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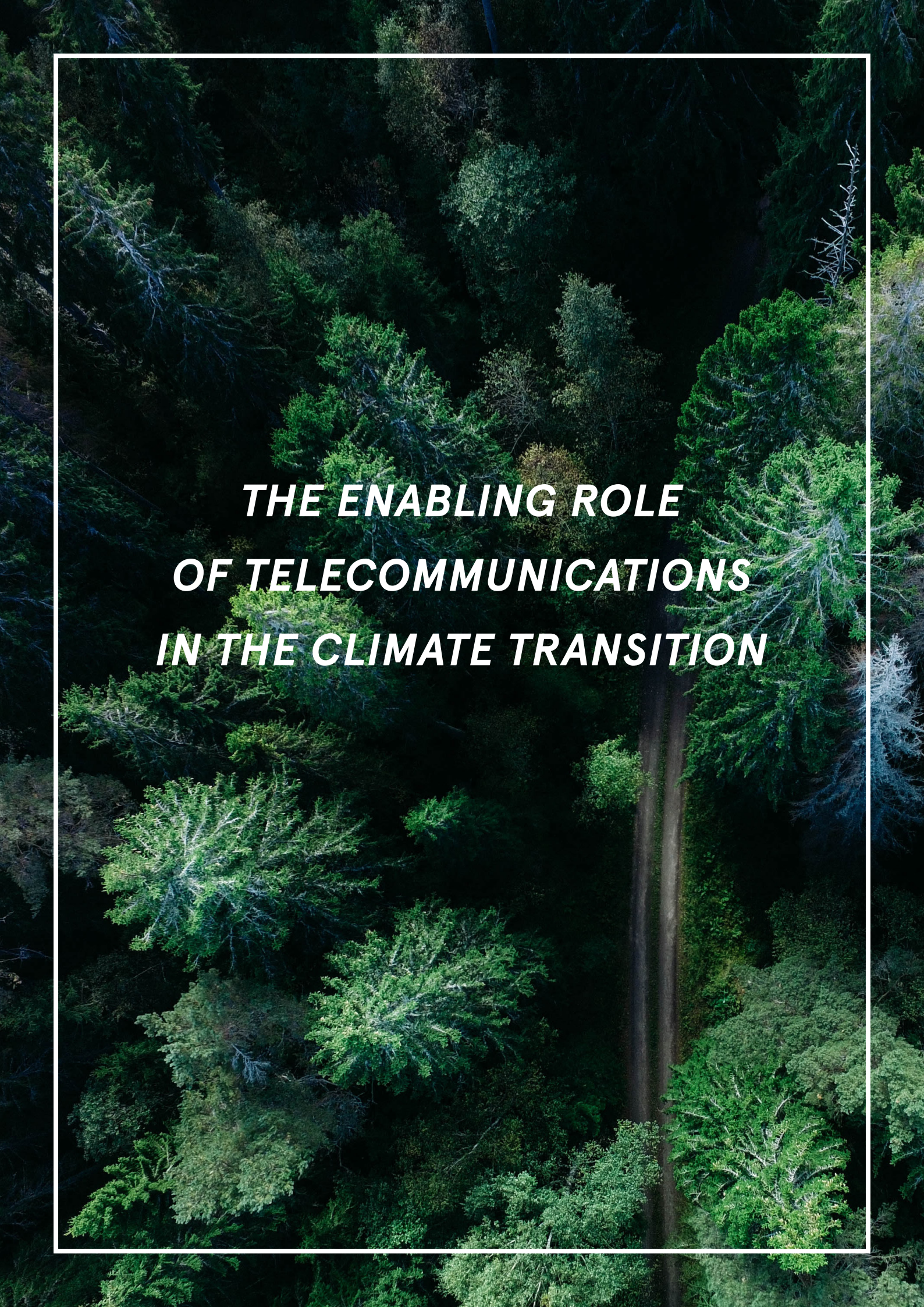

THE ENABLING ROLE OF TELECOMMUNICATIONS IN THE CLIMATE TRANSITION

CONTENTS

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KEY TAKEAWAYS

- The Information and Communications Technology (ICT) industry deserves more attention from climate perspective with respect to its approach towards climate risks it faces and the opportunities it gains from enabling other sectors in the climate transition
- The Telecommunications sector alone accounts for 1.5-2% of global GHG emissions, which is similar to the contribution from high-emitting sectors such as aviation and steel manufacturing
- The sector has a crucial role to play in the climate transition – Telecommunications sector enables climate action through connectivity solutions like teleconferencing, etc. as well as emerging solutions like 5G, IoT and TowerCos
- All Telecommunications companies studied already have science-based targets and more than 75% of those are well within the 1.5C trajectory for ICT operators - around 50% have Net Zero targets covering the entire value chain
- Decarbonisation strategies for the Telecommunications sector can fall into one of the four categories – energy efficiency in its operations, renewable energy sourcing, supply chain management and circular economy principles
- The Telecommunications sector does not face a major barrier to switch to decarbonise as most of its operations already use electricity, which can be readily switched to renewables
- However, upstream emissions are an obvious gap to fill - although most companies have robust climate agendas for their own emissions, very few are working towards effectively managing Scope 3 emissions
- Despite the gaps, the enabling effect of the sector's products and services creates a positive impact for customers who partially rely on innovations in the Telecommunications sector to achieve their own net zero ambitions

1 – THE ROLE OF TELECOMMUNICATIONS IN THE CLIMATE TRANSITION

In August 2021, the United Nations Intergovernmental Panel on Climate Change (IPCC) published the first part of its Sixth Assessment Report "AR6 Climate Change 2021: The Physical Science Basis"[1]. These reports assess scientific, technical, and socio-economic information concerning climate change and they will form the basis for intergovernmental negotiations at the COP26 conference. Some of the major conclusions include:

- The planet is warming faster than previously thought, with projections of 1.5°C to 1.6°C warming within the next two decades, i.e. by 2040 itself.
- Limiting warming at 1.5°C is unlikely unless there are "immediate, rapid and large-scale" reductions in greenhouse gas emissions. To enable this requires a coordinated and whole-of-government policy approach, redirecting economies and investments towards sustainability goals, including on climate.

The report has been called 'code red for humanity' by the UN Secretary-General. It is unequivocal that human influence has warmed the atmosphere, ocean and land, and human-induced climate change is already affecting many weather and climate extremes in every region across the globe. The world's publicly listed companies are emitting nearly 11 gigatons of greenhouse gases collectively every year. That puts them on a trajectory to exceed their share of the global carbon budget as soon as 2026.[2] According to the IPCC, there is only a 50% chance of remaining below 1.5 degrees even if the net zero targets for 2050 are met. It is therefore imperative that all actors – governments, corporations and people – in all regions and all sectors act now to affect the necessary change.

As investors we need to widen our lenses on climate change and the demand for climate action from our investee firms beyond the high-emitting sectors. The Information and Communication Technology (ICT) sector has long escaped the scrutiny of investors, regulators and other actors in the climate change debate because of its low carbon profile. But as data consumption grows exponentially, the carbon footprint of the entire industry could very likely grow as well. Expert predictions have forecasted that internet usage will annually increase by 30-40% implying that there will be 30 times today's internet traffic in just 10 years.

In its annual update report in January 2020, the European Telecommunications Network Operators' Association (ETNO) stated that the entire ICT sector generates 2-4% of global GHG emissions. By comparison, the aviation sector has just under 2% of the global footprint in emissions and steel production accounts for just below 3% – that is a strong reason to take a closer look.

The European Framework Initiative for Energy & Environmental Efficiency in the ICT Sector estimates that the ICT industry accounts for 8-10% of electricity consumption and 4% of GHG emissions in Europe.

The ICT sector is vast, and although the lines are blurring, Telecommunications firms are at the heart of the digital revolution. The box below provides an overview of the ICT sub-sectors and some of the main players.

(1) IPCC, 2021: Climate Change 2021: The Physical Science Basis. Cambridge University Press. In Press.
(2) https://www.msci.com/documents/1296102/26195050/MSCI-Net-Zero-Tracker.pdf

INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) ECOSYSTEM

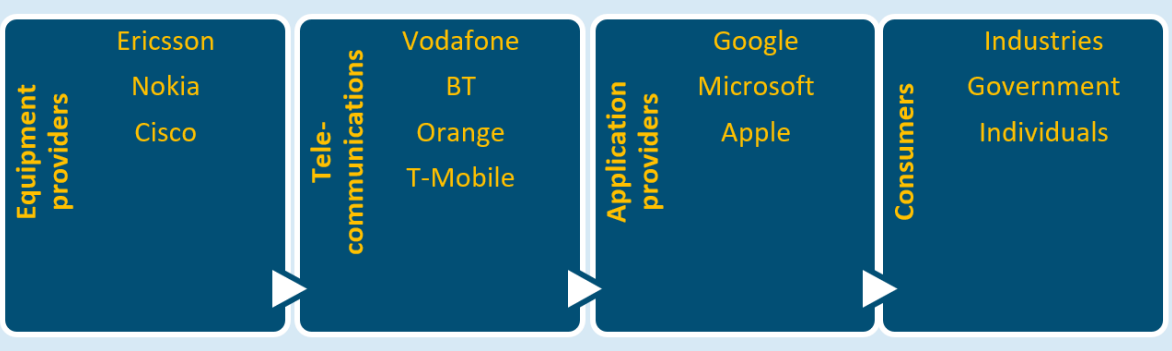
The Information and Communication Technology (ICT) ecosystem consists of the following main group of players, each feeding into the other:

1 – **Equipment providers** who create the elements, i.e. equipment, technologies and devices, that make up ICT networks

2 – **Telecommunications** companies who string these elements together to build and operate networks and include telecoms operators, cable operators, satellite operators, and broadcasters

3 – **Applications providers** who create platforms, content and applications that run over the networks provided by the network operators

4 – **Consumers**, which include individuals and households, companies from other sectors, and government bodies



These layers are, however, not watertight and in many cases companies can be involved in more than one group, through the process of vertical integration. For example, Microsoft has most of its business activities in the first group through the Windows operating system, but it also owns Skype and search engines like Bing and MSN. Vodafone, BT and other network operators are very much involved in selling content, applications and services to their customers. The sectorial layers are very likely going to shift and evolve, and new layers could form over time.

