# THE IMPORTANCE OF ENVIRONMENTAL SUSTAINABILITY IN TELECOM SERVICE PROVIDERS' STRATEGY

**WORLD BROADBAND**
ASSOCIATION

This World Broadband Association (WBBA) white paper analyzes the benefits of sustainability management and sets forth some best practices for achieving primarily environmental sustainability goals with a special focus on fixed broadband networks.

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# EXECUTIVE SUMMARY

Sustainability is fast becoming a focal point of telecom service providers' agendas. While sustainability entails many themes from climate change to equality and diversity, it is topics pertaining to telcos' environmental impact that are most often addressed by service provider sustainability strategies. The $CO_2$ footprint of the telecom industry is roughly 2% of the global footprint—similar to that of the airline industry—while 80% of e-waste is discarded, burned, or illegally traded, with telecom and IT equipment being a major contributor.

By addressing their own energy deficiencies and by enabling sustainable solutions in other industries and ways of living in general, telecom service providers have the potential to have an impact on up to 15% of global $CO_2$ emissions. Digitalization in general and broadband in particular can contribute by cutting transportation, creating gains in productivity and efficiency, and boosting economic growth for companies, individuals, and society as a whole.

Many telecom service providers worldwide now embed sustainability strategies into their everyday business decisions. Many are aiming to become carbon neutral by 2050, and major telcos have set out specific 2030 targets for emissions, waste, and the sharing of renewable energy, which not only reduces a company's own carbon footprint but enables customers and other industries to become more climate positive.

Adopting an efficient sustainability strategy has major benefits for service providers' revenue growth and operational performance. Some of the key benefits include the following:
- Lowering or even eliminating their carbon footprint by decreasing energy consumption through more efficient operations and transitioning to renewable sources of energy, while cutting costs as a result
- Having a positive impact on other industries and customers, enabling them to reduce their own environmental impact and opening new revenue streams for service providers
- Reputational benefits among consumers and business customers, leading to enhanced customer loyalty and long-lasting customer engagement as a recognition of a strong sustainability track record
- New business opportunities in areas that would previously not be available to telecom service providers such as venturing into renewable energy provision (e.g., teaming up with or investing in utility providers or even becoming utility providers themselves)

## RECOMMENDATIONS
- **Get serious and invested.** Telecom service providers should not treat sustainability merely as a box-ticking exercise. Instead, they need to recognize it as a positive cost-saving and revenue-generating opportunity, embedding sustainability principles and policies at the core of their company values and culture.
- **Be ambitious.** Progressive, actionable targets are an essential component of a successful sustainability strategy that is rewarded by customers as well as investors, which are increasingly evaluating their investment decisions against companies' environmental policies and targets.
- **Be specific.** Service providers need to carefully evaluate their individual conditions and set targets that reflect them. For example, there will be a different emissions baseline for an operator with a full-fiber network than for a service provider that is beginning to transition from legacy copper network to fiber to the home (FTTH). The value case and potential value generation of sustainability targets will depend on the specifics of each company's market conditions, operations, and infrastructure.
- **Avoid greenwashing.** Companies that set policies and targets that do only the bare minimum, set goals that are too modest or too far into the future, and use deceptive marketing to make themselves look environmentally friendly will lose in the long run. Consumers and investors are becoming more discerning and increasingly more knowledgeable. They will see through greenwashing attempts and take their business or investment elsewhere.
- **Team up.** In our interconnected world, it takes a team effort to deliver on sustainability targets. Service providers cannot achieve zero emissions and zero waste on their own,

and they need to look for ways to team up with suppliers, customers, and investors to collaborate, co-innovate, and incentivize to bring about change. These can include alliances and coinvestment in renewable energy, teaming up with customers and incentivizing them to reduce e-waste and migrate to renewable energy, cocreating strategic roadmaps with vendors and other suppliers to decarbonize the supply chain, and finding new financial sources (such as green finance investments or green bonds) to fund the transformation.
- **Make reporting mandatory and standardized.** While many service providers have been active in developing sustainable strategies and practices, these are often isolated initiatives. The creation of a universal framework with standardized targets aimed specifically at telecom service providers would benefit the telecom industry. Mandatory reporting would speed up adoption of sustainability strategies and expand and expedite the positive impact of these policies on the global environment.

# INTRODUCTION

The issue of sustainability has become an urgent topic for telecom network operators in recent years and was only intensified by the unprecedented demand for digital services during the COVID-19 pandemic. The need for seemingly infinite bandwidth has forced telecom infrastructures to consume more energy than ever, expanding their carbon footprint as a result. The $CO_2$ footprint of the telecom industry is roughly 2% of global emissions—similar to that of the airline industry. But by addressing their own energy deficiencies and enabling sustainable solutions in other industries and ways of living in general, telecom service providers have the potential to have an impact on up to 15% of global $CO_2$ emissions according to the Science Based Targets (SBT) initiative.

Most telecom service providers have set out high-level goals for net carbon neutrality by 2050, a goal supported by the European Green Deal and the United Nations Sustainable Development Goals. Some (especially in Europe) have already reached these goals, combining a reduction in their emissions with carbon-offsetting investments. In addition, most major service providers have defined specific 2030 targets for emissions, waste, and the share of renewable energy they use.

Fixed broadband service providers will play a key role in reducing the environmental impact of the telecom sector by shifting to sustainable technologies such as full FTTH networks in addition to contributing to socioeconomic sustainability by connecting the unconnected using fixed wireless access technologies. Facilitating working from home for many, and cutting commuting emissions as a result, is a prime example of the beneficial effects of fixed broadband on the global environment. But fixed broadband connectivity is also essential for operating energy-efficient technologies that reduce carbon emissions and save customers money (whether in the B2B or B2C segment). Technologies such as smart thermostats, heat pumps, and water heaters, when deployed widely, can significantly reduce energy demand not just for individual households but also for public institutions such as schools or hospitals. In the B2B segment, smart products and solutions that rely heavily on fixed broadband, such as smart agriculture or smart logistics, provide companies with the tools to lower their environmental impact by making operations more energy efficient, a key customer enablement factor.

