities, states and regions disclose their carbon emissions each year to the CDP.

By 2021, 60 mobile operators accounting for 66% of global mobile connections disclosed their climate impact, risks and opportunities to the CDP – an increase of 266 million connections compared to 2020. Not only are more mobile operators disclosing, but those that do disclose are providing more information, leading to significantly higher scores. By scoring mobile operators, the CDP aims to incentivise and guide them on a journey through disclosure towards becoming leaders in environmental transparency and action.

There are four main score categories:

1. **Leadership (A/A-):** implementing current best practices
2. **Management (B/B-):** taking coordinated action on climate issues
3. **Awareness (C/C-):** knowledge of impacts on, and of, climate issues
4. **Disclosure (D/D-):** transparent about climate issues.

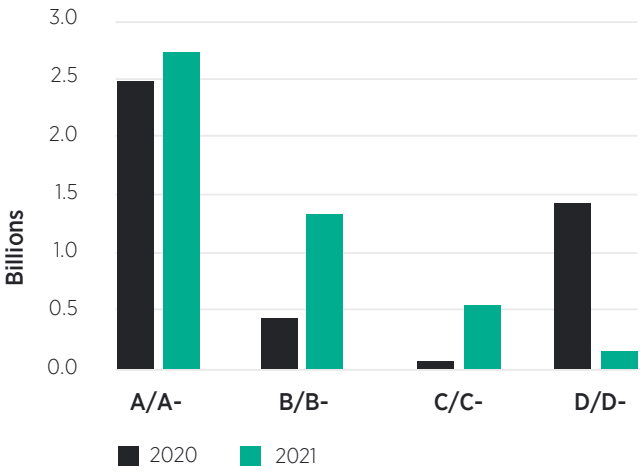
Carbon disclosure scores: 2021 versus 2020

Compared to 2020, scores for operators improved significantly in 2021 (see Figure 3). The number of connections provided by operators in the lowest category dropped from 1.4 billion to 163 million in just one year.

Meanwhile, 2.7 billion connections were provided by A or A- operators in 2021. These operators have demonstrated best practices associated with environmental leadership and have set ambitious and meaningful targets.

Figure 3 **Number of connections by carbon disclosure score category in 2020 and 2021**

Source: CDP

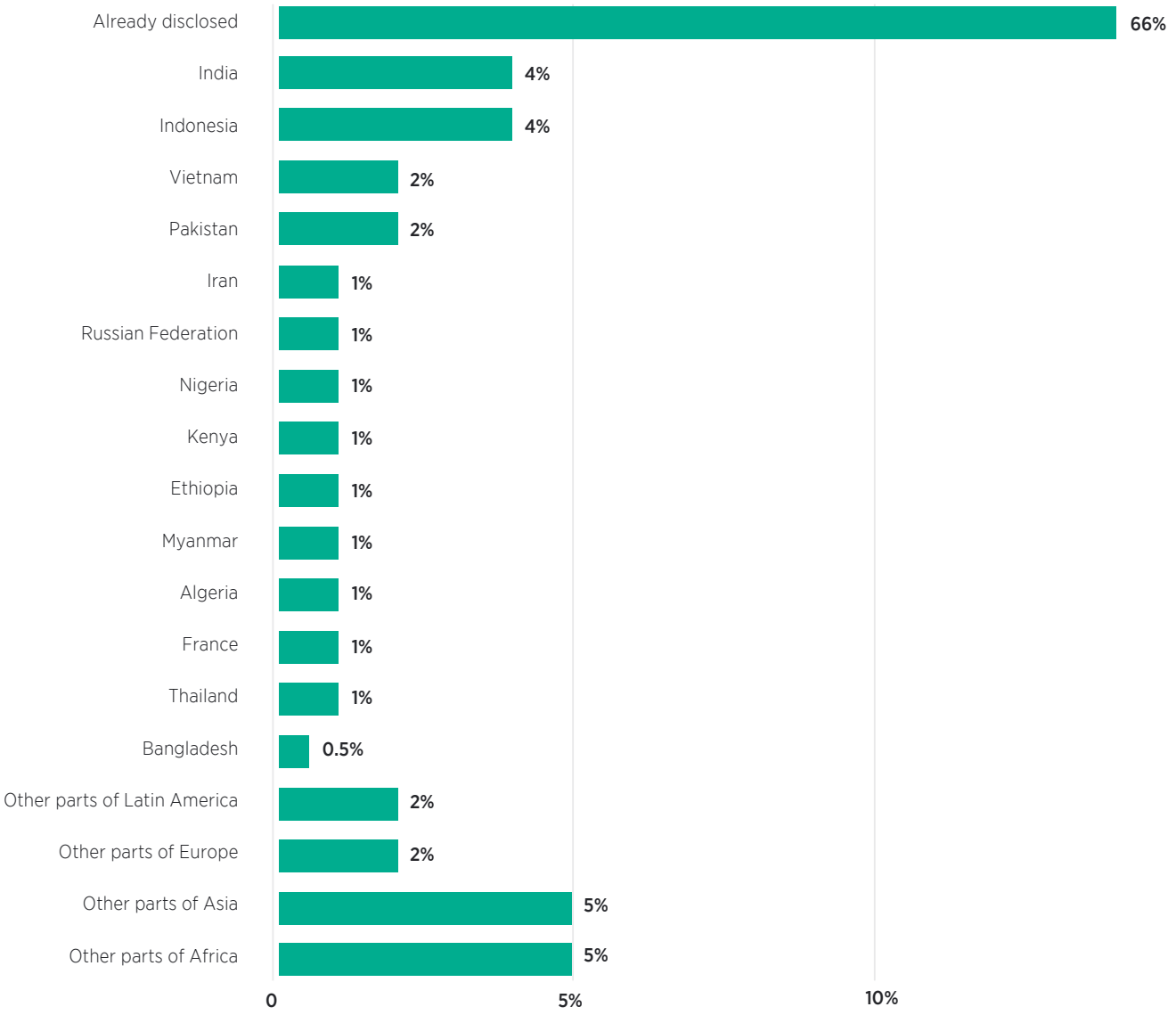


The unreported

In February 2019, the GSMA Board (comprising of members from the largest mobile network operators in the world) set a milestone ambition to transform the mobile industry to reach net zero carbon emissions by 2050 at the latest. Despite mobile operators being at the forefront of net zero ambitions and most disclosing their climate impacts, a significant part of the ecosystem currently does not report its impact. Of total global connections, 2.8 billion (34%) are currently provided by mobile operators that do not disclose their climate impact.

Figure 4 **Uncovering the unreported: countries with operators that do not disclose their climate impact**

Source: CDP and operator websites



While operators from more developed countries are likely to have higher levels of disclosure, less developed countries in Asia and Africa have the strongest representation in the list of those that do not disclose. Operators from India, Indonesia, Vietnam, Pakistan and Iran lead the list in terms of number of connections. This is likely due to a combination of factors such as a lack of resources, suitable capabilities and a more challenging operating environment, among others.

The industry can't manage what it doesn't measure. To carry out full, global and accurate analysis and provide actionable recommendations for all operators, data from the unreported countries is required. There has been significant progress recently, but there is still room for more. To fully understand the emissions of the mobile industry, harmonised and ubiquitous climate impact disclosure is essential.

Case study: Zain

At Zain, we believe in disclosing our climate action to our stakeholders as proof of transparency, commitment and seriousness about addressing climate change. A comprehensive disclosure process such as the CDP questionnaire challenged our approach to tackling climate change during our first public submission in 2020, resulting in Zain attaining a B score. While this score told us that the company is moving in the right direction, it also highlighted some gaps spanning climate-related opportunities, the use of scenarios analysis, the targets and the emissions scopes to supply chain management.

To ensure that we build on the findings of the 2020 CDP report, Zain decided to build an action plan to improve the company's climate action disclosure process. Our plan included the list of all initiatives, processes and committees to be implemented for an alignment with the best available practices for addressing climate change.

Included Energy Efficiency in our operational strategy

Climate Action Committee (CAC) providing its Board of Directors with an oversight on climate-related issues

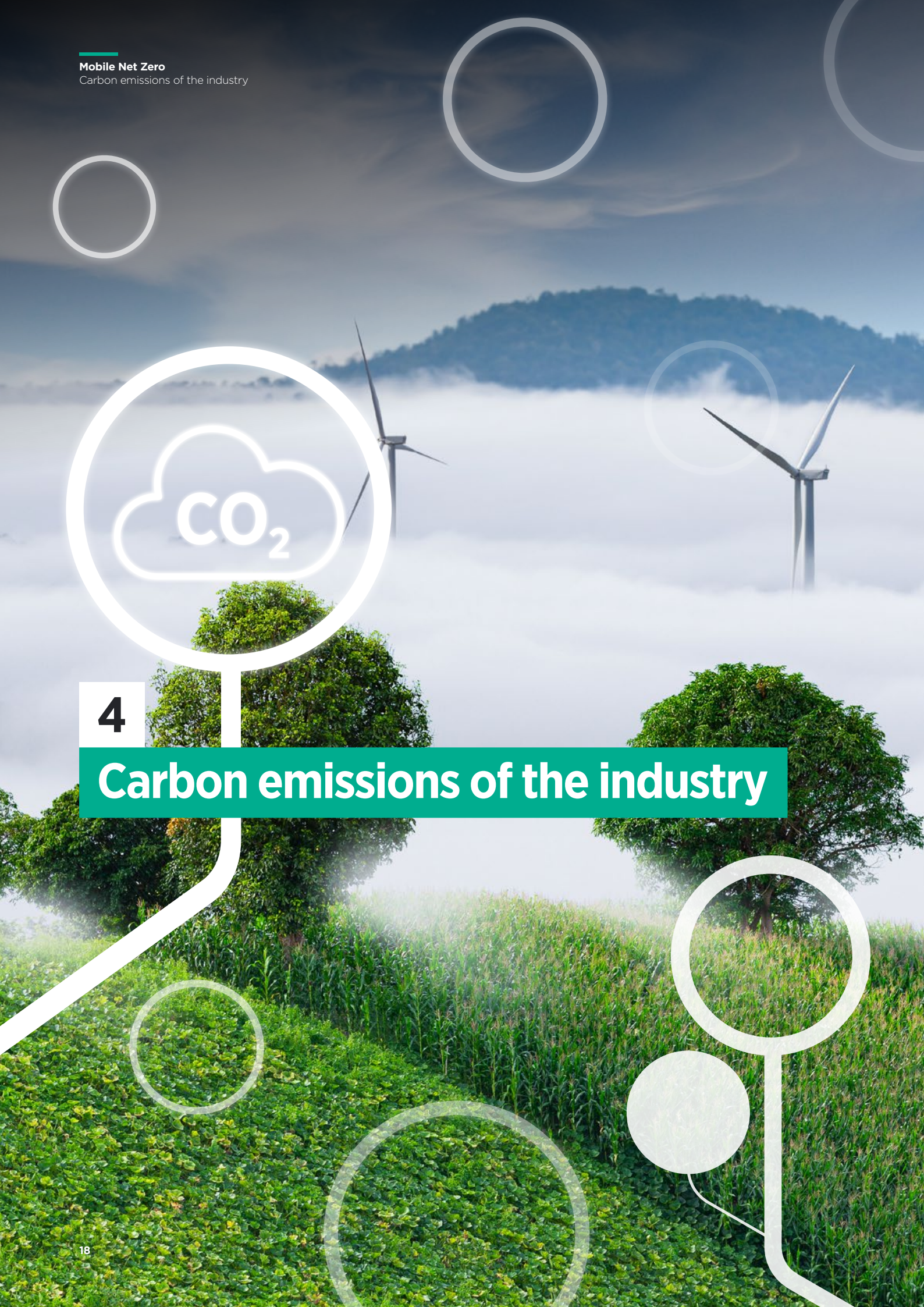
Revisited climate change scenario analysis process and additional climate change-related opportunities

