Greening Digital Companies
Report 2024

Monitoring emissions and climate commitments

ITU

World Benchmarking Alliance

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Table of Contents

List of tables, figures and boxes 4
Acronyms and abbreviations 6
Foreword 7
Executive summary 9
About ITU and WBA 11

1 Climate impact of digital companies 13

2 Scope 3 emissions 21

2.1 Introduction 22
2.2 Analysis by Scope 3 emission category 29
2.2.1 Purchased goods and services 29
2.2.2 Capital goods 30
2.2.3 Fuel- and energy-related activities 31
2.2.4 Upstream transportation and distribution 32
2.2.5 Waste generated in operations 33
2.2.6 Business travel 34
2.2.7 Employee commuting 36
2.2.8 Upstream leased assets 37
2.2.9 Downstream transportation and distribution 38
2.2.10 Processing of sold products 39
2.2.11 Use of sold products 40
2.2.12 End-of-life treatment of sold products 41
2.2.13 Downstream leased assets 43
2.2.14 Franchises 44
2.2.15 Investments 45
2.3 Scope 3 targets 47

3 Assessment 49

4 Conclusions 51

5 Annex 56

5.1 Assessment methodology 65
5.1.1 Target 65
5.1.2 Data 65
5.1.3 Performance 65
5.1.4 Assessment example 66

List of tables, figures and boxes

Tables

Table 2.1: Most relevant categories for digital company industries 28

Table 2.2: Devices recovered by telecommunication operators, 2022 43

Table 2.3: Singtel investment emissions, 2022 46

Table 2.4: Companies with measurable Scope 3 targets, 2023 47

Table 4.1: Current and emerging Scope 3 emission disclosure requirements 55

Table 5.1: Company overview 57

Table 5.2: Assessment calculation for Apple 68

Table 5.3: Assessment score 70

Table 5.4: Science Based Target initiative (SBTi) emissions reduction target 79

Figures

Figure 1.1: Top 10 companies by operational Scope 1 and 2 emissions, 2022 14

Figure 1.2: Top 10 companies by electricity used and companies purchasing 100 per cent renewable electricity, 2022 15

Figure 1.3: Top corporate purchasers of renewable energy, GW, 2022 16

Figure 2.1: Three scopes of emission 23

Figure 2.2: Source of digital company emissions, 2022 23

Figure 2.3: Emissions are mutually exclusive 24

Figure 2.4: Emissions are counterbalanced 25

Figure 2.5: Double counting allowed 26

Figure 2.6: Nokia distribution of Scope 3 emissions, 2022 27

Figure 2.7: Top 10 companies by absolute and relative emissions, Category 1 - Purchased goods and services, 2022 29

Figure 2.8: Apple supplier clean energy programme 30

Figure 2.9: Top 10 companies by absolute and relative emissions, Category 2 - Capital goods, 2022 31

Figure 2.10: Top 10 companies by absolute and relative emissions, Category 3 - Fuel- and energy-related activities, 2022 31

Figure 2.11: Top 10 companies by absolute and relative emissions, Category 4 - Upstream transportation and distribution, 2022 32

Figure 2.12: Top 10 companies by absolute and relative emissions, Category 5 - Waste generated in operations, 2022 34

Figure 2.13: Top 10 companies by absolute and relative emissions, Category 6 - Business travel, 2022 34

Figure 2.14: Capgemini business travel emissions 35

Figure 2.15: Top 10 companies by absolute and relative emissions, Category 7 - Employee commuting, 2022 36

Figure 2.16: Infosys employee commuting emissions; and top 10 companies by commuting emissions per employee, 2022 37

Figure 2.17: Top 10 companies by absolute and relative emissions, Category 8 - Upstream leased assets, 2022 38

Figure 2.18: Top 10 companies by absolute and relative emissions, Category 9 - Downstream transportation and distribution, 2022 39

Figure 2.19: Top 10 companies by absolute and relative emissions, Category 10 - Processing of sold products, 2022 39

Figure 2.20: Top 10 companies by absolute and relative emissions, Category 11 - Use of sold products 2022 41

Figure 2.21: Top 10 companies by absolute and relative emissions, Category 12 - End-of-life treatment of sold products, 2022 42

Figure 2.22: Top 10 companies by absolute and relative emissions, Category 13 - Downstream leased assets, 2022 44

Figure 2.23: Companies by absolute and relative emissions, Category 14 - Franchises, 2022 45