However, telecom service providers should not view sustainability simply as an inevitable burden of compliance with the global green agenda and international environmental targets.

> " Telecom service providers have the potential to affect up to 15% of global $CO_2$ emissions. "

Instead, service providers need to approach sustainability as a positive cost-saving and revenue-generating opportunity. Strong environmental, social, and governance (ESG) performance is also rewarded by investors and results in higher market valuations. Moreover, customers and businesses increasingly prefer to engage with carbon-neutral service providers. Business customers, especially the larger ones, have their own sustainability targets to meet and will place environmental factors high on their list when choosing suppliers. Therefore, recognizing the potential that sustainability holds for them will allow service providers to create efficient and long-term strategies, setting them up for a zero carbon, zero waste future while reaping commercial benefits and exploring new areas of growth.

This World Broadband Association white paper analyzes the benefits of sustainability management and sets forth some best practices for achieving primarily environmental sustainability goals with a special focus on fixed broadband networks.

# BENEFITS OF EFFICIENT SUSTAINABILITY POLICIES AND STRATEGIES

With the demand for digital connectivity skyrocketing, telecom service providers have been faced with a sustainability conundrum: an ever-increasing bandwidth capacity leads to unprecedented increases in energy consumption. And there are no signs of it stopping. As Omdia's fixed broadband forecast shows, there will be approximately 1.6 billion fixed broadband subscriptions globally by 2027 with the average download speed of consumer fixed broadband connections reaching nearly 900Mbps.

FIGURE 1: GLOBAL FIXED BROADBAND SUBSCRIPTIONS AND AVERAGE DOWNLOAD SPEED FORECAST, 2019–27
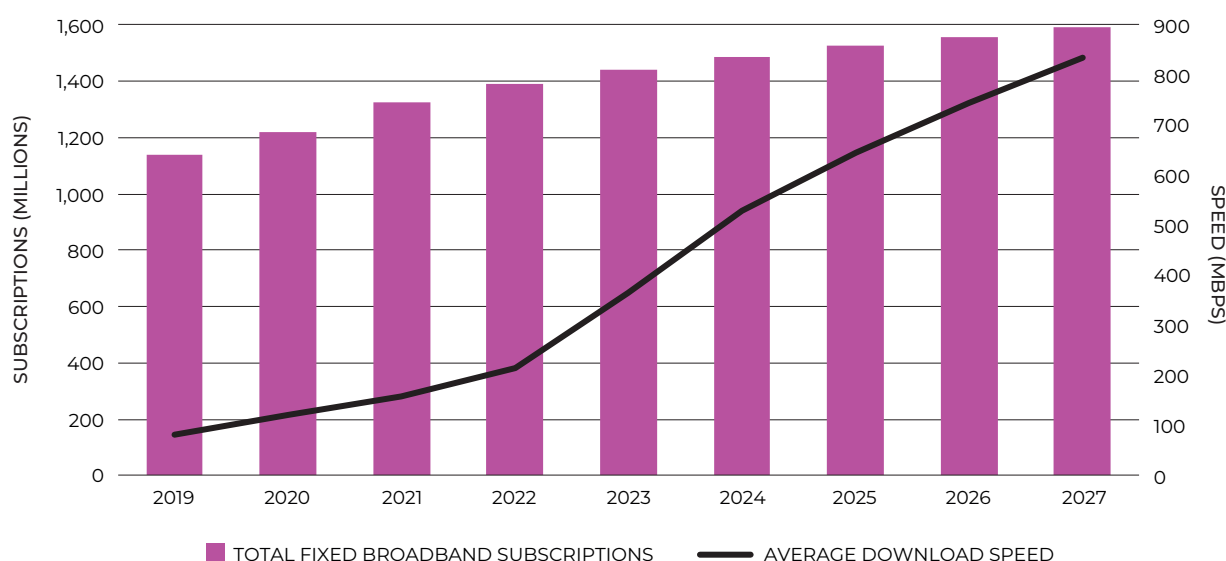


SOURCE: OMDIA

As a result, sustainability is fast becoming one of the key areas of focus, and all major telecom operators recognize the need for addressing environmental sustainability, setting ambitious targets and reporting their advancements. However, there is no unified framework for telecom sustainability reporting or a set of uniformly adhered-to targets. Instead, each company currently chooses for itself which framework (if any) it follows and the targets it aspires to. There are several standardized sustainability reporting frameworks, such as the Global Reporting Initiative (GRI), Carbon Disclosure Project (CDP), or Sustainability Accounting Standards Board (SASB), but none of these is specifically designed for telecom reporting, and the decision to follow them is at the discretion of the individual service provider.

Similarly, only some companies are joining the SBT initiative, which sets quantitative goals that support the Paris Agreement and the necessary greenhouse gas (GHG) emissions reduction trajectory aligned with the 1.5°C global warming limit. For the ICT sector specifically, the SBTs require mobile network operators to slash operational emissions by 45% between 2020 and 2030. Over the same period, fixed network operators must reduce their emissions by 62% and data centers by 53%. Committing to SBTs is most common among European service providers (because these are also bound by the European Green Deal agenda), while in Asia & Oceania and the Middle East & Africa, telcos tend to set their own targets.

## DIRECT ENVIRONMENTAL BENEFITS: THE FOOTPRINT EFFECT

### LOWER CARBON FOOTPRINT

In order to address their own carbon emissions, telecom service providers need to focus on all three scopes of emissions:

- **Scope 1 emissions** are direct emissions from company-owned and -controlled resources (i.e., generated directly from burning fossil fuels). Telcos typically generate few of these emissions.
- **Scope 2 emissions** are indirect emissions from purchased electricity, heat, and water (cooling) (i.e., from a utility provider). Lowering emissions from power consumption within the access network is at the core of most service provider strategies.
- **Scope 3 emissions** are all indirect emissions that occur in the value chain of the reporting company, including both upstream and downstream emissions. This is the biggest impact area, typically making up more than two-thirds of a telecom service provider's total carbon emissions.