Further engaged with our suppliers and partners on climate-related issues

Expanded our Scope 3 emissions from 2-7 categories

Created a Task Force made of stakeholders from all concerned departments for a weekly tracking of our progress towards closing all of the identified gaps

Closing the gaps identified by the CDP report helped Zain improve its climate action due to improved board-level oversight of climate-related issues faced by the organisation. The inclusion of all of the scopes in the emissions inventory process increased the field of our mitigation efforts through an engagement with all of our suppliers and partners and the implementation of new climate-related opportunities. By adjusting our processes, structures and guidelines to close the 2020 CDP report gaps, as well as executing multiple initiatives across our operations, we increased our 2021 score from B to A- and we are now working to further improve our climate action to achieve an A-grade in the next disclosure as well to solidify our climate action journey.

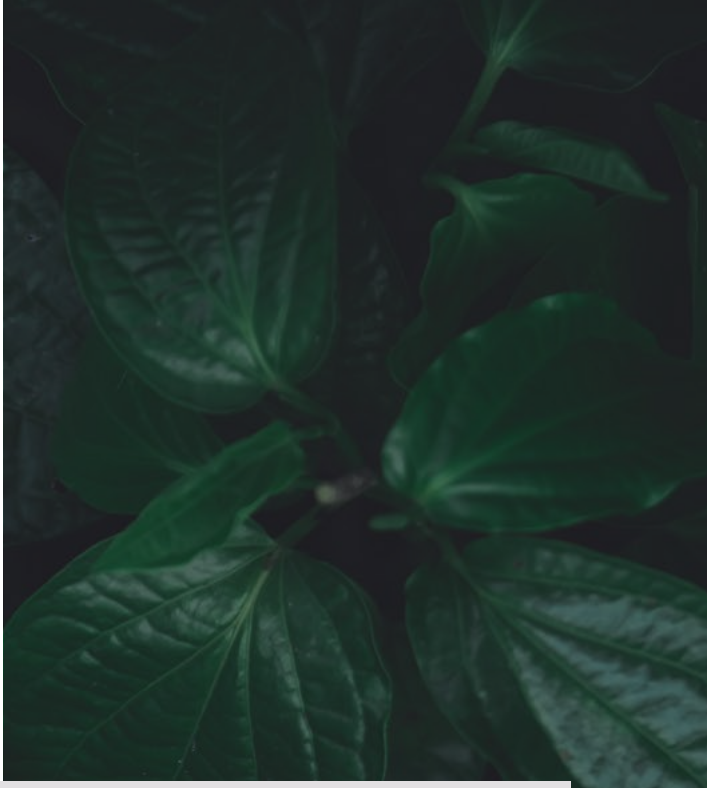


4 Carbon emissions of the industry

Measurements and methodologies

An increasing number of operators have set ambitious targets to achieve net zero carbon emissions, but what are the emissions of operators now, in 2022? Different methodologies can be adopted to measure emissions from operators and their supply chains. The most widespread approach is to use scopes to define greenhouse gas (GHG) emissions.

Scopes 1, 2 and 3 categorise the kinds of carbon emissions operators create in their own operations and in the wider value chain:



- **Scope 1 —** Direct emissions from an operator, such as from running its fleet for network maintenance and using diesel to operate base stations in hard-to-reach areas.
- **Scope 2 —** Indirect emissions, such as the electricity use or energy bought for heating and cooling buildings, produced on its behalf.
- **Scope 3 —** Emissions that are not associated with the operator itself but 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. Scope 3 is often the largest in terms of emissions and the hardest to measure accurately.

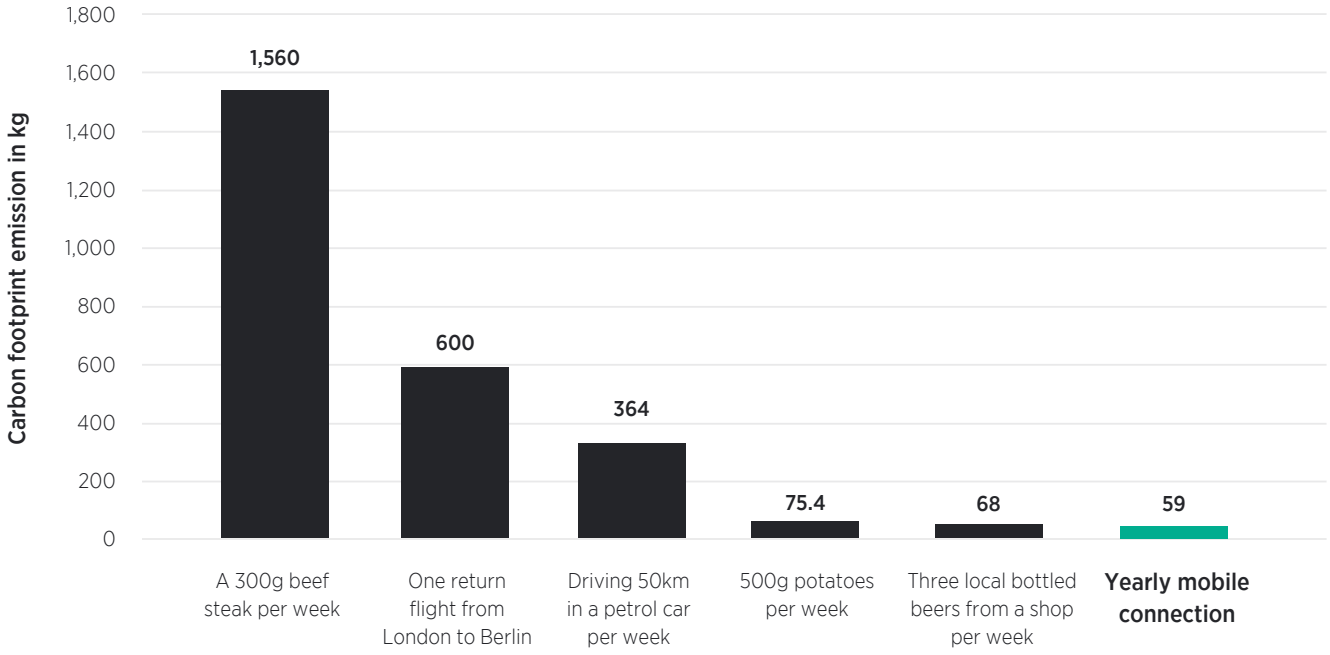
Operators' Scope 1 emissions are marginal compared to their Scope 2 and Scope 3 emissions. In 2021, a year's mobile connection is responsible for 59kg of CO_2 emissions on average, while consuming four average-sized beef steaks (1kg) is responsible for 99kg of CO_2 emissions.[2]

> Different methodologies can be adopted to measure emissions from operators and their supply chains. The most widespread approach is to use scopes to define greenhouse gas (GHG) emissions

2 Environmental Impacts of Food Production, OurWorldInData.org, 2020

Figure 5 **Annual greenhouse gas emissions of different activities**

Source: OurWorldInData.org, EIT Food



To measure all of the emissions associated with the operation of a company, Scope 3 emissions should be considered. Data gathering and processing are more complex and diverse than with Scope 1, or Scope 1 and 2 combined. The overall methodology for Scope 3 is currently unclear. Work is required on standards, reporting and coordination across supply chains. Only 44% of operators by connections provided reliable Scope 3 data in 2021.

With the addition of Scope 3 emissions, a higher margin of error should be factored into estimates. This is not just because of the smaller sample of data, but also because of the methodological constraints and the lack of Scope 3 accounting harmonisation, which increase the potential margin of error.

Emissions in the context of data traffic

While operators on average increased their carbon emissions by 2% globally during 2021, many have succeeded in controlling or even reducing their emissions. Despite growing data traffic requirements and ongoing 5G transformation, a number of operators including AT&T, Verizon, Telenor and KDDI succeeded in reducing their carbon emissions between 2020 and 2021. Few industries are similar to mobile in this respect; operators' primary output, data traffic, is increasing by double-digit growth rates each year, but emissions levels are being controlled and kept almost flat. This is due to two main factors; firstly, new networks such as 5G are more energy-efficient at moving data, and secondly, operators are investing in lower carbon energy to power networks, such as onsite and market-based renewable electricity.

Estimating operators' carbon emissions

Despite the challenges associated with measuring Scope 3 emissions, GSMA Intelligence has estimated that operators are responsible for around 490 million tonnes of carbon dioxide equivalent ($MtCO_2e$) per year, or approximately 1% of total global carbon emissions in 2021.[3] This figure is based on carbon emissions disclosures to the CDP in 2021 and GSMA Intelligence estimates. In general, Scope 1 emissions are about 10% of Scope 2 emissions, which are about a third of Scope 3 emissions. These ratios vary between operators, but Scope 3 is always the largest share.

Unlike studies focusing purely on mobile networks, the above data includes mobile operators' entire operations, including their fixed networks and data centres. Measuring just mobile networks will be increasingly challenging as operators embrace fixed-mobile convergence. Operators are currently in a transition phase, with distinctions between fixed and mobile networks fading as services use a combination of fixed broadband and local access wireless technologies.

To help understand and reduce supplier emissions, the GSMA is working with the Climate Action Taskforce and supplier associations, such as the Joint Audit Cooperation, to encourage more suppliers to disclose their environmental impact to the CDP and set science-based targets for carbon reduction. The ambition is to accelerate the low-carbon transition across the sector with further significant investments in renewables, combined with engagement with suppliers to drive circular economy principles. This will reduce resource extraction as well as life cycle energy and carbon emissions.