As mentioned before, the scope of this report is limited to the Telecommunications sector which broadly includes the wireless/wireline networks and services providers like BT, Vodafone and T-Mobile. Predominantly these firms fall into the second group – Telecommunications Network Operators, but as discussed above many of these firms have significant R&D budgets for new technologies.

Telecommunications companies are alone responsible for up to 40% of emissions from the ICT sector, representing about 1.5-2% of global GHG emissions[3]. Almost the entire carbon footprint of the Telecommunications sector comes from the networks – both fixed and mobile. This is a major area where effective climate strategies for these firms contrast with the technology firms, for whom data centres are a major source of GHG emissions.[4] Physical risks from climate change can be significant as the Telecommunications sector has a significant amount of infrastructure assets.

In many ways, Telecommunications companies are 'enablers' of a sustainable future. As we discussed in our February edition of this Quarterly, investing in the transition includes the companies whose products and services allow other companies to achieve their carbon reduction targets. The importance of Telecommunications and the broader ICT sector to society and to the environment has never been felt more strongly. As promoters of digitalization and connectivity, the sector has gained a critical role in our economy by addressing the digital divide and enabling our societies to work, learn, connect, and entertain, especially when the global pandemic necessitated virtual patterns.

Digitalization plays a significant role in climate change. For example, ICT activities for climate change mitigation are already recognised in the 'enabling' category under the EU Taxonomy. Although Telecommunications activities are not specifically acknowledged yet, ongoing discussions recognise their significance.[5] Telecommunications firms can enable large reductions in GHG emissions in lifestyle and across all economic sectors through the provision of digital solutions that can improve energy efficiency, inventory management and business operations by reducing travel and transportation, e.g. via teleworking and videoconferencing, and by substituting physical products for digital information. The latter capacity is referred to collectively as 'second order' or 'enablement' effects. According to the GSMA report on the enablement effect[6], the level of avoided emissions achieved by mobile communication technologies is 10 times greater than the global carbon footprint of mobile networks themselves – a tenfold positive impact. However, measuring this impact and using them for evaluation is not straightforward. The foremost challenge is a lack of disclosure in the sector and a lack of comparability between companies that have started to report.

At La Française, our Carbon Impact Assessment methodology looks at both climate risks and opportunities and it is applied for every sector. In this report we discuss the Telecommunications sector as an example for a low-emitting sector based on its operational carbon footprint. Chapter 1 introduces the guidelines for ICT companies for setting science-based carbon reduction targets, and we show how companies in the sector perform. Chapter 2 discusses the decarbonisation roadmap for Telecommunications companies, not only concerning their own carbon emissions but crucially for the entire value chain. In Chapter 3 we discuss the opportunities provided by new technologies and business models and how these can help to enable the climate transition for the sector and its customers. In Chapter 4, we outline our Carbon Impact Assessment approach using BT Group as a case study.

(3) Telecoms & ESG: I Feel The Need.... The Need For Balance; Exane BNP Paribas, August 2020

(4) See our Carbon Impact Quarterly from February 2021 for a discussion of the climate transition strategies in the Technology sector and Microsoft as a case study. https://blueroom.la-francaise.com/carbon-impact-quarterly-2/

(5) ETNO Response to Call for feedback for technical screening criteria for EU taxonomy, September 2021

(6) See https://www.gsma.com/betterfuture/wp-content/uploads/2019/12/GSMA_Enablement_Effect.pdf. The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change.

2 – REDUCTION PATHWAYS FOR SECTORAL GHG EMISSIONS

The SBTi (Science Based Targets Initiative) released the guidance for setting science-based targets for ICT companies in 2020. In order to establish an ICT sector trajectory, a collaboration was initiated between the SBTi, the ITU (International Telecommunication Union), GSMA (GSM Association) and GeSI (Global Enabling Sustainability Initiative) to develop sectoral decarbonisation pathways. This helps ICT companies to set targets in line with climate science. This recommendation takes into account the 1.5°C pathway established by the SBTi based on the IPCC scenarios and an electricity budget approach.

SBTi proposes overall emissions trajectories for the overall sector, and also for the underlying sub-sectors. The entire ICT sector is expected to reduce its emissions by 45% between 2020-2030 and the rate of reduction is significantly higher than the current levels of performance (2015-2020) as shown in Figure 1a below. SBTi also specifies separate trajectories for ICT operators (Figure 1b) and these pathways are different for data centres operators, fixed and mobile network operators.

FIGURE 1a:
Emissions trajectories for ICT sector

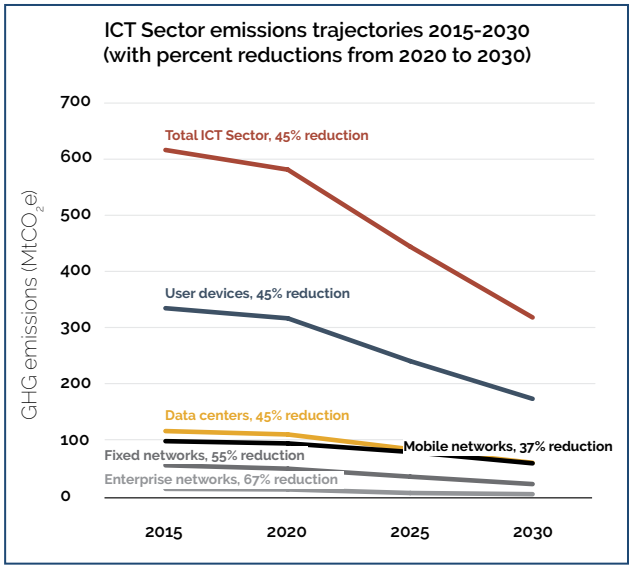
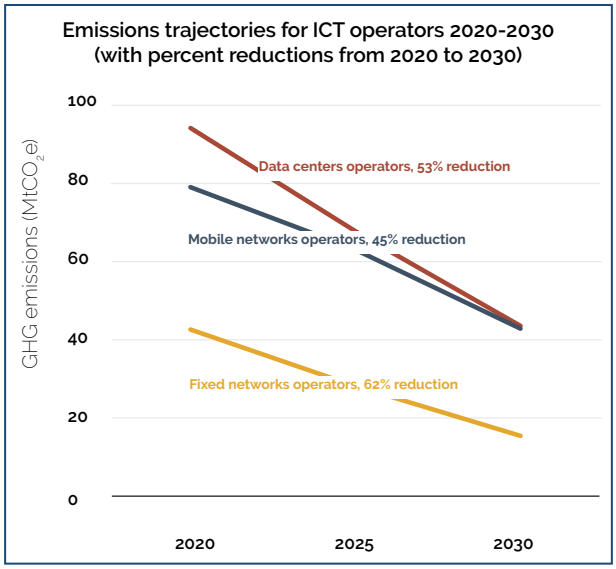


FIGURE 1b:
Emissions trajectories for ICT operators



Source: SBTi

For the Telecommunications companies in our scope, we saw limited exposure to data centres, and hence, the trajectories should follow only the fixed and mobile networks operators' pathways. However, there is no data available for the split of emissions between fixed and mobile networks – this is because in most cases, these networks can be shared, and it can be difficult to separate these. To address this, we average the two pathways, giving us a final applicable pathway of 54% for the Telecommunications companies between 2020 and 2030.

Comparing the 2020-2030 trajectories for 16 of the biggest Telecommunications firms globally, we find that most Telecommunications companies' ambitions on their own emissions are well within or in line with the 1.5 degrees trajectory for the ICT sector i.e. the 45% reduction pathway (Figure 2). All targets are approved by SBTi. Six firms – BT, KPN,

Swisscom, Elisa, Proximus and Tele2 – have already neutralized most of their Scope 2 emissions through use of renewable electricity, although in some cases partially achieved with carbon offsets. As per the IPCC trajectory, remaining emissions are allowed to be net zeroed by 2050 with carbon dioxide removals (CDRs), e.g., carbon sinks, BECCS and direct air capture. In the SBTi trajectory, however, no offsets are allowed. Nevertheless, the carbon neutral ambitions for these firms place them in very comfortable positions with respect to their own emissions.