FIGURE 2: TELECOM SERVICE PROVIDERS' SPECIFIC EMISSIONS SCOPES
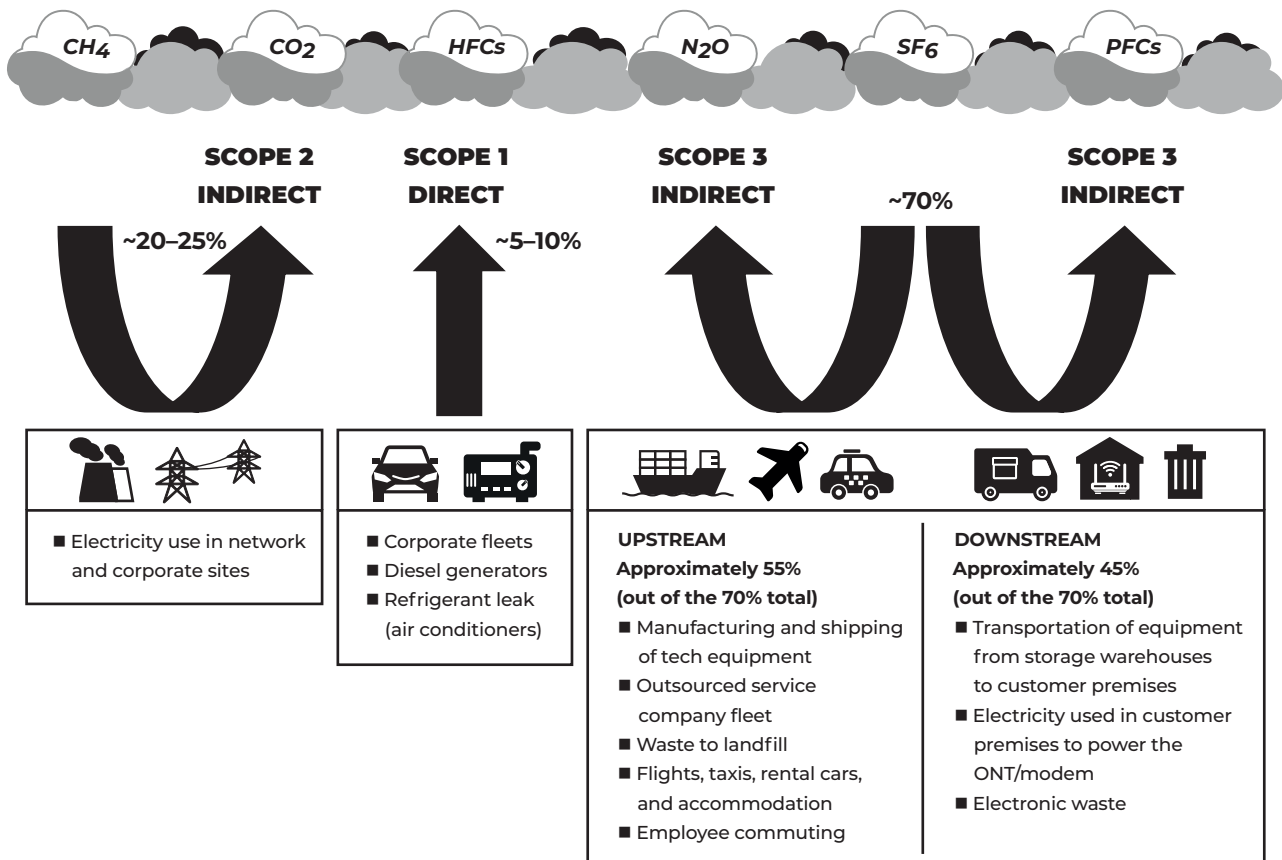


SOURCE: OMDIA

To varying degrees, telecom service providers adopt the following policies to reduce their emissions:
- Increasing energy efficiency
- Increasing the share of renewable energy in their energy consumption and offsetting those emissions that cannot be supplied by renewable energy by funding an equivalent CO2 saving elsewhere
- Influencing their suppliers to reduce emissions (scope 3)

As an example of ambitious targets addressing all three emission scopes, Swisscom has been leading among the European telcos with a goal of a 90% reduction in direct CO2 emissions (compared with a 1990 baseline) by 2025. Moreover, the company currently does not have any scope 2 carbon emissions, since it has been using 100% renewable energy since 2010, achieving this by the use of solar energy and through supporting climate projects to offset the residual emissions creation. In terms of indirect emissions in the supply chain (scope 3), Swisscom reached 29% reduction in 2020 and has committed to a further 25% reduction by 2025, focusing on optimization and improved energy efficiency in customer devices.

Another leader in sustainability strategy, Nordic operator Telia, has adopted a zero carbon and waste strategy to be achieved by 2030 with short- and mid-term goals based on SBTs, which include a 50% reduction in its own emissions by 2025 (compared with a 2018 baseline), reduced emissions related to the use of sold and leased products by 29% by 2025, and engagement with suppliers so that 72% of suppliers have set SBTs by 2025. Moreover, Telia achieved 100% renewable electricity use in 2020 (two years ahead of its original target date).

Deutsche Telekom also adopted clear SBTs to reduce absolute scope 1 and 2 GHG emissions by 95% by 2025 (compared with a 2017 baseline) and to neutralize the last 5% or so of the company's carbon footprint through high-quality carbon removal projects. By 2040 at the latest, the requirement of climate neutrality will apply to Deutsche Telekom's entire value chain from production to customer use (scope 3).