Figure 6 **Growth in data traffic, carbon emissions and electricity, 2021 versus 2020**

Source: CDP, GSMA Intelligence, Ericsson

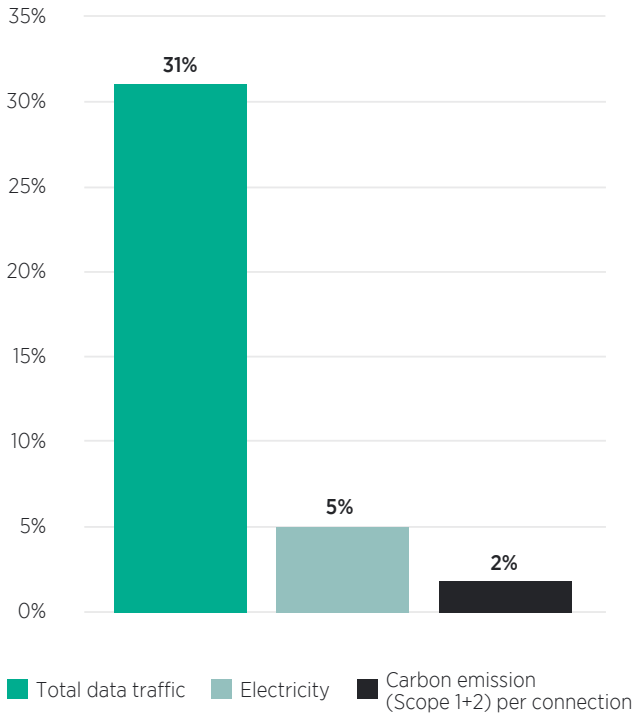
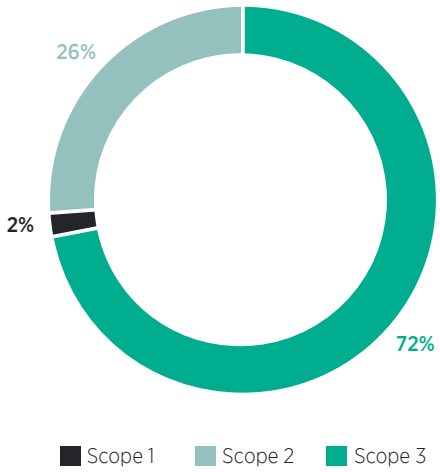


Figure 7 **Operator CO_2 emissions in 2021**

Source: CDP, GSMA Intelligence



3 'Global CO_2 emissions rebounded to their highest level in history in 2021', IEA, March 2022

Case study: KDDI

The KDDI Group has been deploying various kinds of businesses, including finance and energy. Among those business activities, telecommunication is always at the centre. As a whole group, we released our policy in promoting sustainable business management to realise both sustainable development of society and growth.

As the KDDI Group aims to achieve carbon neutrality by 2050 and actively work on countermeasures to climate change, its Science Based Targets initiative (SBTi) goal was approved in February 2022. In order to fulfil the SBTi principles, we calculated our GHG emissions from 110 group companies, which include several small-scale ones. During the process, we encountered each company's existing issues and differences in progress towards sustainable business management. After deep discussion, close communication and involvement of our top management, led by the project team members at the KDDI headquarters, we mutually understood our efforts and completed the target setting.

> "After deep discussion, close communication and involvement of our top management, led by the project team members at the KDDI headquarters, we mutually understood our efforts and completed the target setting"

The KDDI Group itself plans to accelerate its carbon neutrality goal from FY2050 to FY2030, and our data centres plan to further accelerate their carbon neutrality by FY2026. We will reduce CO_2 emissions using measures to save energy and switch over to renewable energy at our base stations, buildings and data centres.

We are going to newly establish our group to strengthen our energy business and focus our efforts on decarbonising businesses, including renewable power generation.

The KDDI Group keep tackling our challenge of realising carbon neutrality and promoting sustainable business management.

5 Energy efficiency and mobile connectivity

Energy efficiency has extended beyond corporate social responsibility to become a core strategic priority across the telecoms ecosystem. Major network and equipment vendors have been vocal about improvements to network solutions, recognising that more efficient equipment is a major purchasing criterion among operators for cost and reputational reasons. Networks are part of the broader narrative of how to reach net zero, which also includes substantive discussions on reducing the environmental impact of devices and transitioning to renewable energy supplies. This represents the start of a new way of doing business on the path to 2050.

Energy efficiency growing in importance at industry awards

Energy efficiency and sustainability featured heavily in the 2022 Global Mobile Awards (GLOMOs). Winning a category or being shortlisted for a GLOMO brings professional recognition and international media attention. Customers, mobile operators and equipment vendors closely follow the outcome of the judging process.

The growing importance of energy efficiency was particularly noticeable in the shortlists and winners announced for the 2022 awards. As well as an award for Best Mobile Innovation for Climate Action, solutions providing energy efficiency performed particularly well in the infrastructure, devices and industry categories. Innovations included the following:

2022 GLOMO Global Mobile Awards

5G

The Green 5G Project from China Mobile and Huawei (Winner of Best Mobile Innovation for Climate Action)

Ericsson's ultra-lightweight Massive MIMO 6419 platform with portfolio-wide energy savings

Telefónica's Green Radio – an intelligent software solution for energy optimisation

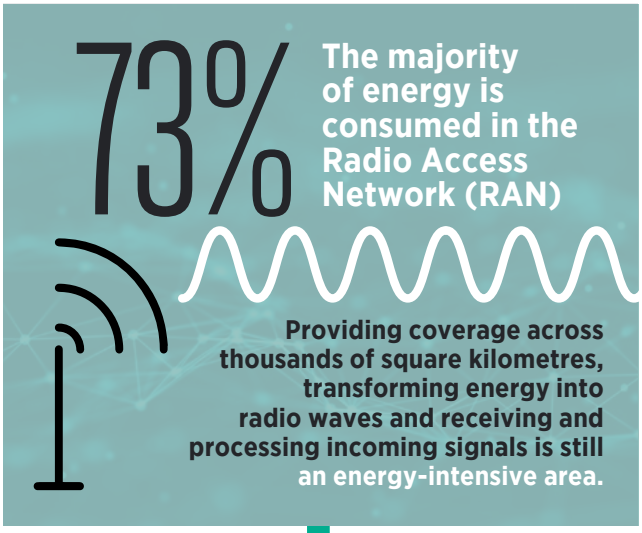
ZTE's Green Native initiative to reduce end-to-end ICT carbon emissions

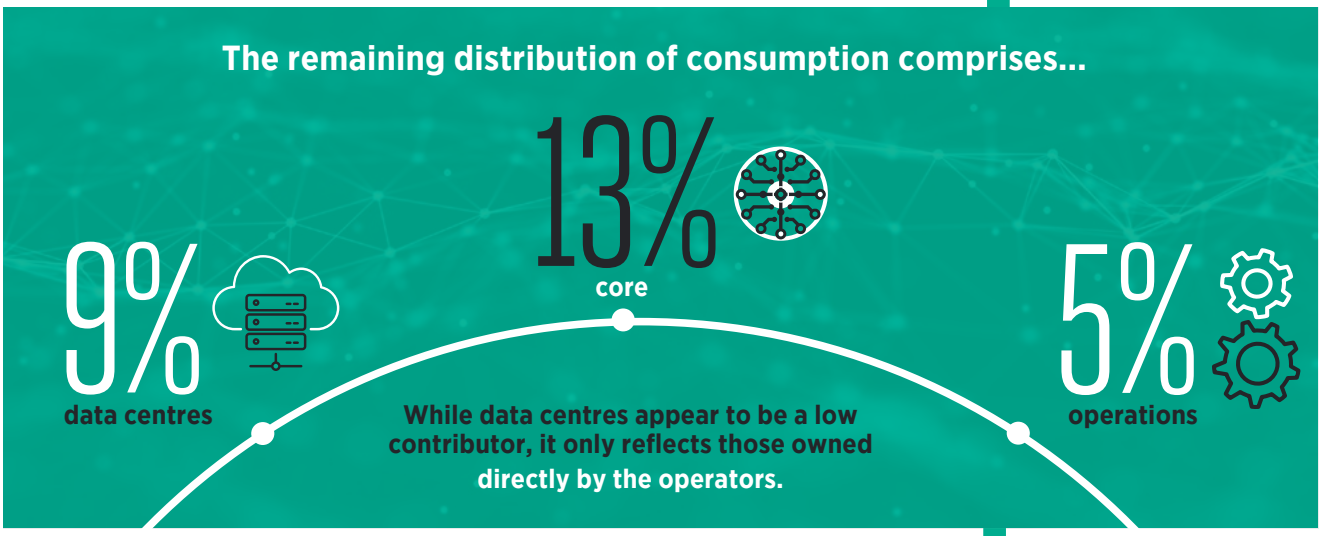
KT's Network Power Saving Technology

Benchmarking energy efficiency

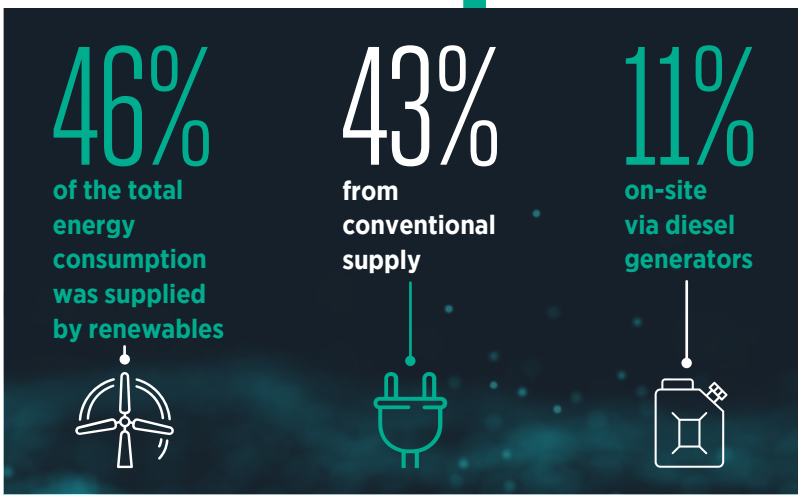
In 2021, GSMA Intelligence released an energy efficiency benchmarking service for mobile networks. The unique analytical approach allows operators to compare the energy efficiency of their networks against peers on a like-for-like basis. The tool uses real-world data inputs from operators on a fully anonymised basis to quantify network energy consumption, efficiency levels and fuel sources. Seven operators participated in the project: BT, Deutsche Telekom, Etisalat, Globe, KPN, Smart and Vodafone. The operators provided data from 31 networks in 28 countries.