Figure 2.24: Top 10 companies by absolute and relative emissions, Category 15 - Investments, 2022 46

Figure 3.1: Companies scoring at least 75 per cent on the climate assessment 50

Boxes

Box 2.1: Emission allocation principles 24

Box 2.2: Innovative waste management 33

Box 2.3: Intel employee business travel 35

Acronyms and abbreviations

AI	Artificial intelligence
CO_2e	Carbon dioxide equivalent
CSDDD	Corporate Sustainability Due Diligence Directive
CSRD	Corporate Sustainability Reporting Directive
DIB	Digital Inclusion Benchmark
EPR	Extended producer responsibility
ESG	Environmental, social and governance
EU	European Union
FY	Fiscal year
GHG	Greenhouse gas
GPU	Graphics processing unit
HQ	Headquarters
ICTs	Information and communication technologies
IEA	International Energy Agency
IoT	Internet of Things
IPCC	International Panel for Climate Change
ISO	International Standardisation Organisation
ISSB	International Sustainability Standards Board
IT	Information technology
ITU	International Telecommunication Union
kW, kWh	kilowatt, kilowatt-hours
MW, MWh	Megawatt, megawatt-hours
SBTi	Science Based Targets initiative
UN	United Nations
USD	United States dollar
TW, TWh	Terawatt, terawatt-hours
WBA	World Benchmarking Alliance

Foreword

In an era marked by rapid technological advancement and an urgent call for environmental sustainability, digital technology companies stand at the forefront of the global transition to a net-zero society. The environmental impact of the digital industry is complex, presenting both benefits and significant challenges. Their potential to drive climate change monitoring, energy optimization, and the adoption of low-emission technologies becomes evident; yet, digitalization also sparks environmental concerns, including about increased energy and water consumption, raw material depletion, and e-waste. For example, the Global E-waste Monitor 2024 reported 62 billion kg of e-waste was generated globally in 2022.

This third edition of the Greening Digital Companies report, a collaborative effort by the Telecommunication Development Bureau (BDT) of the International Telecommunication Union (ITU) and the World Benchmarking Alliance (WBA), assesses greenhouse gas (GHG) emissions and energy use of 200 digital companies. The report offers a detailed analysis of data, delivering insights into best practices aimed at improving companies' emission reduction performance, advancing towards low-carbon operations, and enhanced climate reporting. The report has revealed that the race to develop artificial intelligence (AI) and expand data centers is driving unprecedented growth in the digital sector, yet it is also fuelling a sharp rise in GHG emissions and energy consumption. These companies are making significant investments in renewable energy, yet the challenges of integrating these resources, especially as AI-driven energy demands grow, remain substantial.

While many digital companies disclose their operational emissions, a significant portion of their carbon footprint - related to their entire value chain, including suppliers, transportation, and product use - remains underreported. Of the 200 companies reviewed, only a fraction fully discloses these broader emissions, which are on average, six times larger and therefore often constitute most of their environmental impact. Moreover, just 42 companies have committed to reducing these emissions across all relevant categories, underscoring the need for more comprehensive and transparent reporting practices. Addressing the complexities of GHG emission reporting in the digital sector requires concerted efforts towards standardization, transparency, and ambitious reduction targets. As regulatory bodies tighten emission reporting requirements, it is clear that digital companies must balance their innovative drive with a stronger commitment to environmental sustainability. To support this, the report recommends that governments should establish approaches for monitoring of national ICT sector GHG emissions and energy use, and play a role in accelerating green energy availability.

The report sheds light on the disparities in renewable energy adoption across regions. While companies headquartered in Europe lead in sourcing 100 per cent renewable electricity, those in East Asia dominate in overall electricity consumption, often relying heavily on non-renewable sources. This imbalance highlights the need for a more equitable global approach to energy sustainability in the digital sector.

Data from this report highlights that the 200 companies assessed collectively account for nearly 1 per cent of global GHG emissions and around 2 per cent of electricity use with the actual numbers certainly higher since companies do not reported across all GHG emission categories. The goal of achieving a "twin transition" - simultaneously advancing digital growth and environmental sustainability – is facing challenges as the sector's carbon footprint continues to grow, raising concerns about its progress to global climate goals.