## ENERGY AND POWER-SAVING BENEFITS

The ICT industry is responsible for approximately 5–9% of global electricity consumption, so energy and power saving is clearly at the top of telcos' environmental agendas. Some key strategies adopted to achieve these goals include switching to new, energy-efficient technologies for network operations and data centers. For example, 80% of Swisscom's power consumption can be attributed to fixed and mobile networks and IT hosting. By upgrading legacy networks to future-proofed technologies such as FTTH, companies can considerably reduce their energy dependencies. In recent years, Belgian incumbent Proximus has begun investing in transitioning its traditional copper legacy network to full fiber and has seen a 75% reduction in power consumption as a result.

Addressing the power consumption of customer end devices such as customer premises equipment (CPE) is another important aspect of service providers' strategies to achieve energy efficiency.

> " Energy consumption typically accounts for 20–40% of telcos' network opex and 3.5–4% of total operating expenses. "

Moreover, according to GSMA, energy consumption typically accounts for 20–40% of telcos' network opex and 3.5–4% of total opex (based on consulting firm Kearney's data). An Omdia study of major operators found that electricity costs equate to between 1% and 2% of revenue. Therefore, pursuing energy reduction targets does not only help companies' ESG ratings but also (and from a business point of view, probably even more importantly) leads to considerable cost savings, which can have a meaningful impact on profit margins.

## SECONDARY IMPACT AND CUSTOMER ENABLEMENT: THE HANDPRINT EFFECT

In addition to reducing their own end-to-end emissions, telecom service providers have a historic opportunity to help other industries become more energy efficient. Once a telco has an environmental sustainability approach in place to address its own footprint, it can begin to help other industries cut down their emissions. Service providers are best placed to offer solutions that enable customers to deliver on their own sustainability targets. ICT services today allow society to be more energy efficient, with the $CO_2$ abatement factor estimated to be nine (i.e., for every ton of $CO_2$ equivalent emissions from the ICT industry, nine tons are saved across the global economy). Digitalization, dematerialization, data sharing and processing, and organizational optimization are all tools delivered by the telecom industry over fixed broadband networks.

Broadband connectivity in particular can further contribute to global GHG reductions by cutting transportation, creating gains in productivity and efficiency, and boosting economic growth for consumers as well as companies, cities, and countries in general. A recent large-scale study published in the journal *Urban Sustainability* has found that working from home four days a week could reduce the levels of nitrogen dioxide ($NO_2$), the main pollutant related to traffic emissions, by 10% and the overall level of traffic-related air pollution by 15%.

It is estimated that wide-scale deployment of smart meters and thermostats could potentially lower US consumer energy demand by 20–30%. The enablement of smart grids can dramatically reduce electricity wastage by providing accurate real-time insight into demand, regulating both production and consumption, and encouraging more responsible usage. Furthermore, smart roads and smart cities rely on broadband connectivity to regulate traffic flow, also contributing to lower GHG emissions.

Some service providers already include the environmental impact of their solutions in their ESG reporting. US telco Verizon, for example, sets a target of 20 million metric tons of $CO_2$ emissions to be avoided annually by 2030 through the use of the company's products and services.

## FINANCIAL BENEFITS AND COST SAVINGS

As mentioned earlier, reductions in energy emissions are closely tied with cost savings. By following the SBTs and reducing the energy needed per unit of traffic by about 70% by 2030, the ICT industry could eliminate up to 15% of all global emissions in the same timeframe. This reduction, according to estimates by consulting company BCG, would equal a 12.1 million gigaton reduction in $CO_2$ or, in money terms, $6.5tn saved. To put this into individual telco concrete terms, in the nine years since it adopted an Energy Efficiency Plan in 2010, global player Telefónica has been able to avoid 1.27 million tons of carbon emissions, saving 4,000GWh and €553m across its group operations.

> " Reducing the energy needed per unit of traffic by about 70% by 2030 would equal a 12.1 million gigaton reduction in $CO_2$ or, in money terms, $6.5tn saved. "

Furthermore, the European Code of Conduct for Broadband Communication Equipment states that total energy consumption for broadband communication equipment in Europe was estimated in 2015 at 50TWh per year, which could be limited (as a result of implementation of the Code of Conduct) to 25TWh per year, resulting in a total saving of about €7.5bn per year.

In addition to direct cost savings, telecom service providers with a strong sustainability track record can also benefit from better investor conditions. Investment management companies, such as BlackRock or Morgan Stanley Capital Investments (MSCI), have in recent years linked their investment decisions to ESG goals, particularly environmental ones. Service providers with insufficient ESG strategy and reporting will find it hard to attract investor funding.

Similarly, when tendering for public projects, telcos will increasingly need to provide evidence of their ESG strategy in order to win public contracts: many tender evaluations now include scores for environmental and other ESG impacts. Companies with developed ESG propositions are also more likely to avoid regulatory intervention and to earn subsidies and government support.

Several telecom service providers, such as Telia, NTT, Orange, Telefónica, Verizon, and Vodafone, have also been issuing green bonds, in which commitment to sustainable targets is necessary to access proceeds. For example, Telia used the proceeds from its 2020 green bonds sale to fund its fiber network transformation in Sweden and to develop Internet of Things (IoT) solutions focused on reducing customers' environmental impact.

## REPUTATIONAL BENEFITS

In addition to the more obvious environmental and cost savings benefits of service providers' sustainability strategies, adopting and effectively communicating ESG policies also creates reputational benefits that can generate further long-term business value.

With climate change now an unescapable reality, consumers are becoming more aware of the environmental impact of the purchases they make and the services they use. In general, the vast majority of consumers are more likely to trust a company that supports environmental or social issues, and they are likely to be more loyal to such companies. In Salesforce's 2022 "State of the Connected Customer" survey, more than 75% of customers said their purchase decisions are swayed by companies' environmental practices such as protecting natural resources and achieving net zero emissions. More specifically, research conducted by BCG has shown that younger consumers are willing to pay a 10% premium for sustainable "green" telco products.

> " Younger consumers are willing to pay a 10% premium for sustainable 'green' telco products. "

A strong sustainability strategy is also important for attracting and retaining employee talent. According to an employee engagement study by Cone Communications, 58% of employees consider a company's social and environmental commitments when deciding where to work, and 55% of employees would choose to work for a socially responsible company, even if the salary offered was lower.