GSMA Intelligence's modelling and analysis provided a snapshot of operators' energy consumption:





Diesel usage is more common in regions where grid electricity is less prevalent – Southeast Asia, the Middle East and Sub-Saharan Africa. However, even in Europe, it accounts for 1–6% of consumption



5G enabling further energy efficiency

Although 5G offers a significant energy-efficiency improvement per gigabyte when compared to previous technologies, new 5G use cases and the adoption of mmWave will require more sites and antennas. This leads to the prospect of a more efficient network that could paradoxically result in higher emissions in the absence of active intervention. 5G is the first wireless technology where energy efficiency has been considered during standardisation.

Each cellular technology has become more energy-efficient since 2G as the transmission technology has improved. On top of this, a number of energy-saving measures are built into the 5G standard, such as sleep or shutdown functions in the transceiver and a low-energy scheduler solution. 5G has been designed with network energy efficiency in mind, with 5G's specification offering the potential for a 90% reduction in energy use to transfer each bit of data compared to previous wireless technologies.[4]

4 'Nokia confirms 5G as 90 per cent more energy-efficient', Nokia, December 2020

Case study: Airtel

Bharti Airtel ('Airtel') with its subsidiary Nxtra Data Limited ('Nxtra') currently operates 10 large and 120 edge data centres across India. We are committed to helping to meet the goals of the Paris Accords and have identified 'Climate Change, Energy Efficiency and Emission Reduction' as critical material issues.

Exponential growth and change in the usage pattern of internet users has increased the demand of power consumption in data centres. The creation of sustainable data centres has become essential in an environmental sense and a business sense. However, the renewable energy market for C&I consumers in India has become very competitive and onboarding is wrestling with many challenges at the state level, including separate and complex regulatory policies, lengthy approval processes, uncertainty over policies and so on.

The challenge for Airtel was to maintain a renewable energy share in the energy mix of data centres with the increased power consumption demand and improvements in energy efficiency to reduce energy usage.

To overcome these challenges, Airtel has chosen state-level strategies in India for reducing Scope 2 emissions for its data centres.

Commissioned a photovoltaic asset via partnership with Amp Energy in Uttar Pradesh data centres: For data centres in the state of Uttar Pradesh, Airtel has partnered with Amp Energy via acquiring a 26% equity stake in one of the Special Purpose Vehicles formed by Amp Energy and commissioned photovoltaic asset with an installed capacity of 28MW.

Sourced electricity from a hydro power plant for Delhi data centres: Airtel has negotiated and signed a Power Purchase Agreement for sourcing the electricity from a 9MW hydro power plant to its data centres in Delhi.

Leveraging wind and hydro renewable energy for Karnataka and Tamil Nadu data centres: The group relies on sourcing ~6.5MW of renewable energy from wind and hydro assets in Karnataka and Tamil Nadu around the clock. Nxtra has acquired some stakes in the power generating companies to source this power.

Partnered with Avaada Energy to source solar power: Airtel has also joined with Avaada Energy, the leading developer of renewable energy, for sourcing solar power from 65MW of photovoltaic assets.

All of these contracts are long-terms ones with long-term commitments by project developers on renewable energy supply at a fixed generation price to Airtel.

Airtel has decided to install on-site captive generating plants at data centre facilities in the states where policies are not favourable for renewable energy sourcing. Over the last few years, Airtel has installed 28 rooftop solar photovoltaic plants at data centre locations, with the total installed capacity standing at 1.57MW.

Airtel has also explored the option of redemption of I-REC certificates against the electricity consumption at data centre facilities to reinforce its renewable energy sourcing programme. It purchased 14,752 certificates in FY2020-21, representing 14,752MWh of electricity generated from renewable energy sources.

Airtel constantly aims to ensure optimal energy utilisation across the entire life cycle of its data centres, from design to operations. Airtel identified PUE (Power Usage Effectiveness) as the measure to check the energy effectiveness for our data centres, and continual improvement in Average PUE is visible across the last three years.

Airtel has also made substantial investments in energy-efficient products and services in order to promote and adopt new technologies and services in operations as part of energy conservation measures to improve energy efficiency.

> “Exponential growth and change in the usage pattern of internet users has increased the demand of power consumption in data centres. The creation of sustainable data centres has become essential in an environmental sense and a business sense”

6 Transitioning to renewable electricity

Growing use of renewables

The estimated electricity consumption of the global operator community in 2021 was around 293 million MWh – a 5% increase on 2020. Global data traffic increased by 31% over the same 12-month period. While this is a significant improvement in efficiency, operators cannot rest easy. To reduce their environmental footprint driven by energy consumption, they can act in two ways: improve their energy efficiency and increase their use of renewables.

Where available, the use of renewable sources is a quick and effective way to reduce environmental impact. Pushing renewables to the top of the list are their impact on carbon reduction, little risk of quality of service being impacted and the relatively marginal CAPEX requirements. However, the use of renewables depends on factors which are often beyond operators' control, such as the local climate, country-level regulatory environment, grid availability and the price of renewable energy from the grid. Though there are regional differences in the use of renewables, the shift from fossil fuels and non-renewable electricity to renewables is underway globally.

> The use of renewables depends on factors which are often beyond operators' control, such as the local climate, country-level regulatory environment, grid availability and the price of renewable energy from the grid

European operators are at the forefront of renewables usage, as they can access renewable energy more easily via the grid. Many have set ambitious goals, while some already have network operations that are 100% powered by electricity from renewable sources.

Figure 8 **Mobile operator electricity sourcing**

Source: CDP

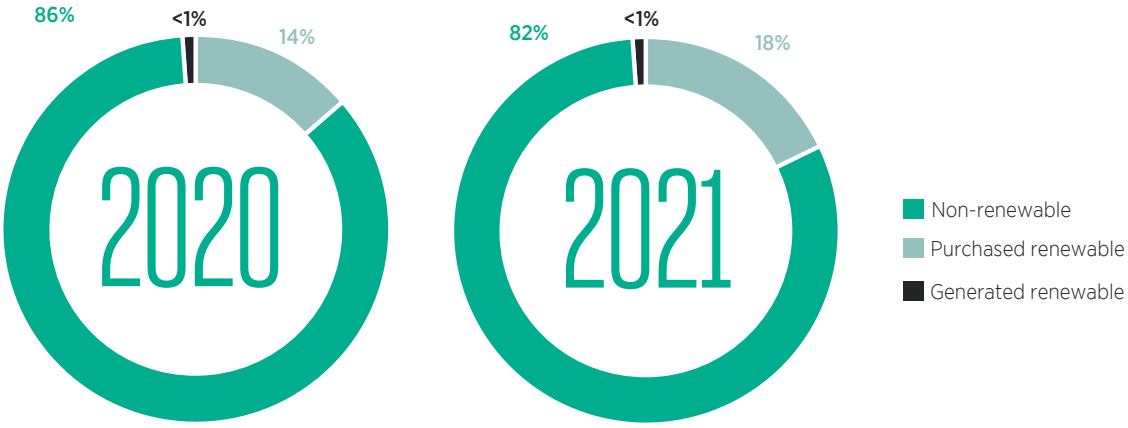
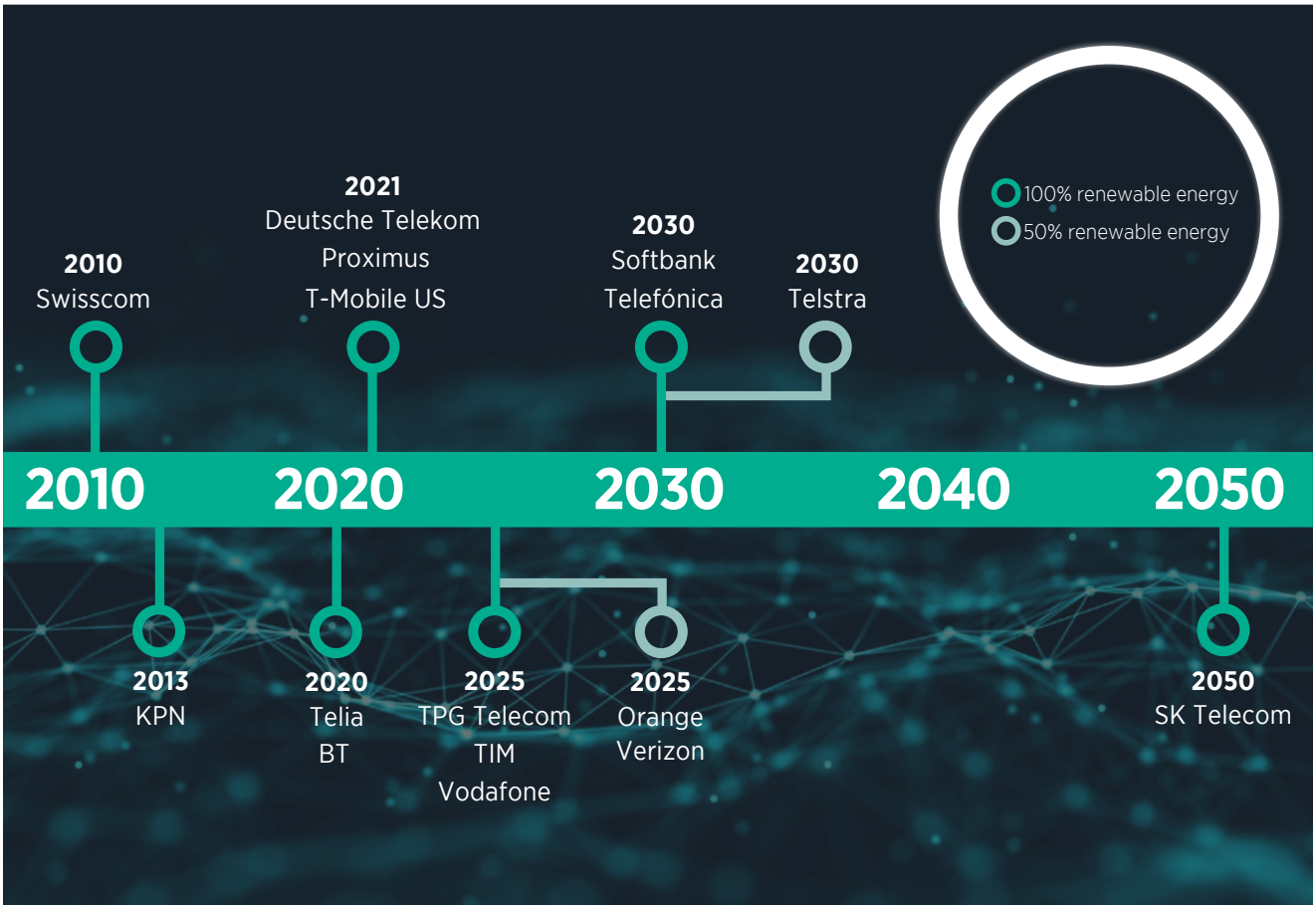


Figure 9 **Timeline for mobile operators with renewable energy targets**

Source: GSMA and operator websites



Accessing renewable electricity

GSMA Intelligence's latest report[5] on energy benchmarking shows that renewables are mostly purchased via certified energy suppliers. While solar is becoming more price-competitive, renewable electricity generation is still outside operators' comfort zones. Directly produced electricity accounts for a minority (less than 1%) of total energy consumption. The most common option is to purchase renewable electricity through the traditional grid, from a renewable source.