TABLE 1: Carbon targets for the Telecommunications sector

Company	100% RE target year	Scope 1 + 2 2020 (Mtons CO2e) – 2020	Carbon Neutral Year	Net Zero Year (2030 / 2040 / 2045)	Scope 3 Targets
Swisscom	Achieved	0.01	2020		N/A
KPN	Achieved	0.02	2030	2040	-50% by 2040 vs 2014
Proximus	Achieved	0.03	2030	2030	-50% by 2040 vs 2014, interim milestone of 10% reduction by 2025
Elisa	Achieved	0.00	2020		-12% by 2025 vs 2016
Telia	Achieved	0.01	2020	2030	-29% by 2025 vs 2018 from sold products only
Tele2	Achieved	0.01	2030 *		-60% per subscription by 2029 vs 2019
BT	Achieved	0.17	2040 **	2045 ***	-29% by 2030 vs 2016/17
DTE	2021	**2.51**	2025	2040	-25% by 2030 vs 2017 (covers 80% Scope)
T-Mobile	2021	**1.91**	2020		-15% per customer by 2025 vs 2016
Vodafone	2025	**1.37**	2030	2040	-50% by 2030 vs 2020
Telefonica	2030	**0.74**	2040	2040	-25% by 2025 vs 2016 for fuel and energy activities only, -30% per EUR purchased by 2025 vs 2016 for purchased goods and services and capital goods
Verizon	2035	**3.97**	2035		-40% by 2035 vs 2019
Telenor	Not Committed	**1.21**	Not committed		N/A
AT&T	Not Committed	**5.79**	2035		N/A
Orange	Not Committed	**1.20**	2040	2040	-14% by 2025 vs 2018
Liberty	Not Committed	**0.09**	Not committed		-50% by 2030 vs 2019 for manufacture and use of customer premises only, -50% by 2030 vs 2019 for each home

2020 2025 2030 2035 2040 Not committed

*2029 - **87% reduction by 2030 vs 2016/17 baseline - *** Scope 1 + 2 and upstream only

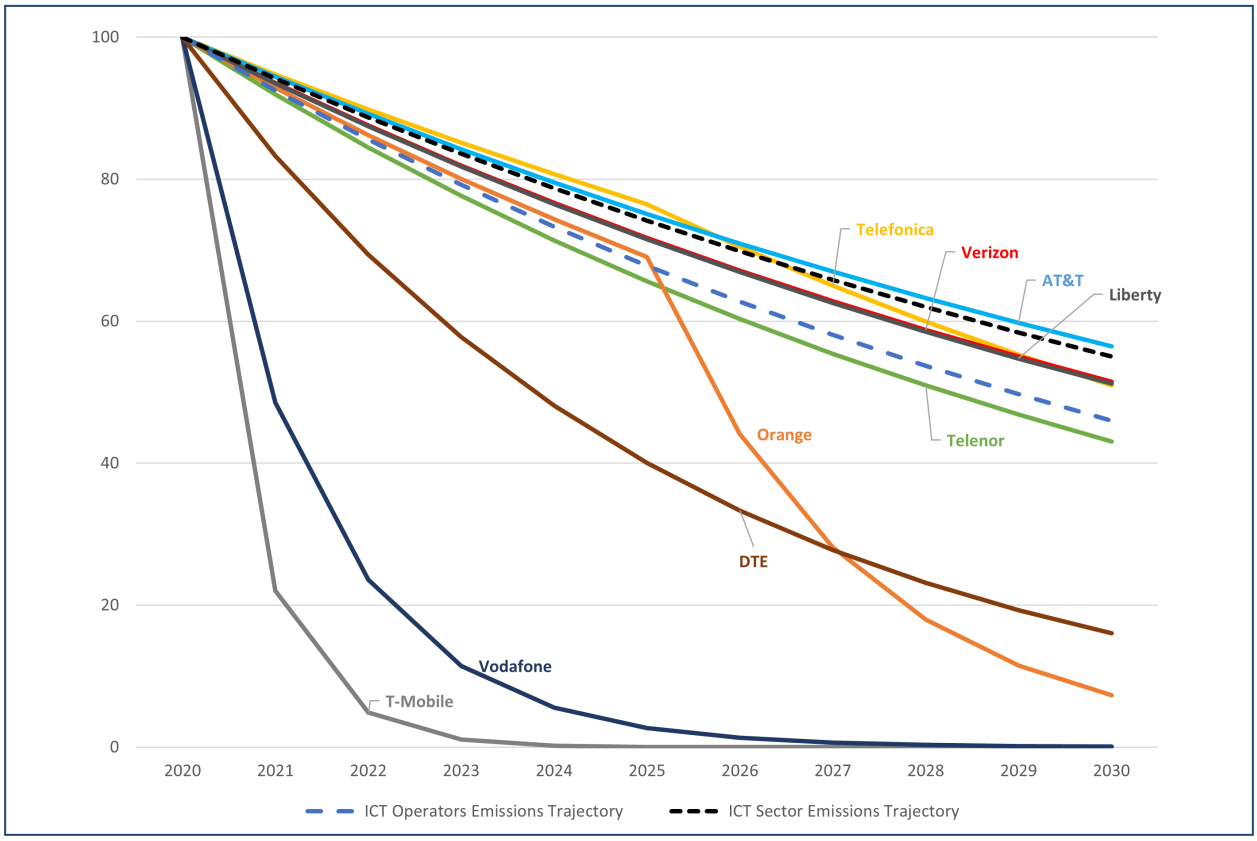
Source: LF SIR, CDP reports, Company reports

On the other hand, many firms like Telefonica, AT&T, Verizon and Liberty target to be just above the expected trajectory for the network operators, and just in line with the wider ICT sector trajectory (45% reduction between 2020-2030) – see Figure 2. Their targets are clearly not ambitious enough – a single year miss can lead to much higher pressure on future emissions reductions.

- Telefonica updated its emissions targets in December 2020 aiming to be 100% carbon neutral in its main markets by 2025, but only 70% in Latin America. It will however reach neutrality in all markets by 2030.
- Orange aims to accelerate its trajectory post 2025, with its net zero ambition for 2040. Before that, it closely follows the ICT operators' trajectory. The success of its ambition will depend on its plans on renewable electricity usage for which it has not committed to 100% yet.

- Telenor's ambitions keep it under the 1.5°C trajectory for operators despite its high exposure to Asia.
- All others – T-Mobile, Vodafone and DTE have ambitious carbon neutrality targets.

FIGURE 2: Trajectory comparison for selected ICT companies with significant Scope 2 emissions



Source: LF SIR, CDP reports, Company reports

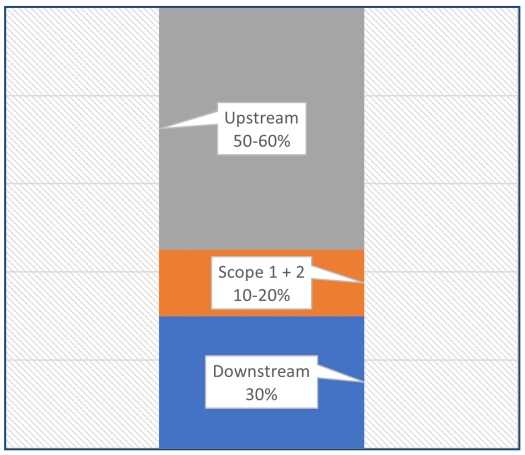
Scope 3 emissions targets

SBTi criteria require that - if a company has significant value chain emissions (Scope 3) – over 40% of total Scope 1, 2 and 3 emissions – the company should set a Scope 3 target covering at least two-thirds of total Scope 3 emissions. More than 80% of the emissions for the Telecommunications industry come from Scope 3 emissions – therefore, the 40% criterion is met. The Scope 3 targets should be in line with the overall ICT sector trajectories provided by SBTi – Figure 1a. While we note that many Telecommunications companies have ambitious enough targets on their own emissions, few of them target sufficient reductions for the entire value chain – including Scope 3 emissions (see Table 1). Some companies like Tele2 and T-Mobile target reductions on a per customer or per subscription basis only. These are not comparable as these numbers can have different meanings for industrial customers and individual consumers. Additionally, not all firms even have net zero targets.