Moreover, business customers of telco services have their own sustainability targets and evaluate service providers' targets and strategies before making their purchasing decisions.

## NEW OPPORTUNITIES

The evolution of sustainability strategies can also open new avenues for telecom service providers that would previously not have been feasible for them. Teaming up with utility providers or even becoming providers of renewable energy themselves can be an interesting proposition and a further revenue-generating opportunity. With rising global power prices and the longevity of telecom operators' energy needs, they could become passive coinvestors in renewable power generation schemes or build their own power plants. For example, in 2018 Telefónica Mexico invested in the Kaixo Solar Park, which currently covers 40% of the company's electricity needs in the country.

Similarly, in 2022 French telecom giant Orange partnered with utility company Engie to build a solar plant at its Côte d'Ivoire data center, which services the operator's 18 subsidiaries in the Middle East & Africa. The data center will generate around 60% of its daytime energy needs from the plant. Orange has implemented similar initiatives in its other markets in the Middle East & Africa and is also looking to build two solar farms in France in 2023.

# ACHIEVING SUSTAINABILITY GOALS

There are many ways that telecom service providers can achieve their sustainability targets. Focusing on emission reduction and using energy from 100% renewable sources is the most frequent approach, which is often combined with the transition to more energy-efficient access technologies, such as FTTH. However, companies also need to pay attention to the way their products and services influence their customers' environmental impact and, simultaneously, what their suppliers' environmental impact is (i.e., scope 3 emissions), both of which are generally harder to track and influence.

## MECHANISMS OF MOVING TO 100% RENEWABLE ENERGY

Telecom operators already source more energy from renewable sources than other industries on average, but there is more that can be done to achieve net zero emissions (i.e., reducing GHG emissions as much as possible and, for any residual emissions, removing an equivalent amount from the atmosphere by investing in carbon removal projects such as reforestation or carbon capture and storage). The shift to renewable energy could be accelerated through, for example, power purchase agreements (PPAs). These are long-term arrangements that assure the developer of a renewables project that it will be able to sell the power it generates in the future and provide the buyer with a stable fixed price as well as renewable energy credits. According to analysis by consultants Oliver Wyman, the price of PPAs has fallen significantly in recent years, and they now provide electricity at prices broadly in line with that of energy generated using fossil fuels despite an undersupply of renewable energy in some locations.

Solar energy, as mentioned earlier, is one of the most-used tools for companies looking to increase their renewable energy usage. US cable giant Comcast has recently entered into a 15-year agreement with clean energy provider Constellation to support the construction of the Blue Sky Solar Project in Illinois. Comcast will source 250MW of carbon-free solar electricity from the 300MW Blue Sky project, a majority share of the project's total output. This will allow Comcast to reduce the $CO_2$ emissions associated with its energy use by nearly 360,000 metric tons annually, equivalent to avoiding the emissions caused by the annual electricity consumption of more than 65,000 homes.

> " The shift to renewable energy can be accelerated through power purchase agreements, which have fallen in price in recent years. "

But in order to become truly a net zero company, a service provider also needs to address its scope 3 emissions, which can make up around 70% of an operator's total GHG emissions. Scope 3 emissions include emissions attributable to purchased goods and services (around half of scope 3) and the use of products and services sold by telecom operators (around 40% of scope 3) such as mobile phones, gateways, and broadband routers.

To reduce emissions in their supply chains, service providers can negotiate with vendors to set their own renewable energy standards and SBT-based targets. UK incumbent telco BT, for example, requires all supplier contracts worth over £25m to have either net zero SBTs in place or a commitment to having them within six months. The company has also introduced a climate clause for some key suppliers that commits them to making measurable carbon savings during the life of their contract with BT. In the US, AT&T integrated sustainability performance metrics into sourcing decisions for 80% of its expenditure. The company wants at least half its suppliers to set their own science-based scope 1 and scope 2 GHG targets by 2024.

As for reducing the consumer impact, companies have been focusing on setting up recycling and buyback schemes and persuading consumers to use renewables through marketing appeals and special offers.

## TRANSITION TO FIBER

In the last decade or so, most leading telecom operators have been able to stabilize or limit their energy consumption and reduce their carbon emissions even though the traffic on their networks has skyrocketed. Since 2015, Telefónica has been able to stabilize power consumption (-0.29%) despite a 176% increase in network traffic and has achieved a 37% reduction in carbon emissions at the same time. In Belgium, Proximus has reduced its fixed broadband power consumption by 38% since 2007, while speeds on its network have increased by a factor of 64. One of the key factors aiding this trend has been the shift from legacy copper networks to fiber-optic networks.