Operators can purchase certified renewable electricity or develop a power purchase agreement (PPA) with a local energy vendor. PPAs are long-term contracts to buy renewable energy in agreed volumes and at prices that meet the needs of the generator and the operator. From an environmental standpoint, PPAs are preferable as they directly increase the renewable electricity supply in the market and the share of renewable electricity. Despite certified renewable electricity not having a direct, short-term impact on the environment, growing demand for it is increasing the price of this greener form of electricity and encouraging companies to invest and produce renewable electricity over the longer term.

Access to renewable electricity is vital for mobile network operators to reduce the carbon emissions of their operations. This is why the GSMA calls on governments to consider suitable energy market frameworks that support renewable energy deployment and access for operators that need to connect many sites.

5 'Going green: benchmarking the energy efficiency of mobile', GSMA Intelligence, 2021

Case study: Claro

Climate change has become the single greatest threat to modern life and reports are clear that a dramatic shift from fossil fuels to renewables is the most impactful solution to reduce emissions and prevent irreversible damage.

In 2020, América Móvil, operating under the Claro brand in Latin America, adopted science-based targets (SBT) that would require mobile network operators to reduce emissions by at least 45% by 2030.

Project Palomino
In 2021, Claro Dominican Republic, a subsidiary of América Móvil, partnered with Caban Systems to successfully develop a renewable energy pilot that sought to reduce the use of diesel fuel using Energy-as-a-Service (EaaS). EaaS allows customers to generate renewable energy on-site and offset grid costs. Caban Systems generated clean energy on-site on behalf of Claro Dominican Republic.

Challenges
Claro Dominican Republic selected their Palomino site for the pilot because of the remote and challenging nature of the location. Palomino is located beside the José Armando Bermúdez National Park, a national forest surrounded by thick mountainous terrain. Prior to the pilot, the site had been powered with a diesel generator and was inaccessible to a traditional electric grid.

The Solution

Caban Systems deployed a turnkey energy infrastructure solution, including lithium-ion batteries, remote intelligent controllers and solar generation, all monitored in real-time with cloud-based software. The implementation of cloud-based software enabled Claro to track and report the performance of energy systems, including site-related energy generation, emissions reductions and cost savings. This significantly supports customers with achieving and reporting ESG targets.

The Results

The implementation of EaaS enabled Claro to modernise the entire site operations with zero upfront costs and enabled the operator to immediately save on OPEX and emissions while increasing reliability for the end user.

Claro reported an annual fuel savings of 98.5% and an annual reduction of 5,162 diesel gallons per year. Shifting to EaaS and renewable energy, Claro was able to align business objectives, customer satisfaction and ESG targets.

In securing an on-site renewable energy solution, Claro was able to successfully align business objectives with customer satisfaction to achieve its goals and contribute to a better world.

7 Mobile industry supply chain

Sustainable network equipment

Based on mobile industry analysis, the biggest source of emissions for operators is not from their electricity consumption, but from emissions arising from the industry's supply chain. Equipment and device manufacturing and their supply chains are responsible for significant levels of emissions.

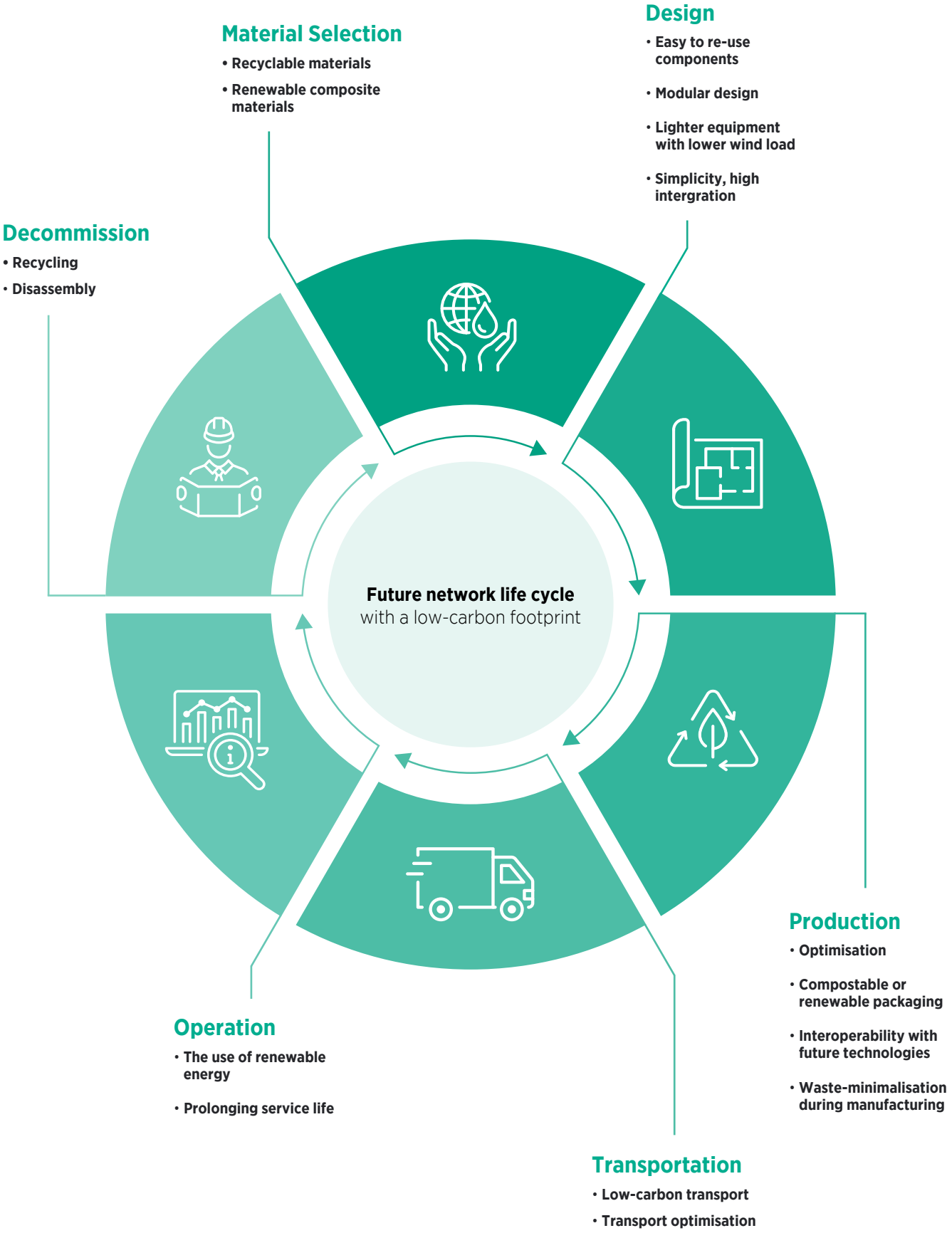
Low-carbon product life cycle management is essential to the telecoms industry because network equipment and rapid improvements in wireless network infrastructure require significant physical upgrades. New, low-carbon products enable a complete rethink of lifecycles. Vendors need to implement changes from the beginning, at the product design stage, and help customers with the decommissioning and disassembly of network equipment, as well as reusing elements of legacy equipment.

This year, the GSMA has worked with operators to understand the challenges of moving towards a more circular economy of network equipment. Recommendations that are being actioned include creating common metrics to measure the environmental impact, creating and interconnecting marketplaces for second-hand equipment, and raising awareness of the benefits of a more circular economy across the industry.

The GSMA also developed a good practice target with operators to help focus efforts. This states that the operator supports moving to a more circular economy for network equipment and sets a date for 100% of their network equipment being responsibly resold, reused, remanufactured or recycled. Non-recyclable materials will be disposed of securely. So far, Telefonica and Tele2 have committed to achieve this by 2025 and Smart Communications by 2030.

Figure 10 Future network equipment life cycle with a low-carbon footprint

Source: GSMA Intelligence



The impact of virtualisation

Virtualisation efforts around software-defined networking over the last decade have helped centralise network intelligence and control at the software layer. This helped to standardise the underlying hardware, creating an opportunity to implement network updates without physically touching the legacy hardware. The opportunity for infrastructure vendors to compete on innovation in hardware features has consequently become less relevant because software features allowing control and modular upgrades have become the default.

From a sustainability perspective, there are clear benefits. Older physical equipment does not need to be disposed of if it can be upgraded via software. The decline of hardware-centric innovation reduces e-waste and the need for physical activities such as site visits, logistics, shipping, service and maintenance. Less physical activity limits the climate impact of future network updates and new features. In addition, virtualisation also offers cheaper, more frequent and customised innovation, reducing manufacturing and transport emissions associated with the supply chain.

Vendor landscape

Figure 11 **SBT commitments of most commonly used suppliers to mobile network operators**

Source: Science Based Targets Initiative[6]

COMPANY	SCIENCE-BASED TARGETS
Accenture	Committed to reducing absolute Scope 1, 2 and 3 GHG emissions by 11% by 2025 from a 2016 base year. Near term: 1.5°C by 2025.
Alphabet/Google	No SBT commitment.
Amdocs	Committed to reducing absolute Scope 1 and 2 GHG emissions by 21% by 2024 from a 2019 base year. Near term: 1.5°C by 2024.
Apple	Committed to reduce absolute combined Scope 1, 2 and 3 GHG emissions by 62% by 2030 from a 2019 base year. Near term: 1.5°C by 2030.
Brightstar	No SBT commitment.
Ciena	No SBT commitment.
Cisco	Committed to reducing absolute Scope 1 and 2 GHG emissions by 60% by 2022 from a 2007 base year. Near term: well below 2°C by 2022.
Dell	Committed to reducing Scope 1 and 2 GHG emissions by 50% by 2030 from a 2019 base year. Near term: 1.5°C by 2030.
Ericsson	Committed to reducing absolute Scope 1 and 2 GHG emissions by 35% by 2022 from a 2016 base year. Near term: 1.5°C by 2022.
Fiberhome	No SBT commitment.