The digital sector has the potential to lead in the fight against climate change, but this requires a renewed focus on reducing emissions across the entire value chain, investing in sustainable energy solutions, and ensuring that the rapid advancements in AI do not come at the cost of our planet's future. Findings of the report will be used to monitor ICT sector commitments towards net-zero and progress on ITU's Green Digital Action. ITU and WBA remain committed to supporting digital companies in these endeavours, driving the information and communication technology sector towards a more sustainable and low-carbon future. We invite you to explore the data and examples in this report.

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Executive summary

Digital technology companies are pivotal in the global transition to a low-carbon economy, spearheading initiatives to reduce greenhouse gas (GHG) emissions through, *inter alia*, significant investments in renewable energy and by enabling other sectors to lower their emissions via digital products and services. Advancements in technologies like the Internet of Things, robotics and artificial intelligence, offer potential for climate change monitoring, energy optimization, and adoption of low-emission technologies. However, digitalization also has considerable impacts on the environment including GHG emissions, energy and water consumption and e-waste.

This joint International Telecommunication Union (ITU) and the World Benchmarking Alliance (WBA) report, now in its third edition, evaluates the GHG emissions and energy use of 200 leading digital companies. The report offers insights and best practices to help these companies to improve their emissions reduction performance, achieve low-carbon operations and improve their climate reporting.

This 2024 edition of the report focuses on corporate value chain (Scope 3) emissions. Scope 3 emissions, which include upstream and downstream activities, account for the far greater part of the emission footprint of digital companies. The report found that Scope 3 emissions are, on average, over six times greater than operational (Scope 1 and 2) emissions, underscoring their critical role in a company carbon footprint.

Scope 1 and 2 emissions for the 166 digital companies that disclose climate data (accounting for 98 per cent of the revenue of the 200 companies) were 293 million tCO_2e in 2022, or 0.8 per cent of the world total energy-related emissions. The top 10 highest Scope 1 and 2 emitting companies–all from East Asia or the United States–accounted for 55 per cent of the total. All but one of the ten reported an increase in operational emissions in 2022. Worrisome is that eight of the ten have not submitted a target to the Science Based Target initiative (SBTi) committing them to reduce Scope 1 and 2 emissions within a 1.5°C aligned scenario.

Of the 200 companies, 148 reported their electricity consumption, estimated at 518 TWh in 2022 or 1.9 per cent of the world total. The top 10 with the highest consumption levels were reported by companies headquartered in East Asia and the United States. These ten consumed 51 per cent of the total electricity reported by all companies with their consumption rising 9 per cent in 2022. Four (Alphabet, Amazon, Microsoft and Deutsche Telekom) purchase 100 per cent renewable electricity although they are not always getting it where they need it. Two of the Asian companies (Samsung and TSMC) belong to RE100, a group whose members are committed to procuring 100 per cent renewable electricity. However, their target date for reaching 100 per cent is far into the future (2050 and 2040 respectively). The three China headquartered telecommunications operators on the list have not made commitments towards 100 per cent renewable electricity.

Additionally, 103 companies provided data on the proportion of renewables they purchased in 2022. Notably, 16 companies reported sourcing 100 per cent renewable electricity. The data highlight regional disparities, with companies headquartered in East Asia dominating in electricity consumption, while companies headquartered in Europe lead in renewable electricity usage. Companies headquartered in the United States fit into both categories. This suggests varying levels of availability, emphasis and progress on renewable energy adoption across different regions.

In regards to Scope 1 and 2 emissions reductions, just over half of the digital companies have submitted a target to the Science Based Target initiative (SBTi). However, only 69 have been validated by SBTi and they cover only 19 per cent of the 200 companies' total emissions.

There is wide variability in the disclosure of Scope 3 emissions among digital companies. Some companies provide comprehensive data across all relevant categories, while others omit significant portions. Many companies face challenges in accurately calculating and attributing Scope 3 emissions, including a lack of data from suppliers, double counting and inconsistent application of emission allocation principles.

Discouragingly, less than half of the companies covered provide a full inventory of their Scope 3 emissions.

Given that Scope 3 emissions are, on average, over six times greater than Scope 1 and 2 emissions combined, there is significant potential for carbon reduction in this area. It also highlights the importance for the 125 companies which do not disclose a full Scope 3 emission inventory to track and monitor these emissions.