FIGURE 3: GLOBAL FIXED BROADBAND SUBSCRIPTIONS BY TECHNOLOGY FORECAST, 2019–27
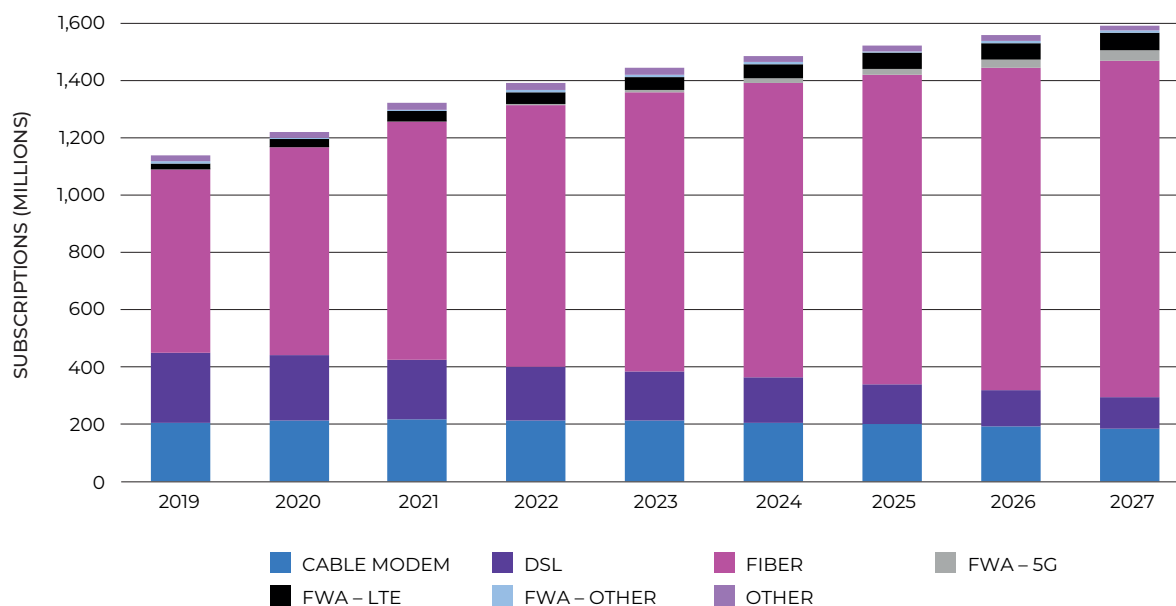


SOURCE: OMDIA

Omdia's forecast for global fixed broadband subscriptions by access technology clearly indicates the growing dominance of FTTH subscriptions, which will reach 1.2 billion worldwide and account for nearly three-quarters (74%) of all fixed broadband subscriptions by 2027.

From a sustainability point of view, their future-proof scalability and virtually infinite capacity make full-fiber networks the most energy-efficient solution for service providers' fixed access networks. Replacing copper-based DSL connections with FTTH technology breaks the link between bandwidth demand and power consumption. According to data provided by Nokia, VDSL requires many more active components in the network than Passive Optical Network (PON) and so consumes more power. But when one also considers the far greater bandwidth of Gigabit Passive Optical Network (GPON) in comparison with VDSL, the net gain can be a 12-fold improvement in bits delivered per watt consumed. XGS-PON takes this even further, delivering five times the bandwidth of GPON for only twice the power consumption with another positive impact on energy efficiency.

Research by the Technical University of Central Hesse in Germany further concluded that FTTH networks require up to three times less electricity than copper-based vectoring/supervectoring networks (VDSL/FTTC, or fiber to the curb) and up to six times less power than coaxial cable networks (HFC) in the DOCSIS 3.1 standard. Furthermore, comparison of the power consumption

of gigabit FTTH and cable networks reveals that FTTH consumes up to eight times less electricity than HFC networks. Translating this to specific figures for Germany, we see that FTTH networks require 154MW of power, while VDSL consumes 350MW and HFC 650MW.

Similar results have been recorded by New Zealand wholesale infrastructure providers Chorus, Enable, Tuatahi First Fibre, and Northpower, whose study on broadband emissions found that FTTH has a lower per user emissions footprint than all the other fixed broadband alternatives in New Zealand. In comparison with VDSL and cable HFC, GPON can deliver emissions reductions of 28–41% and 12–29% respectively (at average access rates higher than ~50Mbps). At high average access rates (e.g., over 600Mbps), XGS-PON provides an even greater emissions advantage than GPON because of more power-efficient equipment (watts per user) outside customer premises. For GPON and XGS-PON networks providing similar minimum per user speeds at peak, the per user emissions footprint of XGS-PON can be 17% lower than that of GPON.

It is also worth noting that fixed networks, and fiber networks specifically, require much less power than mobile networks. A recent study by Eoptimo in Denmark comparing the energy consumption of a 1Gbps fiber-optic connection with that of an equivalent 5G connection concluded that a fiber-optic connection consumes 85W and the corresponding 5G connection 1,158W. Therefore, the power requirement of a fiber-optic connection is 13 times lower than that of a mobile 5G connection.

Moreover, reduced energy consumption and increased network reliability (through the absence of active network elements in the field) mean that FTTH networks cost less to run and operate. Moving to a full-fiber network also allows for central offices to be consolidated, again reducing energy consumption. A more reliable network requires fewer field support staff and less travel to network locations to carry out maintenance and repairs.

> **FTTH consumes three times less electrical power than traditional copper-based networks and up to six times less electrical power than cable networks.**

But not ensuring that end-user devices such as CPE (i.e., modems, routers) are as energy efficient as possible is detrimental because customer equipment is a major source of power use in the access network. In other words, a fiber network will never reach its full potential if the energy efficiency of the end-user devices used by customers is not addressed. Providing consumers with energy-efficient CPEs presents further significant opportunities for emissions reductions. For example, Chorus' 3rd Generation GPON gateway, which integrates the optical network unit (ONU) and modem functionality into a single box, can halve the total power consumed by separate ONU and modem boxes. Another way to reduce power consumption and emissions in customer premises is the innovative fiber-to-the-room (FTTR) solution, an all-optical Wi-Fi solution that directly extends optical fibers to each room, achieving gigabit coverage everywhere at home and eliminating the need for additional energy-consuming CPE.

New broadband network construction inevitably results in GHG emissions and other environmental damage. It is therefore important to build robust network infrastructure that can cope with future demands in a sustainable way. Fiber is created from simple materials (glass, silica, quartz, plastic), which means production can be carried out locally from start to finish and does not require the highly polluting extraction and transportation of ore from all over the world. For the rollout of fiber cables, alternative trenching methods, trenchless technologies, and codeployment in nontelecom infrastructure have been developed and slash the carbon emissions of deployment with less waste, less backfill material, and less time consumption. However, to ensure that fiber networks are rolled out in the most sustainable way possible, service providers should avoid network duplication and overbuild. Utilizing open access network

solutions should be the preferred way forward in future fiber deployments to save costs and resources and promote fair competition conditions.