CONTINUED

6 sciencebasedtargets.org/companies-taking-action

CONTINUED

COMPANY	SCIENCE-BASED TARGETS
HP	Committed to reducing Scope 1 and 2 GHG emissions by 60% by 2025 from a 2015 base year. Near term: 1.5°C by 2025.
Huawei	No SBT commitment.
IBM	No SBT commitment.
Ingram Micro	No SBT commitment.
Microsoft	Committed to continuing to source 100% renewable electricity through 2030. Also committed to reducing Scope 3 GHG emissions intensity per unit of revenue by 30% by 2030 from a 2017 base year and to avoid growth in absolute Scope 3 emissions. Near term: 1.5°C by 2030.
NEC	Committed to reducing absolute Scope 1 and 2 GHG emissions by 55% by 2030 from a 2017 base year. Near term: 1.5°C by 2031.
Nokia	Committed to reducing absolute Scope 1, 2 and 3 GHG emissions by 50% by 2030 from a 2019 base year. Near term: 1.5°C by 2030.
Oracle	No SBT commitment.
Sagemcom	Near term: committed
Samsung	No SBT commitment.
Tata	No SBT commitment.
TechData (TD Synnex)	Near term: committed
Tech Mahindra	Committed to reducing absolute Scope 1 and 2 GHG emissions by 22% by 2030 and 50% by 2050 from a 2016 base year. Near term: 2°C by 2030.
Westcon	No SBT commitment.
ZTE	No SBT commitment.

The GSMA has been participating in the CDP supply-chain programme on behalf of the mobile industry to encourage key suppliers to disclose their carbon emissions and set science-based targets. The intention is to emulate the impact of mobile operators' climate action commitment. This means first creating a better understanding of climate impact across suppliers, encouraging target-setting in line with the net zero by 2050 ambition and subsequently driving rapid emissions reductions.

Case study: Tele2

As part of its vision to lead in sustainability, Tele2 is climate-neutral in its own operations and well on its way towards net zero. In 2021, Tele2 met its objective of a 90% reduction of Scope 1 and 2 greenhouse gas emissions compared to the 2019 base year, several years in advance of the original target deadline of 2025. The reduction in Scope 1 and 2 emissions was mainly a result of using 100% renewable electricity throughout all operations in 2021. Remaining emissions were offset using carbon removals, a combination of afforestation projects and the latest carbon-capture and storage technologies.

Based on approved SBTi targets and as a part of its updated sustainability strategy, Tele2 has the further goal of achieving zero Scope 1 and 2 greenhouse gas emissions by 2029 and a reduction in Scope 3 greenhouse gas emissions of 60% per subscription by 2029, using 2019 as the base year.

Tele2 sees new 5G networks and upgraded 4G networks as crucial technology in reducing emissions, because they consume significantly lower amounts of energy per unit of transferred data compared to previous generations of technology, while also catering for an increasing demand for data. Tele2's 5G networks can also enable greater efficiency in a wider sense, as more and more parts of society become connected – traffic systems interacting with public transport systems, interacting with car park systems, interacting with GPS systems and so on. 5G not only enables a more energy efficient society; it can also reduce traffic jams and overcrowded subways.

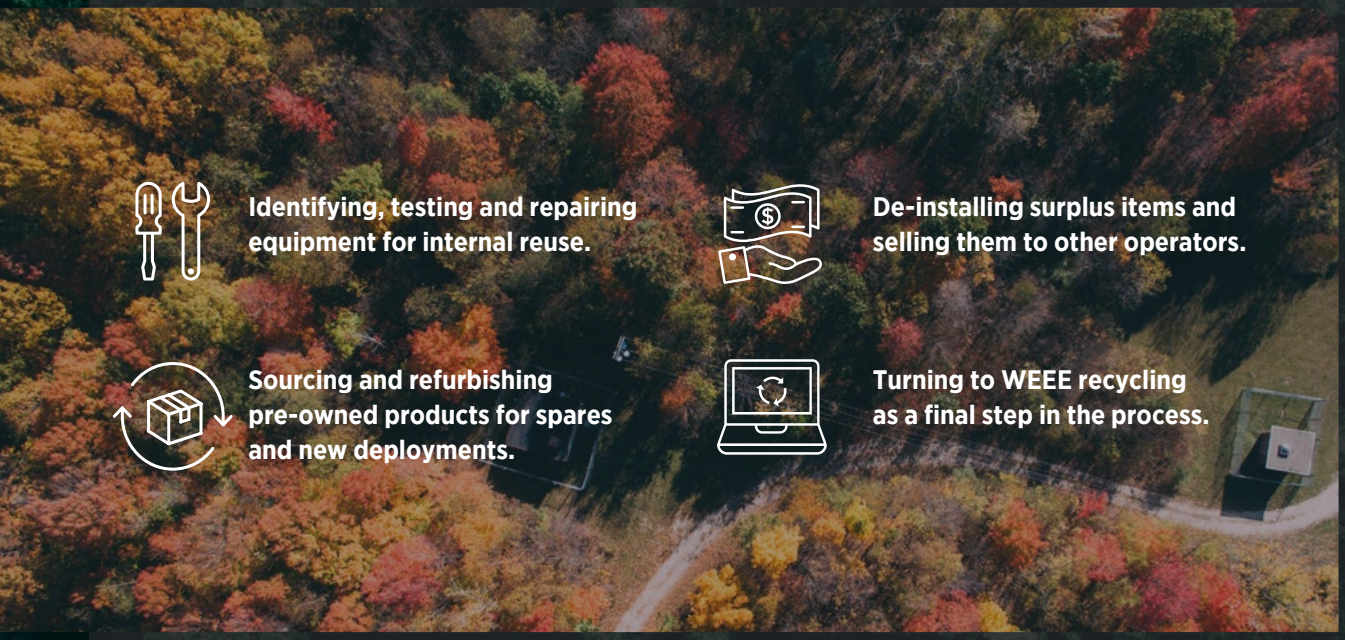
Tele2 has also identified circularity as a key part of achieving its goals for supply chain emissions reductions and 'Advancing circular economy to combat climate change' is one of four focus areas of Tele2's sustainability strategy. In March 2022, Tele2 was the first telecommunications company in the Nordics and Baltics to publicly commit to 100% of its network equipment being responsibly resold, reused, remanufactured or recycled by 2025, and non-recyclable materials being disposed of securely. Going forward, Tele2 will be working with its suppliers to achieve its aims and creating opportunities for its customers to change their reuse and recycling behavior.

Case study: Telia Company

Acting sustainably is all about implementing circular economy practices. Telia Company believes in the important role that collaboration plays in creating solutions that accelerate the transition to circularity and enhance sustainability.

The circular economy is based on three principles: designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. At Telia Company, not only do we provide the backbone of the digital society in the Nordics and Baltics, but we're also embracing sustainability at the heart of their purpose and strategy. Telia Company is proud to partner with TXO to help their business adopt circular practices and achieve incredible environmental and business results.

Telia Company is working towards a zero-waste goal by supporting the continual use of resources. This means adopting TXO's circular economy services, which include:



Identifying, testing and repairing equipment for internal reuse.

De-installing surplus items and selling them to other operators.

Sourcing and refurbishing pre-owned products for spares and new deployments.

Turning to WEEE recycling as a final step in the process.

To provide local sustainability, TXO has established an operational hub in Sweden to serve Telia Company and the Scandinavian region.

"Sustainability is at the core of what we do and partnering with TXO has really helped us demonstrate what becoming circular means in practice" said Simona Vitėnė, Telia Company's Business Development Manager. "What's more, the revenue generated provides an incredible opportunity for us to integrate sustainability even deeper into our business strategy."

David Evans, TXO's Head of Asset Recovery and Services, said, "We love partnering with our customers to support the circular economy at the same time as helping our clients minimise their carbon footprint and maximise financial returns from the green market. At TXO, we're here to help make your sustainability goals a reality."

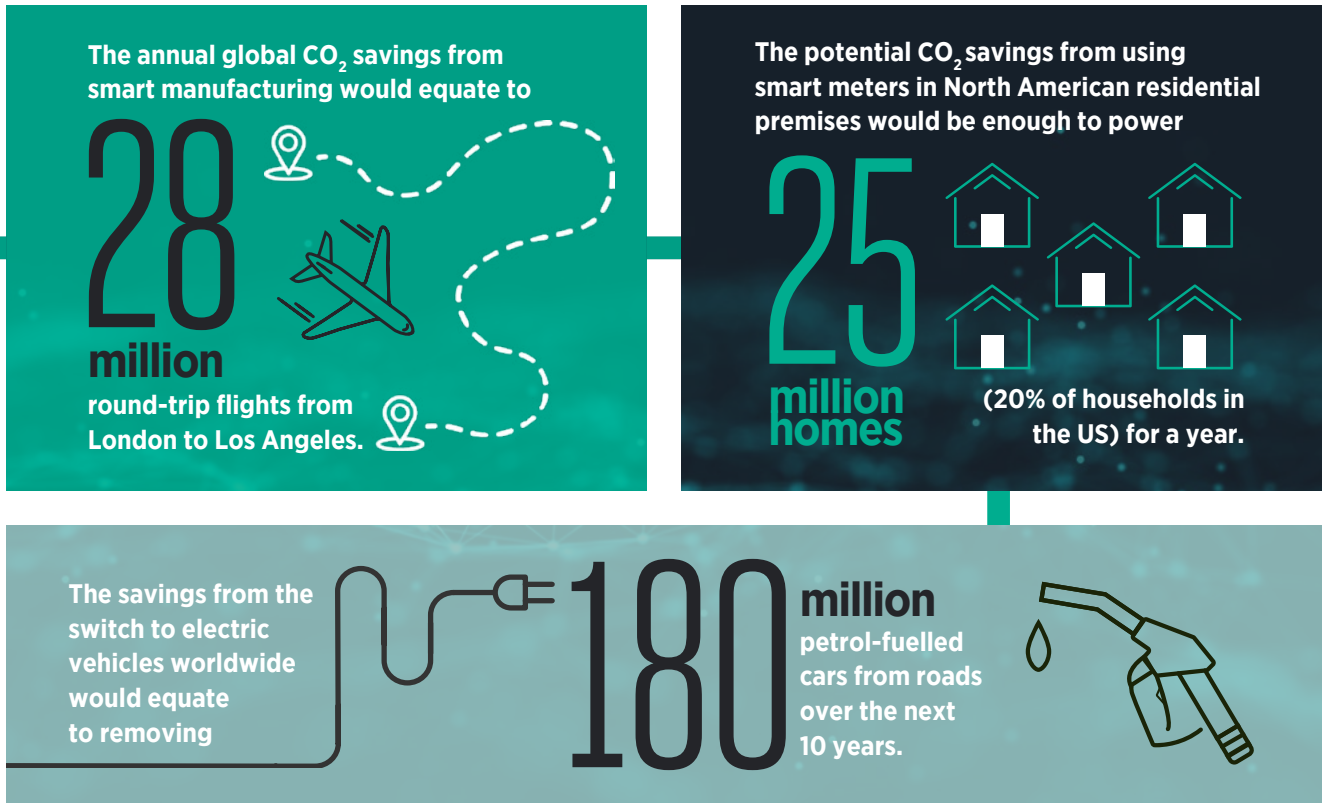
8 Digitisation and enablement

Mobile and digital technology helping to accelerate decarbonisation

The use of mobile and digital technology is a key enabler of the decarbonisation transition. Network operators, equipment vendors and supporting ecosystem partners play a key role in the move to digital and low-carbon economies.