Where a breakdown of Scope 3 is reported, 50-60% of Scope 1, 2 and 3 emissions for a typical Telecommunications company are upstream, which is mainly from manufacturing and transportation of equipment and handsets. About 30% is from downstream, i.e. electricity used to power personal devices. Only 10-20% are own emissions (Scope 1 and 2; see Figure 3a). The most significant Scope 3 categories for Telecommunications (and the broader ICT sector) are:

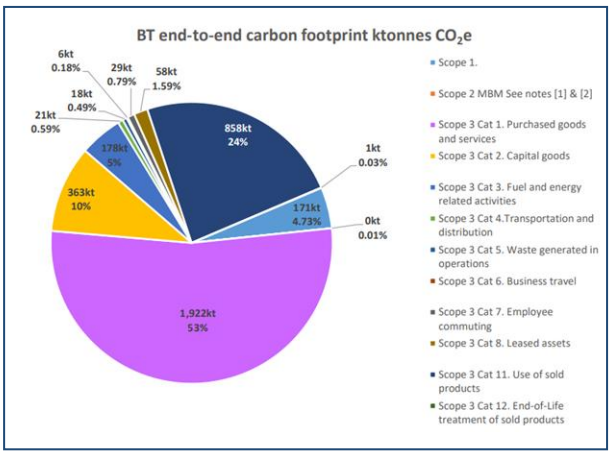
1) Purchased Goods and Services (Upstream), and 2) Use of Sold Products (Downstream), as can be seen in the case of BT in Figure 3b.

FIGURE 3a: Average emissions distribution



Source: LF SIR, Company reports

FIGURE 3b: Scope 3 categories for BT



Source: LF SIR, Company reports

Some net zero targets include the upstream supply chain only. BT's net zero target by 2045, for e.g., does not include the downstream. The firm notes that if the UK grid electricity is de-carbonised by 2035 (in line with the UK's net zero strategy), its downstream emissions will be automatically neutralized by 2035. We believe this rationale does hold ground for companies operating in countries with net zero targets, but only seven countries around the world have passed their carbon neutral targets into law (Denmark, France, Sweden, Hungary, New Zealand and the UK) and 24 others have these as official policies.[7] For the rest, these plans are just proposals. Both policies and proposals can be changed alongside governments. Hence, Scope 3 targets should include both upstream and downstream, even if it is just for monitoring purposes.

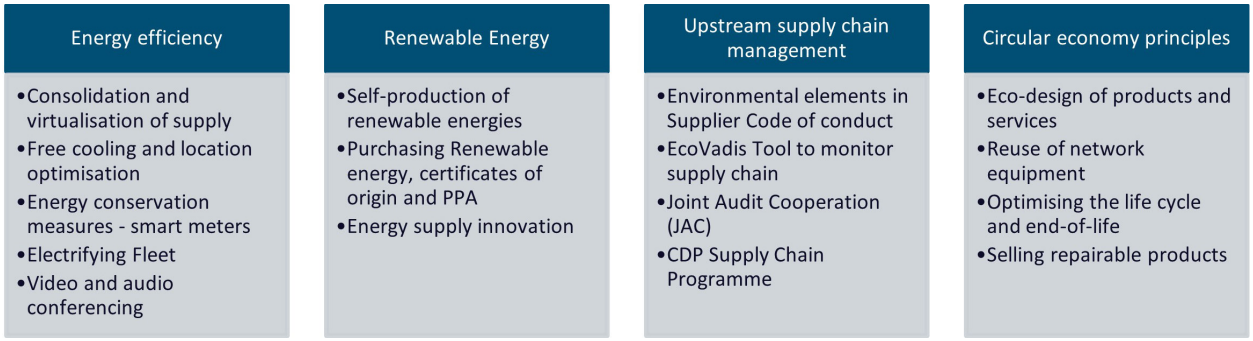
(7) https://www.visualcapitalist.com/race-to-net-zero-carbon-neutral-goals-by-country/

3 – DOMINANT DECARBONISATION STRATEGIES

Decarbonisation appears to be relatively straightforward for the Telecommunications sector. The sector can keep its Scope 2 emissions within the limits proposed by the above trajectory through increasing the use of low carbon electricity supply. But renewable electricity might not be available everywhere to the same extent, within the same time frame. Hence, the sector needs additional efforts like improving energy efficiency of networks and buildings, electrifying fleets, etc. To reduce emissions in their supply chains, Telecommunications operators can work with their suppliers, using transparency measures and communicating their priorities. Consumers can also be persuaded to use renewables to power their devices and equipment through marketing appeals and offers.

Overall, we believe that the main strategy for the sector to decarbonise is the implementation of simultaneous, vigorous and urgent actions in four areas, as shown in Figure 4.

FIGURE 4: Key decarbonisation strategies for Telecommunications firms



Source: LF SIR

We discuss energy efficiency, renewable energy and supply change management in the remainder of this chapter. A fourth element of the environmental footprint of the industry is electronic and electrical waste (e-waste). E-waste is defined as anything with a plug, electric cord or battery (including electrical and electronic equipment) from smartphones, laptops, televisions, etc. that has reached the end of its life, as well as the components that make up these products. End-of-Life treatment of sold products are a small part of Scope 3 emissions for Telecommunications firms (<0.5%) as reported currently but E-waste is often dumped in landfills, and/or is burned where it can be detrimental to health and the environment. According to the UN[8], each year, approximately 50 million tonnes of e-waste are produced, equivalent in weight to all commercial aircraft ever built; only 20% is formally recycled. If nothing is done, the amount of waste will more than double by 2050. Circular economy principles from eco-design to recycling, reuse and repair of products are essential to deal with the enormous problem of e-waste.

It is worth mentioning that apart from emissions, climate risk for the Telecommunications sector also comes from physical risks associated with extreme weather events on infrastructure assets. With more outsourcing and sharing of Telecommunications infrastructure, these risks are, in part, delegated/mitigated but they should still form an important part of business risk management. Steps to improve resilience of towers and data centres through regular monitoring, adoption of advanced technology (drones, satellite data) to gather data and putting emergency response teams and systems in place are important.

In the rest of this chapter, we discuss the first three pillars of decarbonisation that focus on reducing emissions.

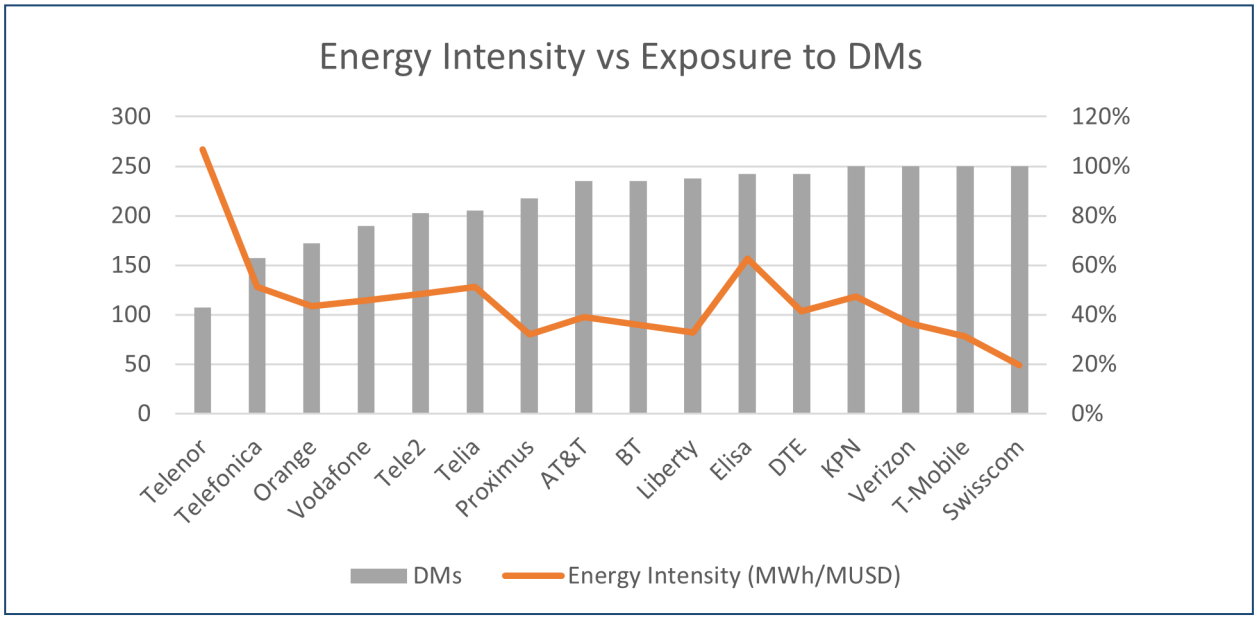
(8) https://www.unep.org/news-and-stories/press-release/un-report-time-seize-opportunity-tackle-challenge-e-waste

a - Energy Efficiency

The SASB materiality map lists energy management as the key material environmental risk for the Telecommunications sector. As discussed, energy efficiency is one of the most important pillars of decarbonisation for the sector. Energy costs for Telecommunications companies are quite meaningful at 8-11% of EBIT, and even higher in emerging markets.[9] For example, Telenor Pakistan's energy costs in 2019 were 9% of revenue and 40% of operating profit. There is an additional risk that energy costs, especially from fossil fuels, will rise higher as carbon prices rise (as well as with higher network usage). Hence, we expect from companies in the sector to move towards improving energy efficiencies, both in networks and regular operations (buildings, travel, fleet) to limit the rise in energy costs.

We compared the energy consumption intensity (by revenue) of 16 Telecommunications firms, as reported to CDP in 2019, presented in Figure 5. Our analysis shows that the business mix does not impact the carbon emission profile of any of these firms, but the geographical mix does. Emerging markets operations have higher emissions due to the need for diesel generators for rural base stations and higher carbon intensity for grid electricity. Plus, the lower price point per unit of data means that energy intensity by revenue metrics look worse. Telenor, which has the minimum exposure to developed markets and highest exposure to EMs has the highest energy intensity (by revenues).