However, even though fiber will reach 1.2 billion subscribers by 2027, more than half of all households will still be without fiber connectivity. In hard-to-reach and scarcely populated areas, FTTH deployment simply is not feasible from either a technical or a return-on-investment point of view. In such situations, fixed wireless access (FWA) technology has a strategic role to play even though it is much less power efficient than GPON (up to 50% for 4G FWA and 4–21% for 5G FWA according to Chorus' study). FWA's easy deployment, without the need for physical last-mile connection, means network operators can reach consumers in unserved and underserved areas, closing the digital divide and delivering on their ESG commitments in the process.

## REDUCTION OF OPERATIONAL EMISSIONS

One of the areas most often addressed by service providers tackling emissions is improving their operational efficiency. As mentioned, transitioning to fiber networks enables such efficiencies, but even without a complete switch-off of their legacy networks, service providers can achieve operational efficiencies by digitalizing and automating their existing infrastructure.

Using zero-touch automation, artificial intelligence (AI) programs can improve energy savings by closely aligning equipment-usage patterns with real-time network demands and identifying performance anomalies in underperforming network equipment that saps energy resources and requires replacement. AI-powered energy solutions can also help reduce the number of onsite visits technicians have to make to troubleshoot network issues.

Network cooling is another major culprit in service providers' emission generation, so optimization of cooling system settings can reduce overall site energy usage and maintenance costs and extend the lifespan of equipment. For example, Verizon has deployed smart cooling systems across its technical network facilities to optimize the cooling system capacity and telecom equipment demand through AI machine learning algorithms. Swisscom has been using recirculated air and water to cool its data centers.

Switching from diesel vehicles and generators to electric vehicles and battery backup systems (sometimes powered by onsite solar photovoltaics) is the main way for service providers to limit their scope 1 emissions. Australian telco Telstra introduced 256 hybrid vehicles to its fleet in 2020, which contributed to a 33% fuel reduction. In the UK, BT aims to transition most of its fleet to zero emissions or electric vehicle models by 2030 where this is the best technical and economic solution and plans to pursue other ultra-low emission solutions where electric vehicles are not a viable option. The company currently owns more than 1,000 electric vehicles, about a third of its fleet (BT Group and Openreach combined).

> " Digitalization, automation, and the use of AI significantly contribute to the reduction of operational emissions. "

Other operational emissions reduction programs can target emissions generated in offices and retail sites in addition to employee-generated emissions, for example, downsizing and consolidating office spaces, implementing low-carbon heating and air-conditioning solutions, office recycling schemes, and so on.

## CIRCULAR ECONOMY

After carbon emissions, waste is the second major factor contributing to any telecom service provider's environmental footprint. It is estimated that 80% of e-waste is discarded, burned, or illegally traded, with telco and IT equipment accounting for a major part of e-waste. To tackle the issue of waste, telecom service providers are increasingly turning to circular economy. The principals of circular economy are based on designing out waste and pollution and keeping products and materials in reuse.

> **Eighty percent of e-waste is discarded, burned, or illegally traded, and telco and IT equipment accounts for a major part of e-waste.**

Most telcos include waste reduction targets in their reporting, although measurements and targets tend to be more vague than for emission reductions. Service providers generally focus on two areas where they look to establish circularity: their network infrastructure components and the retail/ consumer ecosystem.

### INFRASTRUCTURE (NETWORK COMPONENTS) ORIENTED

One way to reduce landfill waste is to focus on the recycling of the actual cabling components used to lay broadband networks. Historically, recycling of both coaxial and fiber-optic cables has been challenging because of the mix of materials involved in their construction. While the individual plastics and glass that make up fiber-optic cables technically can be recycled like ordinary trash, separating them is quite difficult and time consuming. Similarly, the composition of coaxial cables—metal, different types of plastics, and adhesive substances—make the components difficult to separate. It is also hard for each recoverable material to achieve a purity level suitable for reuse. Moreover, it is much more affordable for recyclers to send these cables to landfill, which means there are not many incentives to upcycle.

However, companies such as US cable operator Cox Communications are beginning to change this practice. In 2020, Cox formed a partnership with Ubuntoo, an environmental solutions platform, to search for technology solutions to economically and at scale recycle, upcycle, or repurpose the approximately 25 million pounds (11,334 metric tons) of waste coaxial cable created annually in the US. Cox itself aims to achieve zero-waste-to-landfill efficiency by 2024. The main way to ensure this is to reduce unnecessary discards of new cables by first identifying the most efficient packaging and technician support to ensure that only the necessary amount of cable is used when the network is deployed and second working with dedicated end-to-end recyclers to use the individual components for other industries such as construction or furniture.

Similarly, Taiwan Mobile has been working with recycling innovator MINIWIZ to develop a recycling pathway that turns fiber-optic cable waste particles into custom furniture or a steel alternative and brick and rebar substitutes.

Another way to introduce circularity in network infrastructure is to increase the use of refurbished network equipment in network rollout. Instead of manufacturing all-new elements, network operators can reuse dismantled network components from one part of their network in another, for example, reusing equipment once deployed in urban areas in rural network buildouts. Multinational service providers, such as Orange, can redeploy equipment originally used in more advanced markets for later network rollouts in developing countries.

To this effect, Orange partnered with Nokia in 2021 to increase the use of refurbished equipment in Orange's network deployments across its global footprint (26 countries). As part of the agreement, Nokia will supply the operator with gear from other locations in cases when equipment is not available within Orange Group. Conversely, functional but unneeded equipment within a market is offered first to Orange operators in other countries, but if there is no interest Nokia has the option for buyback, or it will be resold to external partners.

## CUSTOMER ORIENTED

On the customer side, service providers are increasingly focusing on encouraging buyback and other recycling programs of customer electronic waste. While this is most prominent in the mobile segment with trade-in of old phone, service providers are also increasingly incentivizing reuse and recycling of fixed broadband CPE (routers, modems, gateways, etc.).

For example, in 2021 customers of BT returned 1.35 million home hubs and set-top boxes; 46% of these were refurbished for reuse. This equates to 573 tons of waste electronic equipment being reused in BT's circular economy. The remaining 54% will either be refurbished next year or sent to recycling partners.