In research conducted at the end of 2021, GSMA Intelligence outlined a high-level quantification of decarbonisation and associated strategies for four key industries that account for 80% of global emissions: manufacturing, power and energy, transport and buildings. The research demonstrates the clear, practical and beneficial impact of using mobile and digital technologies in the largest and most relied-upon industries. The implementation of specific mobile and digital technologies could result in substantial CO_2 savings for each industry. In aggregate, the savings enabled by the technologies amount to just under 40% (equivalent to 11 gigatonnes) of the carbon emissions savings that these industries will need to achieve over the next decade, assuming an end goal of net zero by 2050.

To put this in perspective at an industry level:



At the beginning of 2022, the European Commission selected the GSMA, Global Enabling Sustainability Initiative (GeSI), European Digital SME Alliance, DigitalEurope and ETNO to support the European Green Digital Coalition. The associations will work with the European Green Digital Coalition (EGDC) to meet the objectives of the EGDC founding members' declaration. The declaration has now been signed by 76 companies active in Europe, comprising 31 current EGDC members and an additional 45 SMEs applying for membership.

EUROPEAN GREEN DIGITAL COALITION

The European Green Digital Coalition

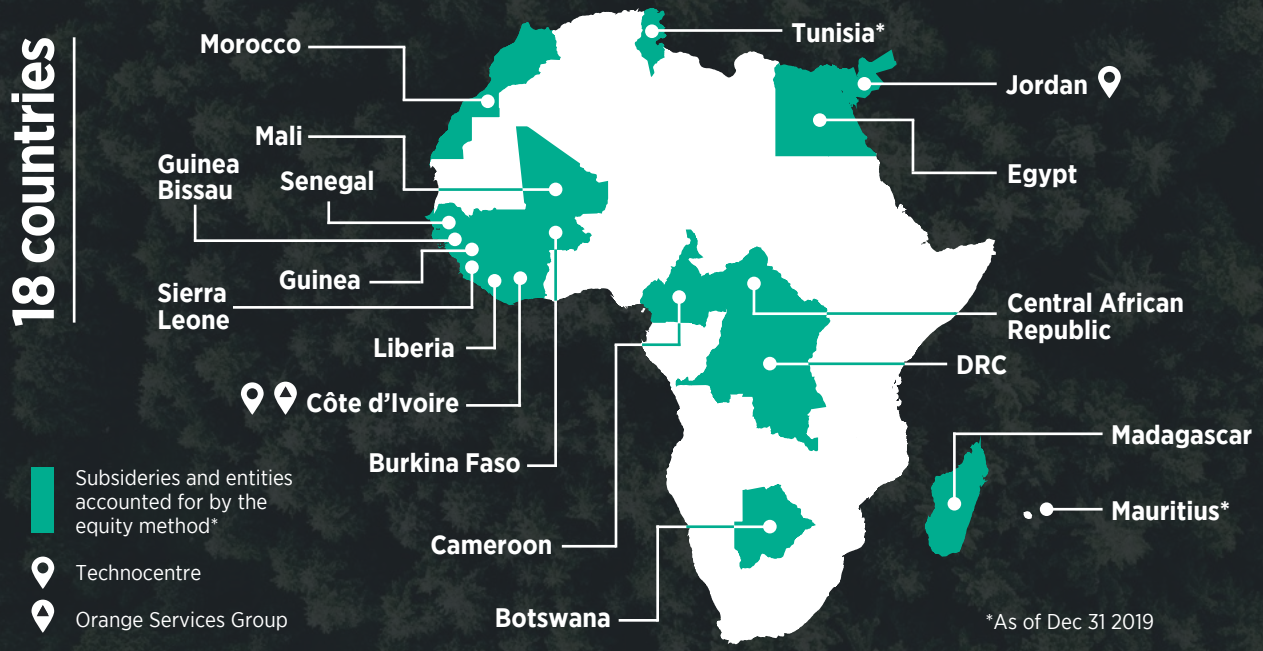
The project will address a crucial shortcoming in the current landscape. It will provide science-based methods to estimate the net environmental impact of digital solutions – both the positive contribution (e.g. carbon reduction) and the direct footprint of a given solution. The consortium will engage in extensive consultations with industry verticals, with a focus on smart energy, connected mobility, energy-efficient builds and construction, precision farming and smart manufacturing. Based on the methods developed to estimate the environmental benefits of digitisation, the project will provide recommendations for green digital transformation and promote widespread take-up by industry players, including SMEs.

> The use of mobile and digital technology is a key enabler of the decarbonisation transition. Network operators, equipment vendors and supporting ecosystem partners play a key role in the move to digital and low-carbon economies

Case study: Orange Energy

Africa has a population of 1.2 billion people and, in 2017, 600 million Africans still did not have access to electricity (Africa Progress Panel, 2017). In sub-Saharan Africa in particular, 70% of the population have no access to the electricity network and power cuts, even in large metropolitan areas, are frequent. In rural areas far from national electricity networks, this rate reaches 82% of the population. Servicing these areas is, therefore, essential.

As a Mobile Network Operator operating in different African countries, Orange has developed a line of services to help energy utilities through Orange Energy, which includes a service to enable customers to manage their energy expenditure by avoiding single-instalment delayed billing. The solution, Orange Smart Metering, leverages mobile money, machine-to-machine connectivity, SMS and other mobile technologies.

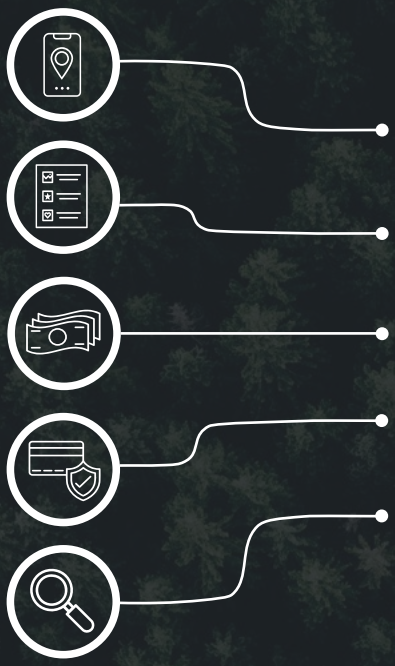


To reduce the reliance on diesel generation, Orange and IPP partners have proposed an Anchor, Business and Communities (ABC) model using solar power. In an ABC mini-grid model, a consistent load (i.e. a telecom tower) acts as an anchor load, consuming a large proportion of power and providing a consistent revenue stream, while also connecting local businesses and residents to reliable AC power via a mini-grid.

Orange provides an integrated smart metering solution to enable energy prepayment via mobile money for the mini-grid customers.

So far, mini-grid pilot projects are being rolled out in two countries: Burkina Faso and the Democratic Republic of the Congo (DRC). The project in the DRC saw the first customers connected to the mini-grid network by November 2021.

The mini-grid installation can be replicated into new villages in districts in the future. Smart meters will be installed directly at the client's premises and will provide the following advantages:



- **Digitised relief operations**
- **Improvement of the customer experience (invoicing, collection)**
- **Payment by Orange Money**
- **Detection and reduction of fraud**
- **Monitoring of the low voltage distribution network**

Smart metering by Orange

Manual metering Operation made automatic + **Billing** Accuracy and payment experience improvement + **Fraud** Identification and resolution + **Production** Optimisation through on demand load monitoring + **Demand response** From massive blackouts

=

Operation and production cost savings

Higher revenue and cash collection

Improved customer satisfaction

Orange Energy is a partner for the mini-grid project with connected smart metering, but also an anchor client that will use the energy produced by the solar mini-grid to power a nearby telecom tower with green electricity.

The smart mini-grid projects initiative has several social, environmental and economic impacts, among which we can list the following:

Job creation	During the construction period, but also for maintenance and the operation phase.
Energy Supply	The mini-grid system aims to provide a green, sustainable and reliable source of energy all year long.
Education	Students can study easily and safely at night, without the loss of power for electronic devices such as laptops, phones etc.
Health	Health centres will be more functional by night, reducing the reliance on kerosene for lighting.
Economic growth	Many commercial activities can be created and new technologies tested for the first time (i.e. cooling systems).

9 Adaptation and resilience

As climate change results in rising sea levels and more extreme weather events, mobile operators' networks could be damaged with greater frequency, resulting in more service interruption for customers and greater financial risks for operators.

Operators are therefore under increasing pressure to make their networks as robust as possible so they can withstand extreme weather and be restored quickly. At the same time, mobile technology and innovation enabled through, for example, AI and big data[7] is uniquely positioned to provide and enable tools for climate change mitigation, adaptation, weather disaster response, pollution and environmental monitoring[8].

Task Force on Climate-Related Financial Disclosures

The Task Force on Climate-Related Financial Disclosures (TCFD) was created in 2015 by the Financial Stability Board to develop consistent climate-related financial risk disclosures for use by companies, banks and investors in providing information to stakeholders. The goal is to achieve a greater understanding of climate risks and facilitate financing of the transition to a more stable and sustainable economy. Network operators are especially exposed to climate-related financial risks because their valuable assets (base stations) are scattered everywhere, including areas at greater risk.