FIGURE 5: Energy efficiency (by revenues) depends on geographical exposure



Source: LF SIR, Factset, CDP, Company reports [DM = Developed Market]

We notice that some firms report on energy efficiency and have respective targets by data units consumed or per customer. However, these are not comparable and quite meaningless – as data traffic and number of consumers continue to increase exponentially. Telefonica, for example, aims to improve its energy efficiency by 90% per petabyte of data by 2025 vs 2015. T-Mobile aims to improve it by 95% per petabyte by 2030. These ambitions introduce more ambiguity as the energy efficiency of newer networks is already better and it is not certain whether the firms intend to actively work towards improving their own consumption efficiency.

(9) Telecoms & ESG: I Feel The Need.... The Need For Balance; Exane BNP Paribas, August 2020

b - Renewable Energy

About 80% of the operational emissions (Scope 1+2) of the Telecommunications sector is based on the use of electricity (Scope 2). As discussed in the previous section, the sector is considered relatively easy to decarbonise, compared to sectors that are yet to be electrified. It is expected that the Telecommunications sector will be able to decarbonise at least as fast, if not faster, than the overall reduction in emissions across the economy (through the decarbonisation of the electricity grid). Telecommunications operators already source more energy from renewable sources than other industries on average, and they can do more by forming agreements with developers of renewable energy and investing in self-generation.

However, due to the asymmetrical availability of renewables and global distribution of the sector, decarbonisation might be more challenging than average conditions imply. For example, Telenor's high presence in Emerging Markets makes it more difficult for it to target 100% renewable electricity, although in its Nordic markets, the firm already sources 98% of its electricity from renewables. Telecommunications companies source most of their electricity from national grids and the composition of these grids can also affect their renewable electricity profiles. For Orange in France, all its electricity is provided by EDF – which is c.98% from nuclear energy.

As discussed before, not all renewable energy claims are the same. Major differences and issues lie with the sourcing and reporting of renewable electricity. The main methods that firms use to source renewable electricity are:

- Long-term contracts (Purchasing Power Agreement, PPAs): Companies can sign a long-term contract (10-20 years) directly with a provider of renewable energy to procure their electricity.
- Certificates (Europe – Guarantees of Origin, US – Renewable Energy Certificates, RECs): Renewable energy providers sell certificates on renewable energy production separately to selling electricity. These certificates can be purchased annually.
- Self-generation: Companies can build their own renewable energy generation. This is particularly important in EMs where solar can be used to reduce need for diesel generators powering rural mobile base stations.

Our note on 'Carbon reduction targets: from ambition to impact' from earlier this year (February 2021) discussed how the technology sector has been spearheading the net zero targets and are the largest purchasers of renewable energy through PPAs.[10] The Telecommunications sector follows as the second largest, although they are still far behind. Several firms in the sector use RECs to reach carbon neutrality – net zero Scope 1 & 2 emissions. Swisscom has been claiming 100% renewables since 2010, although most are from RECs. Unbundled certificates cost little and do not support renewables investment in contrast to PPAs (long-term contracts) that help reduce emissions for the society.

Furthermore, Telecommunications companies are also responsible for a significant proportion of national and regional electricity consumption and hence, can promote the renewable energy transition by investing in long-term PPAs. For example, BT's energy usage is 1% of total UK power consumption and it is the joint largest private purchaser of electricity in the UK. However, only 7% of renewable electricity claimed by BT comes from long-term PPAs. The firm says that it intends to increase this percentage but apparently finds a shortage of reliable greenfield projects in the country.

KPN is a clear leader with all its renewable energy sourced via 10-year PPAs combined with Guarantees of Origin. It has been using 100% renewables since 2014, far ahead in the sector.

Many firms have also invested in self-generation. Telefonica issued a green bond in January 2020 with part of proceeds for renewable self-generation. Telenor's solar power generated at its base stations in Asia contributed to 5% of its total energy consumption in Asia. Orange also has solar farms on its sites in Jordan and some other countries.

(10) https://blueroom.la-francaise.com/wp-content/uploads/2021/02/XX3530-Carbon-Impact-Quarterly-Fevrier-2021.pdf

Case Study: Telenor's Asia emissions and ambition

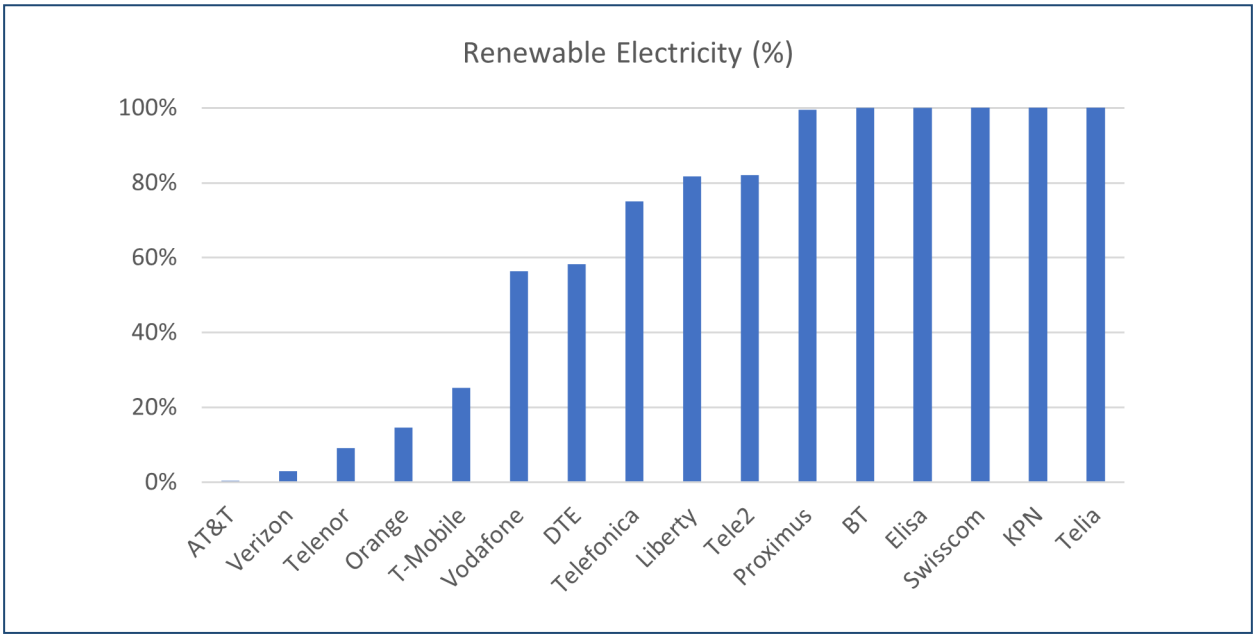
Telenor saw energy consumption rise 9% in 2019, largely because of its material exposure to Asia through operations in Thailand, Malaysia, Bangladesh, Pakistan and Myanmar, where access to renewable energy is hard – indeed, Telenor notes that its Asian operations accounted for 96% of its CO2 emissions. As such, the company has an overt strategy to use solar energy solutions in Asia. It installed solar energy solutions for c. 3,000 radio sites in Asia in 2019, up from 2,500 in 2018, and plans to double this over the next 3-5 years.

When asked about this at the March 2020 Capital Markets Day, Telenor's CEO indicated that the move towards solar power also made good commercial sense (through lower energy costs), as 16% of its CO2 emissions are from diesel generators on radio sites, where local electricity grids can fail. Although doubling of solar energy solutions is not so ambitious given the c. 100,000 radio sites in the region, we agree that the move to solar energy has a positive monetary business case, not just environmental.

Source: Company Reports, Barclays 2020

As reported to CDP for 2020, six firms in the sector had already achieved close to 100% renewable electricity in their annual electricity consumption portfolio (Figure 6) and report close to zero Scope 2 emissions. There are some clear laggards like AT&T and Verizon which source less than 10% of their electricity from renewables despite being c.100% domiciled in developed markets. We observe a pronounced gap between European and US firms in adoption of renewables. Orange is one of the few companies in Europe that has not signed up to RE100 and does not have a 100% renewable energy ambition – it aims to source 50% from renewables by 2025. This is unambitious in our view, albeit due to supply constraints with EDF in France.

FIGURE 6: Energy efficiency (by revenues) depends on geographical exposure



Source: LF SIR, CDP, Company Reports

c – Supply chain management

As mentioned previously, 50-60% of emissions for the sector firms come from the upstream supply chain. For companies, which have already neutralised their Scope 2 emissions, this percentage is even higher (c.80%) – making upstream the next big priority for the sector. The crucial step in this respect would be proper communication of the priorities of the operators to their suppliers, through a well-developed Supplier Code. Environmental criteria about energy efficiency, renewables usage and circular economy should be part of supplier contracts. Suppliers should be encouraged and enabled to have science-based targets in line with ICT sector trajectories and report to organizations like CDP; and encourage their own suppliers to do so.