While 103 digital companies covered in this report have submitted an emissions reduction target to SBTi, only 73 have a Scope 3 target. Of those, the scope, quality and transparency of Scope 3 targets vary. Only 27 digital companies (i.e., 14 per cent of the 200 assessed) have a non-intensity based Scope 3 target that covers all relevant categories and for which the base year emissions can be determined. Eighteen companies are on track with their target with a reduction in Scope 3 emissions from the base line. Scope 3 emissions are rising in the other 9 companies. It should be borne in mind that the vast majority of digital companies have no or a non-measurable Scope 3 target.

Addressing the complexities of Scope 3 emission reporting in the digital sector requires efforts towards standardization, transparency, and ambitious reduction targets. It is important to enhance transparency by publicly disclosing emission methodologies and adopting standardized reporting frameworks and guidance. Measurement practices need to be enhanced in order to avoid inconsistencies and double counting. It is particularly important to collaborate with suppliers and service providers for data and to achieve comprehensive emission reductions. By improving Scope 3 emission reporting, digital companies can strengthen sustainability initiatives and contribute meaningfully to global climate and environment goals.

AI's rapid advancement is driving an increase in energy consumption and GHG emissions for digital companies, exacerbating climate change. Leading cloud providers Google, Microsoft, and Amazon who also have significant involvement with AI, report a 62 per cent rise in operational GHG emissions since 2020, reaching 47 million metric tons in 2023, and a 78 per cent increase in electricity usage, now over 100 TWh - equivalent to the energy consumption of the Philippines. These companies are investing heavily in renewable energy, but challenges persist, especially with the integration of AI intensifying energy demands. Despite a handful of companies setting ambitious climate targets, many are now facing challenges meeting these amid the growing energy needs of AI technologies. To mitigate the environmental impact of AI, companies must balance innovation with sustainability and improve transparency in reporting AI's environmental footprint.

The 2024 edition of the *Greening Digital Companies* report highlights a concerning trend: while the digital sector is rapidly advancing, its environmental impact is worsening. Despite the industry's commitment to a twin transition - embracing both digital growth and environmental sustainability - this third report reveals an overall decline in progress towards climate goals across the 200 companies. GHG emissions and energy consumption have increased, while transparency and accountability have declined. These developments do not yet fully account for the growing impact of AI technologies, which are poised to further strain energy resources and exacerbate emissions. Many digital companies are failing in an assessment of their data disclosure, targets and performance. Only 70 achieved a passing grade of 50 per cent or higher and 27 scored zero. Third-party verification, improved methodologies and regulation are essential for enhancing transparency and accuracy. The widening gap between digital expansion and sustainable practices underscores the urgent need for more robust and genuine commitments to mitigate the sector's escalating environmental footprint.

Governments also have a major role to play by liberalizing energy markets, accelerating green energy availability (e.g., reducing red tape for permitting and construction of renewable energy facilities) and investing in grid modernization including energy storage technologies. Digital companies have shown a huge appetite to invest in renewables, but the green energy needs to be made available at the locations where the companies operate.

About ITU and WBA

This is the third edition of the *Greening Digital Companies* report produced by the International Telecommunication Union (ITU) and the World Benchmarking Alliance (WBA).

ITU is the United Nations specialized agency in the field of telecommunications and information and communication technologies (ICTs). ITU has been given the mandate to develop a programme in response to the challenges of climate change and the growing quantities of e-waste globally. It is involved in climate change activities including research, capacity building and development of international standards. In the ITU strategic plan for 2024-2027, target 2.5 is significant improvement of ICTs' contribution to climate and environment action, as measured by concrete indicators including the global e-waste recycling rate and the contribution of telecommunications/ICTs to global greenhouse gas (GHG) emissions. ITU develops standards that provide guidance on how to set science-based targets and achieve net-zero emissions, including an emissions trajectory for ICT companies to reach the 1.5°C scenario in the Paris Agreement (Recommendation ITU-T L.1470), and guidance (in the form of two supplements) on decarbonizing following a 1.5°C pathway for operators of mobile networks, fixed networks, data centres and manufacturers. Specific net-zero guidance developed by ITU for ICT companies (ITU-T L.1471) builds on net-zero approaches by the Science Based Targets initiative, the Race to Zero campaign and other projects. ITU has also developed technical standards that provide methodologies for assessing energy consumption and GHG emissions for ICT organizations (Recommendation ITU-T L.1420). These standards are developed under the activities of the ITU Telecommunication Standardization Sector (ITU-T), in ITU-T Study Group 5 (SG5) on issues related to electromagnetic fields, the environment, climate action, sustainable digitalization and circular economy. For more information on the work of ITU-T SG5, please visit: https://www.itu.int/en/ITU-T/studygroups/2022-2024/05/Pages/default.aspx.