Many operators have already undertaken short- or long-term TCFD-aligned climate change risk and opportunity analysis. Based on the data provided by the operators to the CDP, 46% of the network operators by revenue and 32% by connections have started their TCFD-aligned climate change risk and opportunity analysis. Short-term climate risk-related analysis covers the impacts already experienced and the expected impacts over the next few years. Long-term risk assessment scenarios are modelled according to a 20- or 30-year timespan, in many cases to 2050 to align with the Paris Agreement. Examples includes A1, Globe Telecom, Orange, Safaricom, Taiwan Mobile, Telenor, Verizon and Vodafone, who have carried out comprehensive climate-related financial analysis and scenario planning, including the following:

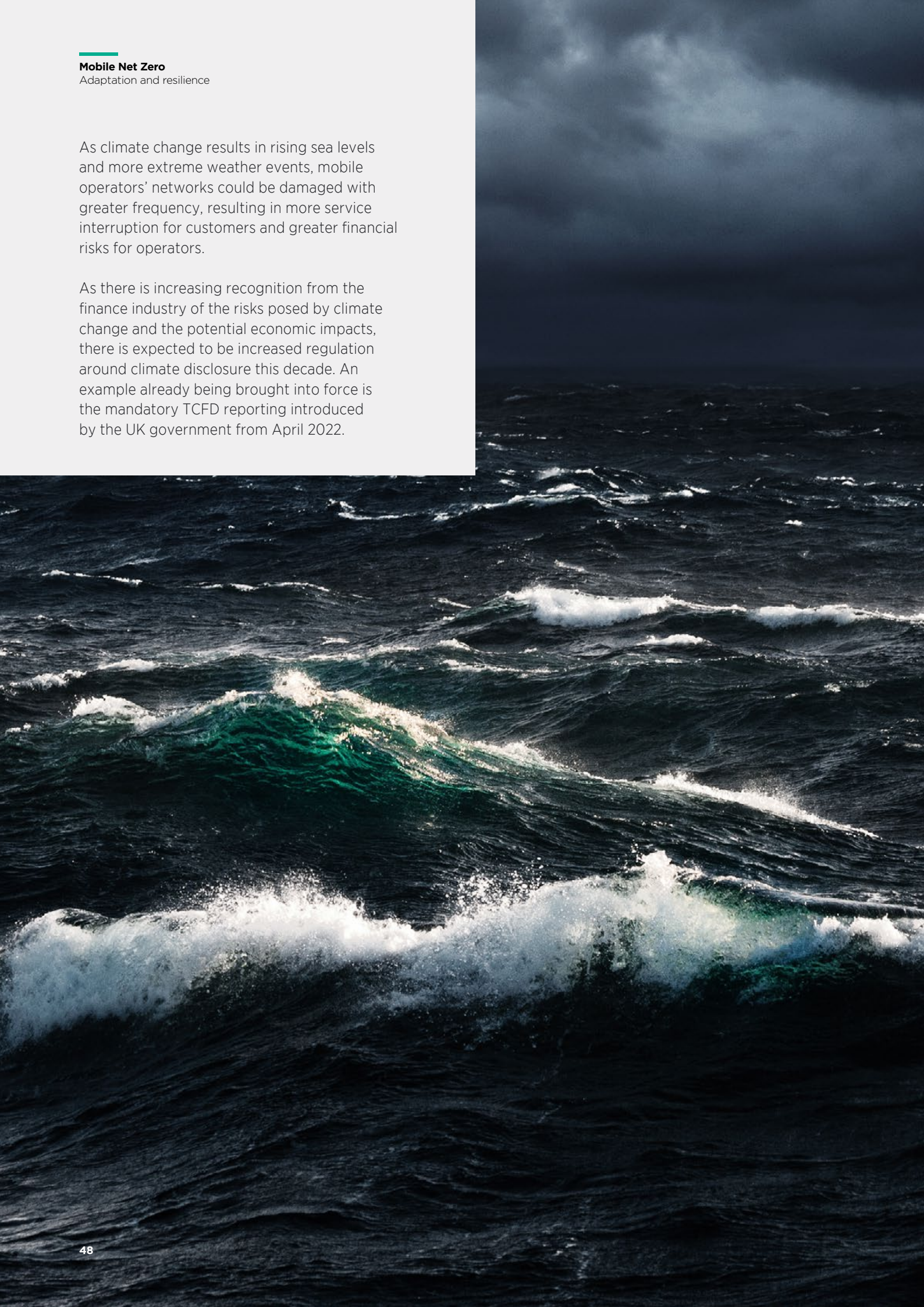
A1 conducted an initial climate scenario analysis based on TCFD, which took the 'Paris Scenario' versus a '+4 degrees Scenario' into assessment. A1's analysis focused on supply chain impacts (critical production locations of equipment and possible impacts on delivery chain), energy price developments including regulation and operational impacts (critical locations, frequency of extreme weather events etc) on the risk side.

Vodafone has undertaken a high-level TCFD-aligned climate change risk and opportunity analysis and selected market-level deep-dive assessments. As part of this process, Vodafone used scenario-based analysis aligned to the Bank of England's reference climate scenarios – used to stress-test the UK financial system against climate change.

7 gsma.com/betterfuture/aiforimpact
8 gsma.com/mobilefordevelopment/resources/the-role-of-digital-and-mobile-enabled-solutions-in-addressing-climate-change

As climate change results in rising sea levels and more extreme weather events, mobile operators' networks could be damaged with greater frequency, resulting in more service interruption for customers and greater financial risks for operators.

As there is increasing recognition from the finance industry of the risks posed by climate change and the potential economic impacts, there is expected to be increased regulation around climate disclosure this decade. An example already being brought into force is the mandatory TCFD reporting introduced by the UK government from April 2022.



Case study: Safaricom

Safaricom recognises that climate change poses a number of physical risks caused by the increased frequency and severity of extreme weather events like flooding, droughts etc. and transition-related risks like economic, technology or regulatory challenges related to moving to a greener economy.

In response, Safaricom has undertaken a high-level analysis focusing on climate change risks and opportunities.

The business is currently on a journey to align internal processes to the recommendations of the Taskforce on Climate-Related Financial Disclosures (TCFD).

From risk assessments, Safaricom quantifies the business impacts of all material climate-related risks over **short-, medium- and long-term time** horizons to better understand the financial value at risk across service revenue and operational cost.

2021
2025

The short-term analysis period is from 2021 to 2025, which covers the immediate impacts already being experienced and the expected impacts over the next five years. This is also well aligned with the company's 2025 mission and strategy.

2026
2035

The medium-term analysis period is between 2026 and 2035, which covers the medium-term impacts expected to occur in the future. Medium-term risks are dependent on the scenario chosen and how early action is taken, with significant differences between three temperature increase scenarios on both risks and opportunities.

2036
2050

The long-term risk and opportunity analysis period is from 2036 to 2050, which covers the longer-term impacts expected to be experienced under the different climate scenarios, with a range of temperature increases from <1.5°C to >3°C under different scenarios. Each scenario has different risks and opportunities over both physical and transitional areas across this time range.

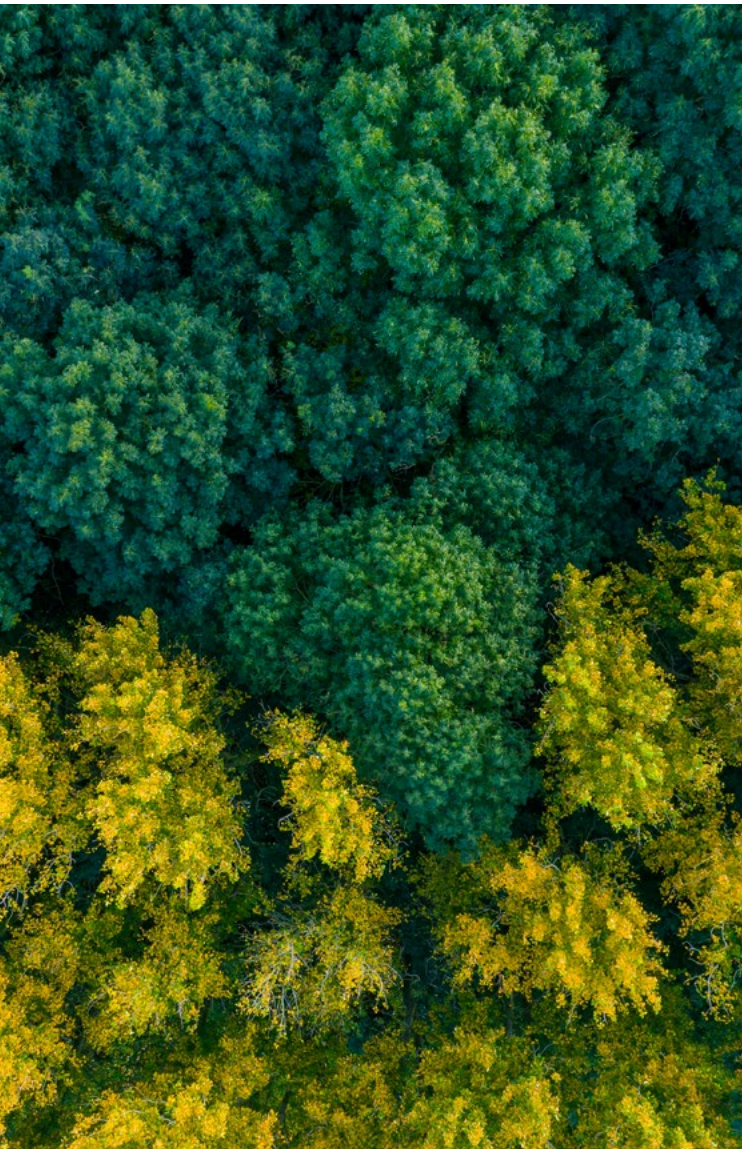
Safaricom has also made a distinction between the risks and opportunities related to our internal operations and those related to our supply chain.

The outputs of the exercise are used to make decisions on existing policies and to review or develop new ones, especially looking at opportunities to improve business resilience and continuity. It also informs the assessment of long-term business sustainability and resilience, pinpoints areas of further climate action, and informs environmental targets and objectives.

Recommendations

Moving the whole mobile industry to net zero emissions by 2050 will require concerted effort and action by all key industry 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 table gives an overview of the actions needed by stakeholders if the industry is to be successful in its net zero ambition:



Operators

- Disclosure through the CDP and aligning with TCFD
- Setting science-based and net zero targets
- Switch to renewable energy
- Develop circular economy initiatives for network equipment and connected devices
- Engage with suppliers on climate action

Suppliers

- Disclosure through the CDP and aligning with TCFD
- Setting science-based and net zero targets
- Switch to renewable energy
- Develop circular economy initiatives for network equipment and connected devices
- Engage with operators on climate action

Governments and policymakers

- Support the private sector in their decarbonisation efforts
- Accelerate access to renewables and engage in dialogue with the private sector where there is a lack of access
- Recognise the enablement effect of the digital transformation

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