Service providers are also paying increased attention to the recyclability of new devices and look for products that are made from recyclable materials with easily dismantlable parts.

# CONCLUSION

By adopting long-term, all-encompassing sustainability strategies, telecom service providers can make substantial positive change to the environmental impact of the ICT industry. They are also best placed to help customers and other industries in turn reduce their climate impact. Sustainability therefore presents a major business opportunity, and those service providers that proactively address their own sustainability and offer solutions for others to tap into will see revenue growth, improved operational performance, and investor rewards, all the while contributing to making the world a better place.

## FINAL RECOMMENDATIONS

- **Service providers should work together to set common sustainability targets and indicators to promote industrywide reporting.** If service providers can agree on a standard measurable approach, there will be a clearer spotlight on telco sustainability and ESG initiatives, which would by itself promote industry commitment to sustainability goals. Creating unified sustainability KPIs—especially around network emissions and supply chain activities and impacts—and specific initiatives to improve the environment and society can then expedite the reach and impact of sustainability policies, for example, achieving zero emissions across the industry globally and ahead of target dates.

- **Service providers need to team up with partners in order to increase the chances of success of their sustainability strategies.** Service providers alone cannot fully execute their sustainability initiatives: they need cooperation with trusted partners. Across vendors, other suppliers, recyclers, and beyond, a successful sustainability strategy needs to be thought out throughout the whole network lifecycle and service provider ecosystem.

- **Service providers should actively market and publicize their sustainability successes, such as network emission reductions.** Consumers increasingly care about environmental topics, and service providers should carefully assess how they can most effectively market their sustainability activities. Service providers have many channels through which they can communicate how they benefit the communities and environments they operate in. However, service providers need to back up such marketing messaging with proof or real results rather than make plainly "greenwashed" promises and misrepresent data. Service providers that are vigorously reducing their network emissions have a clear opportunity to use these achievements to get ahead of their competitors. Competition among service providers could

then extend beyond marketing the fastest and largest network to also include the greenest network messaging.

- **Service providers need to incorporate accountability and oversight into their sustainability strategies.** Sustainability targets need to be anchored in detailed roadmaps supervised at the corporate level. Sustainability policies need to become an intrinsic part of corporate strategy, with oversight and accountability leading all the way to top management, ideally tying C-level management's variable compensation to sustainability accomplishments.

# APPENDIX

## FURTHER READING

*Service Provider ESG Initiatives – 2021 Market Analysis* (August 2022)

Science Based Targets, "Guidance for the ICT sector," https://sciencebasedtargets.org/sectors/ict#about-the-project, retrieved August 2022

UNFCCC (February 28, 2020) "Telecoms Sector Agrees Pathway to Net Zero Emissions," https://unfccc.int/news/telecoms-sector-agrees-pathway-to-net-zero-emissions

Roman Friedrich, Stefan Hoffmann, Tobias Lampe, and Sebastian Ullrich, "Putting Sustainability at the Top of the Telco Agenda," BCG, www.bcg.com/publications/2021/building-sustainable-telecommunications-companies, retrieved August 2022

BT Group, "BT Group carbon reduction plan," www.bt.com/bt-plc/assets/documents/digital-impact-and-sustainability/our-approach/our-policies-and-reports/bt-carbon-reduction-plan.pdf, retrieved August 2022

Corina Comendant & Kieran Murray (November 25, 2021) "Assessing the emissions footprint of the fibre networks relative to other fixed broadband options in New Zealand," https://company.chorus.co.nz/file-download/download/public/2314

Deutsche Telekom, "Reducing CO2," www.telekom.com/en/corporate-responsibility/climate-and-environment/is-01-climate-and-environment-context/reducing-co2-355308, retrieved August 2022

Maya Ormazabal, "Case Study: Telefónica," GSMA, www.gsma.com/futurenetworks/wiki/telefonicas-energy-and-climate-change-strategy/, retrieved August 2022

Infosat (May 5, 2022) "Gutachten: Glasfaser ist die digitale Infrastruktur mit dem geringsten Stromverbrauch," www.infosat.de/technik/gutachten-glasfaser-ist-die-digitale-infrastruktur-mit-dem-geringsten-stromverbrauch

Kearney, "Strategy and Top-Line," www.kearney.com/communications-media-technology/article/-/insights/time-for-telcos-to-double-down-on-sustainability, retrieved August 2022

MINIWIZ, "Why Optical Fiber Cables No Longer Need To Go to Landfill," www.miniwiz.com/blog_detail.php?id=25, retrieved August 2022

Nokia, "Broadband Zero – Delivering the benefits of broadband while minimizing environmental impact," https://onestore.nokia.com/asset/210303?_ga=2.13757495.1805973810.1658167538-1288512846.1658167537, retrieved August 2022

Salesforce, "Trends in the Communications Industry," www.salesforce.com/resources/articles/trends-in-communications/, retrieved August 2022

Telia Company, "Goals and Performance," www.teliacompany.com/en/sustainability/goals-and-performance/, retrieved August 2022

Verizon, "Environmental, Social and Governance (ESG) Report 2021," www.verizon.com/about/sites/default/files/Verizon-2021-ESG-Report.pdf, retrieved August 2022

Alba Badia, Johannes Langemeyer, Xavier Codina, Joan Gilabert, Nacho Guilera, Veronica Vidal, Ricard Segura, Mar Vives, & Gara Villalba, "A take-home message from COVID-19 on urban air pollution reduction through mobility limitations and teleworking," *npj Urban Sustainability* 1:35 (2021), www.nature.com/articles/s42949-021-00037-7

Kristina Waters & Ananya Gupta, "Could the Cable Industry Send Zero Waste to Landfill?" *SCTE Technical Journal* 1:2 114–119, https://wagtail-prod-storage.s3.amazonaws.com/documents/SCTE_Technical_Journal_V1N2.pdf

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