As most of the supply chain is shared between multiple operators, participating in multi-stakeholder partnerships like the Joint Audit Cooperation (JAC) is a cost-efficient, effective way for the firms to manage and monitor their supply chains. JAC is an association of Telecommunications operators aiming to verify, assess and develop sustainability implementation across the manufacturing centres of important multinational suppliers of the ICT industry. JAC's approach includes documentary due-diligence, on-site audits, corrective action plans, improvement roadmaps with common direct suppliers (Tier-1) and beyond (Tier-2 and Tier-3). Currently, the association has 17 Telecommunications Operators as members - AT&T, Deutsche Telekom, Elisa, KPN, MTS, MTN, Orange, Proximus, Swisscom, TDC, Telecom Italia, Telefónica, Telenor, Telia Company, Telstra, Verizon, and Vodafone.

Several firms in the sector use the EcoVadis tool to monitor and manage the sustainability performance of their upstream network. EcoVadis provides a common platform, universal scorecard, benchmarks, and performance improvement tools which can be very useful when managing an interconnected and widespread network of suppliers. The EcoVadis ICT sector initiative is a project inviting ICT companies to adopt a joint assessment and monitoring approach regarding their trading partners' Corporate Social Responsibility performance. Sector initiatives are a powerful way to improve long term sustainability efficiency and supplier risk identification.

Although a lot of firms have targets on Scope 3 emissions and engage in these sector initiatives, there is limited reporting on the actual supply chain performance. One of the best reporting we have seen comes from BT. It reports that:

- 56% of its suppliers by spend (310) reported to CDP in FY20/21
- 73% of these have targets to cut emissions (41% of total) and 44% cut their emissions during the year (25% of total)
- 64% of reporting suppliers buy renewable electricity, equal to 36% of total
- 69% of these suppliers work with their own suppliers on climate change

It is to be noted that less than half of the suppliers for BT are engaged and take any kind of relevant climate action. If this can be taken as a proxy for the industry, Telecommunications operators need to take a closer look at their supply chain engagement especially on environmental (and other sustainability) risks. Not all suppliers are on the right track to deal with climate change impacts.

4 – ENABLING THE CLIMATE TRANSITION ACROSS ALL SECTORS

While getting their own house in order is important, a greater positive climate impact for the Telecommunications sector lies in its potential to enable other sectors of the economy to reduce their own emissions through the use of their products and services. According to the Global e-Sustainability Initiative (GeSI), the combined ICT sector (including Telecommunications) has the potential to significantly reduce global greenhouse gas emissions by 20% by 2030 through helping companies and consumers to save energy.

Digital solutions are a prerequisite for achieving the EU Green Deal's goals across different sectors of the economy and society.[11] The following sections discuss the four areas where the Telecommunications companies can provide solutions for the green transition: Connectivity solutions, IoT, 5G and TowerCos. Together, these solutions can have a large positive climate impact enabled by the sector.

a – Connectivity solutions

Many Telecommunications firms report a so-called 'enablement factor' – the number of times Telecommunications products and services have helped reduce their customers' emissions versus their own emissions (based on GSMA methodology[12]). However, data on these enablement factors is self-audited, sparse and not comparable. At present, few firms report and have ambitions on these avoided emissions.

- BT report that it enables emission savings that are 2.6x its total Scope 1+2+3 emissions. Over 80% of this is due to the reduced need to travel, for example, teleconferencing, field force automation, smart meters and vehicle telematics.
- DT reports 1.74x for Europe for the same ratio (2.44x Germany) - the majority of this is video conferencing, the connected car and cloud computing.
- KPN reports that energy savings by customers of KPN were 93% of KPN Group energy use. 85% is teleworking, and the remaining still includes audioconferencing and video conferencing.
- Vodafone has a target to help its business customers reduce their own emissions by 350mCO2 tonnes over the next 10 years (2020 to 2030). Its own emissions were 1.9mn tonnes for FY20.
- Proximus aims to make a net positive contribution to the climate by 2030 through videoconferencing, cloud and IoT solutions.

For us, the significance of these avoided emissions, as claimed by the companies, are subject to debate. It is mostly based on the concept of avoided emissions compared to a business-as-usual scenario which does not equate to real world emission reductions. The positives we count are commitments towards innovations, investments and increasing awareness towards new technologies and carbon-efficient solutions.

b – Internet of Things (IoT)

The Internet of Things (IoT) and smart connectivity are vital to enabling green microgrids for green technologies and for renewable energy sources to be brought online in place of non-renewable grids. The use of IoT and smart devices also enables energy networks and consumers to be more energy-efficient, thus reducing the overall energy consumption. According to WEF, digital technologies[13], including IoT, can help reduce global carbon emissions by 15 percent across all industrial sectors by 2030.

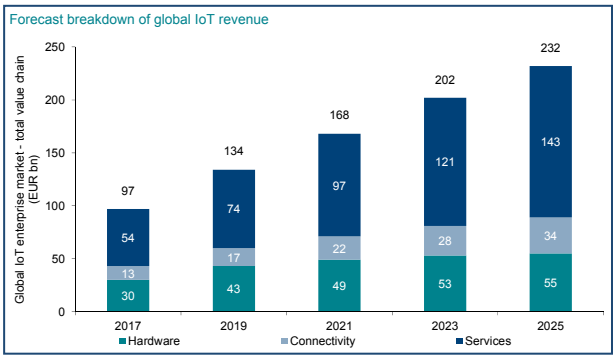
(11) https://blueroom.la-francaise.com/carbon-impact-quarterly/

(12) https://www.gsma.com/betterfuture/wp-content/uploads/2019/12/GSMA_Enablement_Effect.pdf

(13) https://www.weforum.org/agenda/2019/01/why-digitalization-is-the-key-to-exponential-climate-action/

While demand for broadband, video conferencing, etc. will continue to grow, and keep contributing to emission reductions for the consumers, a bigger revenue opportunity for the Telecommunications companies comes from the Internet of Things (IoT) that is addressable by the sector. Broadly speaking, IoT solutions are categorized into three areas – Hardware, Connectivity and Services. The revenue opportunities for Telecommunications companies come from the latter two - connectivity for IoT, and IoT services.

FIGURE 7: Connectivity is and will be a small part of IoT revenues



Source: Exane 2020

So far, Telecommunications companies have been cautious in their investments in IoT, with most companies pursuing connectivity solutions only. Connectivity solutions is expected to be a very small proportion of total IoT revenue right up to 2025 (Figure 7) – which will be dominated by services and hardware. This is because some IoT solutions have very low bandwidth demands such as smart meters. And some can be deployed with specially built local networks, rather than requiring the national connectivity of a telecoms company. Hence, revenue opportunities for these companies from IoT appear to be limited, at present.

Nonetheless, some future uses of IoT could require significant bandwidth, such as autonomous vehicles. Or they require a much higher level of coverage and reliability that deserves a price premium. Many companies are also moving into full IoT services and solutions through partnerships, to create more demand for connectivity. IoT revenue is only 1-2% of group revenue for some firms in the sector but is growing quickly. Vodafone leads with 2% of group revenue derived from IoT, while KPN, Telefonica and Telia report c.1% coming from IoT.

c – Network improvements with 5G

Possibly the largest emissions challenge that faces the Telecommunications industry is the need to design eco-friendly and inexpensive networks to allow for exponentially greater flows of information. In recent years, improvements in energy efficiency across the entire value chain through new networks like 4G and fibre have surprised positively. According to ETNO, between 2010 and 2018, there was an increase in data carried by networks by 1100%, but a reduction in associated carbon emissions by 40% and only a 6% increase in electricity consumption.[14] New developments like 5G are expected to be 90% more energy efficient for consumers per Mbps of data than legacy 4G. Telefonica reports that FTTH (fibre-to-the-home) is 85% more energy efficient and less material-intensive than copper technology.

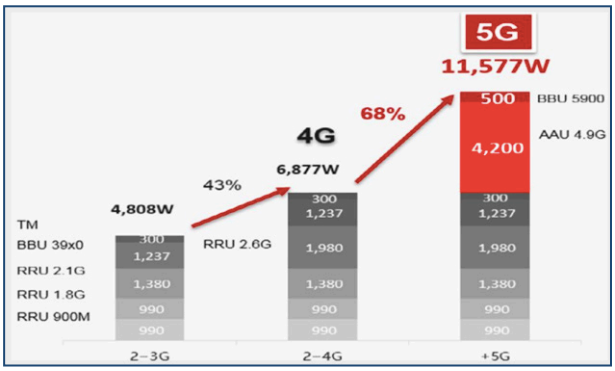
5G, in combination with fibre and other communications technologies, will be the key infrastructure for the digital age. It has the potential to unlock major gains in green technologies with applications for smart buildings, smart cities and smart agriculture. Its ability to support artificial intelligence, robotics, internet of things, remote control and virtual reality will allow for innovation in a wide range of industries and economic sectors.