The present report has been developed by the ITU Telecommunication Development Sector (ITU-D), for more information on ITU-D environment work, please visit: https://www.itu.int/itu-d/sites/environment.

WBA is a non-profit organization that assesses and ranks the performance of the world's most influential companies on the United Nations Sustainable Development Goals. Data in this report were collected as part of the WBA Digital Inclusion Benchmark, which assesses the world's leading technology companies on their performance in enhancing access to digital technologies, improving digital skills, fostering trustworthy use, and innovating openly, inclusively and ethically. In addition, WBA produces the Climate and Energy Benchmark, which measures corporate progress against the Paris Agreement and covers 450 of the world's most influential companies in high-emitting sectors such as the automotive, utilities, oil, gas and transport industries. Learn more, here: https://www.worldbenchmarkingalliance.org/.

1

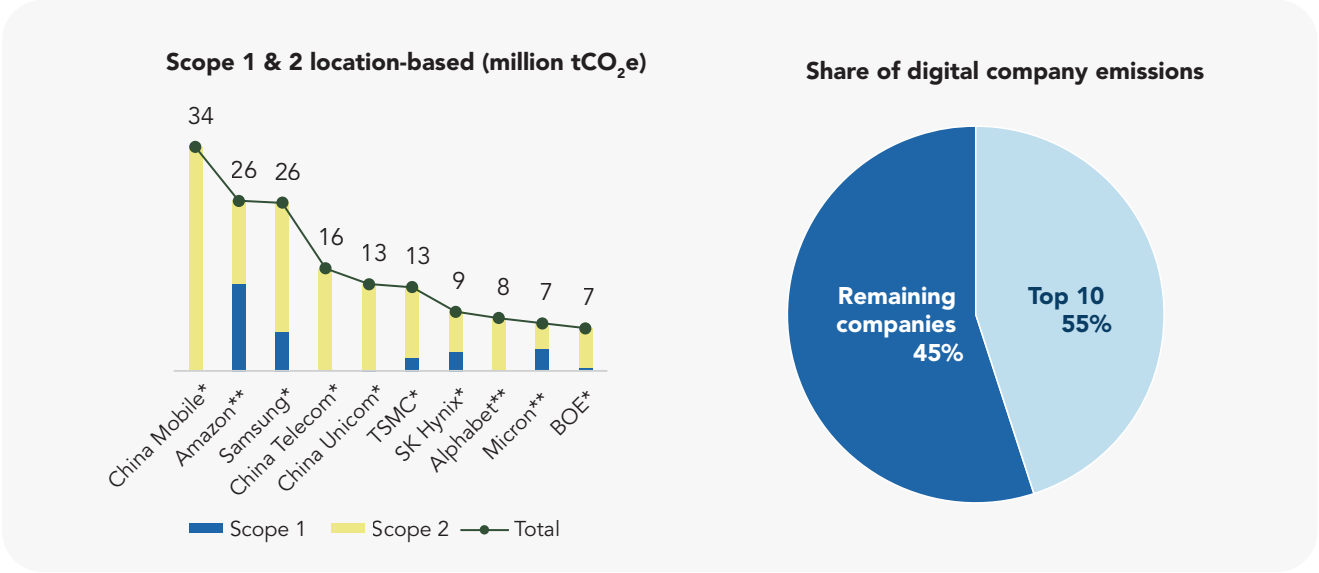
Climate impact of digital companies

The climate impact of digital companies is a complex and multifaceted issue that intertwines technological advancement with environmental responsibility. As digital transformation accelerates globally, driven by technologies such as the Internet of Things (IoT), robotics and artificial intelligence (AI), the potential for these technologies to enhance climate change monitoring, optimize energy use, and promote low-emission technology adoption is significant. However, the environmental footprint of digitalization cannot be overlooked, as it leads to greenhouse gas (GHG) emissions, raw material depletion, energy and water use, pollution and e-waste.