Due to these enhanced capabilities, the data traffic is expected to grow even more exponentially over the next decade.[15] Despite its energy efficiency at the level of a user, a typical 5G base station consumes up to twice or more the power than a 4G base station. And energy costs can grow even more at higher frequencies, due to a need for more antennas

(14) https://etno.eu/downloads/reports/the%20state%20of%20digital%20communications%202021.pdf
(15) https://www.fiercewireless.com/tech/5g-base-stations-use-a-lot-more-energy-than-4g-base-stations-says-mtn

and a denser layer of small cells. Next generation computing facilities needed to support local processing and new IoT services will also add to overall network power usage. According to a joint study released by InterDigital, a mobile and video technology research and development company, and ABI Research in November 2020, the 5G ecosystem will see a 160% increase in power requirements by 2030, vs 2020 levels.[16] (Figure 8) In this scenario, it will be even more imperative that the sector as a whole moves towards renewable energy – not only in its own operations but in the entire value chain.

FIGURE 8: Site power requirements, 2G, 2-4G, and 5G



Source: Huawei

With 5G deployments under way, companies such as Nokia are already looking towards 6G, which is expected to be standardised and in deployment by 2030. Nokia in a white paper envisages 6G to be driven by advances in artificial intelligence and machine learning. 6G is likely to be implemented in higher frequency bands and massive multi-user technologies which will improve its efficiency. And, for the first-time, energy consumption is set to be a key design factor, along with data and computing as fundamental resources.

d - TowerCos – the physical infrastructure opportunity

Historically, most mobile operators in Europe owned their own towers and sharing was relatively low, as coverage was often seen as a source of competitive advantage. In 2015, circa 80% of towers were owned by mobile operators, and there were relatively few examples of sharing the tower infrastructure. Intensifying market competition caused a trend towards tower sharing. The creation of independent TowerCos (like Cellnex and Inwit) has accelerated sharing initiatives. Independent TowerCos already own two-thirds of all towers in the US.

Sharing infrastructure is sometimes the only way that investments in new technologies and networks are feasible. In 2020, TIM (Italian carrier) and Inwit announced a collaboration to deploy small cells in Italy's major cities to support the development of 5G. Small cells are small antennas built and used to integrate the signal that is guaranteed by the systems placed on traditional towers. The economics of shared infrastructure made the business case work for mobile operators in 5G, which otherwise might not have.

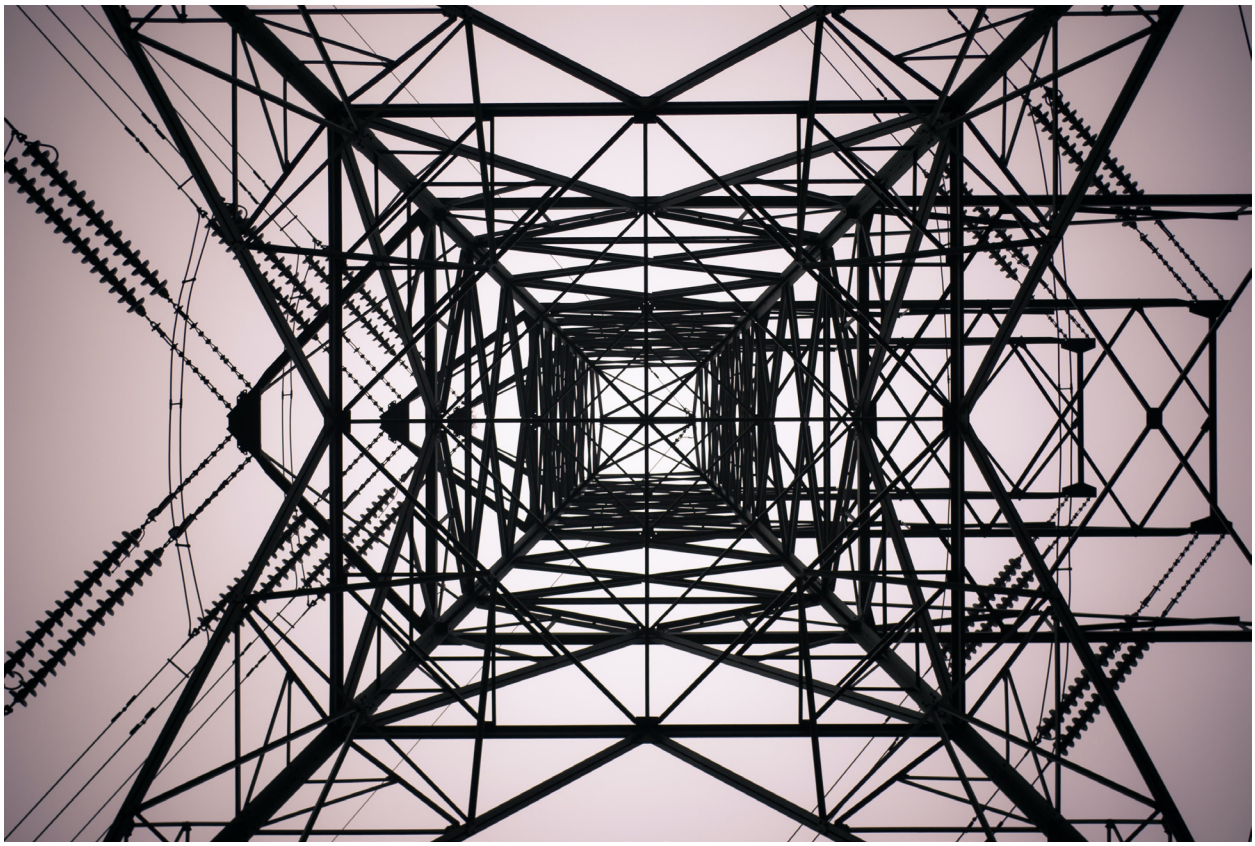
Apart from the obvious financial and strategic benefits, the independent TowerCo sector is well placed to drive climate and social action. The three key areas where the industry can be seen to enable sustainability are:

- **Environmental benefits on shared towers:** When Proximus and Orange Belgium announced an active sharing deal in Belgium in July 2019, they estimated that the energy savings from active network sharing would be 20% per year. TowerCos are well positioned to drive acceleration around energy efficiency, through the use of renewables and on-site use of smart meters, etc. Cellnex already sources 100% renewable energy in Netherlands and Switzerland. It has joined the Global Compact initiative "Business ambition for 1.5°C" and targets net zero emissions by 2050.
- **Less duplication of towers means less overall energy consumption:** Another feature of network sharing is the reduction of duplication of towers in the same areas. At an average, when combining overlapping networks, 10-20% of sites could potentially be decommissioned due to overlap if

(16) https://www.datacenter-forum.com/datacenter-forum/5g-will-prompt-energy-consumption-to-grow-by-staggering-160-in-10-years

operators want to reduce their footprints and energy consumption while maintaining similar coverage and network quality.

- **Bridging digital divides through wider coverage:** There is an immense digital gap among rural and urban populations in Europe and this has been a key focus for regulators. In UK, Ofcom data shows that although mobile operators cover around 97% of the population with 4G, geographic area coverage for all operators is only 67% (57% for roads), and 9% is not covered by any operator (5% for roads). We believe that TowerCos can reduce the total cost of ownership of rural coverage for the sector, and as such narrow the digital divide.

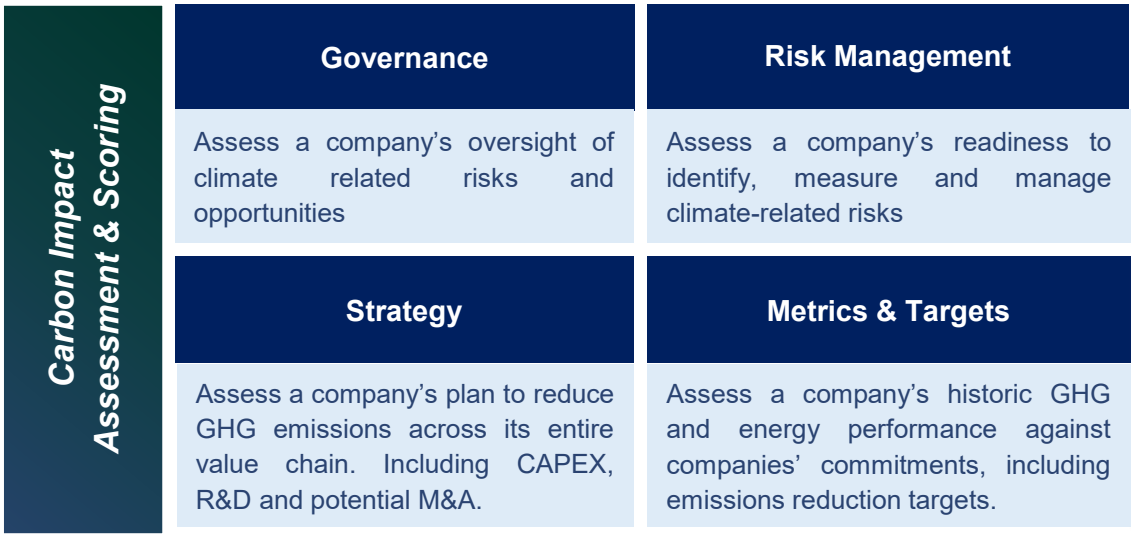


5 – OUR COMPANY-LEVEL APPROACH TO CLIMATE ASSESSMENTS

a – Carbon Impact Methodology

The Carbon Impact Assessment methodology is at the heart of our climate-themed investment strategies. It is based on fundamental research and supported by a quantitative scoring model. The assessment is structured in line with the framework provided by the TCFD recommendations. Many companies in the Telecommunications sector are supporters of TCFD and some have started to implement TCFD recommendations in their annual reporting. Telefonica and Swisscom are among the first movers in the sector, having adopted the TCFD disclosure framework already in 2018, i.e. the year after the framework launch.

FIGURE 9: Framework for Carbon Impact Assessment and Scoring



The Carbon Impact Scoring Model aggregates a number of climate-related KPIs into an absolute score for each company. The performance indicators cover issues including governance, environmental risk management in the supply chain, share of renewable energy consumption, carbon intensity and carbon reduction targets. This quantitative model allows us to systematically analyse and compare the majority of companies in our investable universe. The fundamental research adds a second layer of analysis and ensures that all information concerning portfolio holdings is appropriately reflected. Importantly, it allows us to incorporate forward-looking information into our investment decisions.

We expect the KPI-based scoring signal to further improve over time as companies increase disclosure of climate-related metrics within their financial reporting. To accelerate this process, regulators and standard setters are intensifying efforts to establish generally-accepted disclosure rules for climate-related information. We strongly encourage this process as users of the respective information.

b – Case Study: BT Group

BT Group Plc is a major Telecommunications firm headquartered in London, UK. Operationally, its main business segments are – Consumer, Enterprise, Global Services, and OpenReach. More than 80% of its revenues come Telecommunications services – fixed and mobile. Around 19% come from technology including connectivity solutions, and IT services. According to our research, BT group has a strong carbon impact profile.

This finding is quantified in a Carbon Impact Score of 7.6 (range 0-10, with 10 being the best performer). The company's strong performance in the global Telecommunications sector (top 5%) is due to its robust strategies and performance on its own emissions, engagement with companies in the supply chain, its disclosures being one of the best in the sector and its investments in low carbon solutions. We do note that the company does not have a significant exposure to IoT and share of 5G is low and those are the areas where better results can get the firm closer to being a true leader.

Main takeaways:

- **Climate Governance and risk management:** Board level responsibility and accountability for climate change is robust – dedicated committee and KPIs in remuneration for executive team. Physical risks of climate change are well managed with monitoring and warning systems, regular system upgrades and an emergency response team.
- **Emissions:** BT already reports 100% renewable energy in its own operations - 16% from long-term PPAs, 76% from green tariffs and 8% from certificates. Additionally, it aims to be net zero in operational emissions (including fleet) by 2030, and net zero including supplier emissions by 2045. BT also has targets on improving carbon/energy efficiency, electrifying its fleet and on plastics use.
- **Enablement:** Low carbon solutions contributed to 25% of revenues (£5.3bn) for FY20/21. In January 2021, BT announced investments in 2 IoT based start-ups: iOpt and Everimpact. Achieved its target of 3:1 on emissions saved for customers vs its own – around 13m tonnes. Running consumer campaigns and commissioning research to increase awareness about smart tech. Testing new solutions in telemedicine – remote consultations, remote diagnostic station technology using digital stethoscopes and heart monitors. Aims to increase reach of fibre and 5G.
- **Circular economy:** Targeting zero waste to landfill, encouraging customers to return equipment for reuse and recycling, and cutting down on plastics. BT is also working with the Carbon Trust to calculate the environmental benefit of product returns. It has a partnership with N2S (a technology lifecycle management company) to recover and recycle legacy equipment. N2S has also developed a new refining process which uses bacterial bioleaching technology to recover gold from printed circuit boards.
- **Supply chain:** All suppliers must meet the requirements on climate and environmental management. More than 50% suppliers are reporting to CDP. Twelve key suppliers have a clause in their commercial contracts with BT or Openreach committing them to making measurable carbon savings – including Nokia, MJQuinn and KN Group. Through the Exponential Roadmap Initiative, BT launched the 1.5°C Supply Chain Leaders programme and the SME Climate Hub to support climate action across global supply chains.

FIGURE 10: Key findings of the Carbon Impact Assessment for BT Group plc

Governance

- **TCFD Reporting**: Yes, for the last two years

Board Level responsibility:

- Digital Impact & Sustainability Committee oversees the strategy and tracks progress towards BT's climate ambitions

Remuneration Policy:

- 5% of the annual bonus available to eligible managers, including executive directors, is linked to the target of cutting carbon emissions intensity of own operations by 87% by the end of March 2031
- RSP (Restricted Share plan or long-term remuneration plan) is underpinned with an ESG clause - there must have been no ESG issues which have resulted in material reputational damage for the company

Risk Management

- **ERM process includes climate risks**: Yes
- BT recognises the physical risks to its infrastructure in UK because of extreme weather events and invests in monitoring/warning systems, cooling system upgrades, and has an emergency response team to deal with these
- Monitors possible carbon pricing risks as countries plan for net zero – especially for China where many raw material suppliers are based

Strategy & Initiatives

- **Renewable Energy**: 100% already achieved for FY2021; supports RE100; although only 16% from PPAs
- **Energy efficiency of buildings**: invested c.£21m in energy efficiency projects for buildings, contributing to a global energy reduction of 123 GWh
- **EMS certifications**: sites in Belgium, France, Germany, Ireland, Italy, the Netherlands, Spain and UK are certified to ISO 14001:2015; and/or ISO 50001
- **Low carbon products and solutions**: Carbon-reducing solutions are contributing to 25% of revenue, as per AR 2021 - Teleconferencing and cloud storage to smart manufacturing and IoT (although IoT is negligible part of revenue at present)
- **Circular Economy**: Plastics policy: to reuse, recycle or compost 100% of plastic packaging by end of March 2025
- **Supply Chain**: Encourages suppliers to have theur own climate strategies and report to CDP

Metrics & Targets

- **SBTi approved targets:** Yes
- **To become a net zero carbon emissions business by 2045 - including Scope 1, 2 and supply chain**
- Scope 1 + 2: **To cut carbon intensity of operations by 87% by end of March 2031 vs 2016/17** – based on Scope 1 + 2 emissions per £m value added
- **Scope 3: To cut supplier emissions by 42% by end of March 2031 vs 2016/17**: was aiming 29% last year, but improved after good performance during the year and **to transition most of the fleet to electric or zero emissions vehicles by 2030** (where EVs are not viable, will go for ultra-low emission solutions)
- **Performance FY20/21:**
  - 99.9% renewable electricity worldwide (0.1% where markets don't allow due to non-availability of renewable electricity)
  - 57% reduction in carbon intensity (Scope 1 + 2) in own operations vs 2016/17
  - Supplier emissions cut by 19% vs 2016/17

Source: LF SIR

6 - CONCLUSION

Analysing the carbon impact for Telecommunications sector includes both a climate risk assessment as well as opportunities for enabling decarbonisation for customers and the wider economy. Many Telecommunications firms have robust climate strategies to deal with their own emissions (scope 1 &2) and are well-aligned with the 1.5°C climate trajectory as prescribed by the SBTi. However, there are clear leaders who are already climate neutral and then there are laggards, who have no carbon neutral targets yet.

The sector provides a mixed picture when it comes to Scope 3 emissions. The good news is that downstream emissions are dependent on the local/regional/national climate ambitions – they will be gradually eliminated as users migrate to using more and more renewable energy to power their devices and data consumption. The bad news, however, is that most of the sector lags when it comes to upstream emissions. Very few firms properly report on supply chain emissions, and even fewer have targets to control these.

Renewable electricity consumption is the primary way the sector can decarbonise on its own emissions and in its value chain. The latter is of crucial importance as three quarters of industry-wide emissions are indirect emissions in the value chain. These include the switch to fully renewable powered networks and services, which can be achieved directly by self-generating or indirectly by purchasing Renewable Energy Certificate (RECs) or by entering into long-term power purchase agreements (PPAs). However, long-term PPAs contribute more to climate action than purchasing RECs, especially outside local markets.

Large global operators can also enable the climate transition through a range of measures. New developments in the sector like 5G and IoT present opportunities in carbon/energy efficiency for consumers of their products and services. TowerCos present energy efficiency for the sector itself through sharing of networks and harnessing economies of scale. At present, however, the impact of these opportunities is limited for the sector.

Overall, the sector does well in addressing climate change - the mobile industry is one of the first major sectors to voluntarily set a science-based target for emission reductions. 29 Telecommunications companies representing 30% of global mobile connections are already committed to science-based targets.[17] Over 50 mobile operators, representing more than two-thirds of mobile connections globally, are now disclosing their climate impacts, energy and GHG emissions through CDP. We believe that the sector has a long way to go but it still has a central role to play in the `green and digital transformation'.

(17) https://www.gsma.com/newsroom/press-release/ict-industry-agrees-landmark-science-based-pathway-to-reach-net-zero-emissions/

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