This report documents the emissions and energy use of 200 of the world's leading digital companies.[1] In 2022, the 166[2] companies disclosing Scope 1 and 2 operational GHG emissions reported 293 million tCO_2e, up 12 per cent from the previous year and amounting to 0.8 per cent of global emissions from energy use.[3]

The top 10 highest Scope 1 and 2 emitting companies–all from East Asia or the United States–accounted for 55 per cent of the total. Scope 1 emissions were only significant among the companies that produce semiconductors in this group. All but one of the ten reported an increase in operational emissions in 2022. Worrisome is that eight of the ten have not submitted a target to the Science Based Target initiative (SBTi) committing them to reduce Scope 1 and 2 emissions within a 1.5°C aligned scenario.[4] Of the remaining two, one has withdrawn their SBTi target while the other has not yet had its target validated.

Figure 1.1: Top 10 companies by operational Scope 1 and 2 emissions, 2022



Note: Scope 2 refers to location-based. * Headquarters in East Asia. ** Headquarters in the United States.

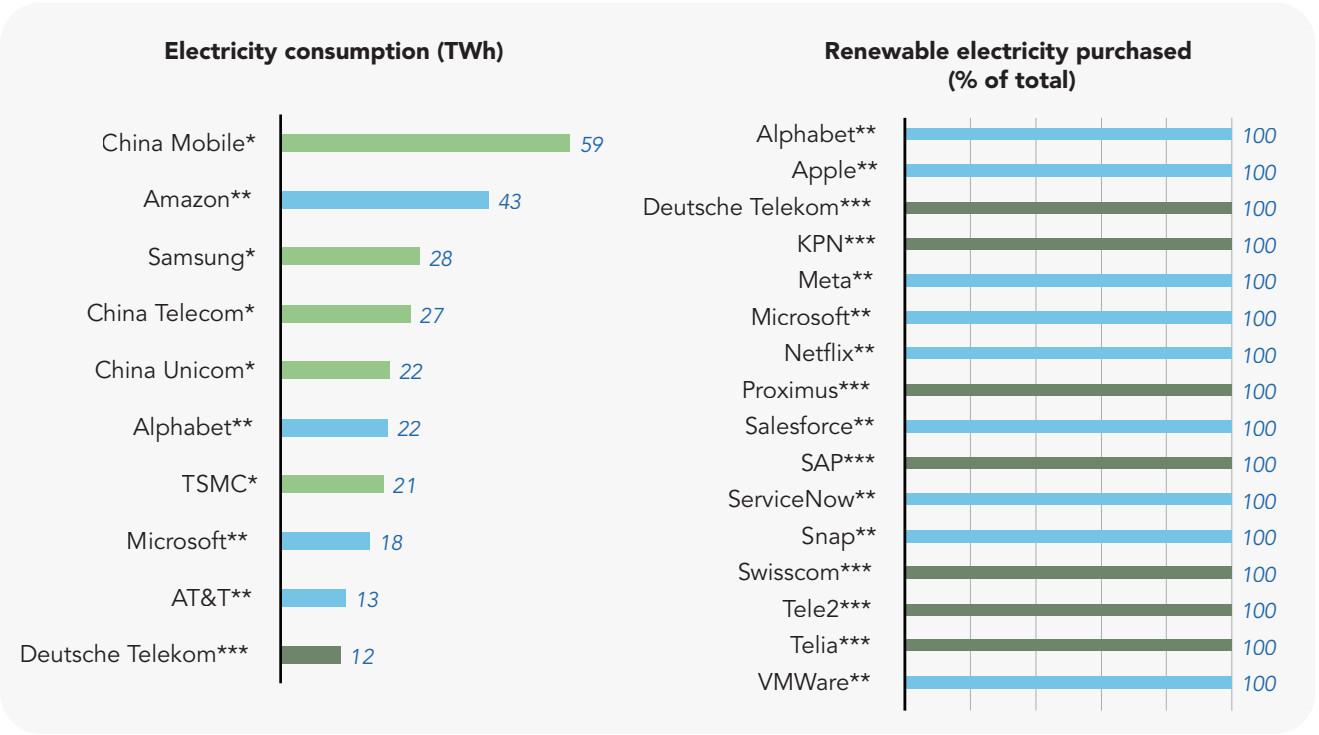
1 See the Digital Inclusion Benchmark at: https://www.worldbenchmarkingalliance.org/digital-inclusion-benchmark.
2 Representing 98 per cent of the 200 companies 2022 revenue.
3 The global figure was 36.8 Gt in 2022. See: International Energy Agency. 2023. "CO_2 Emissions in 2022 – Analysis." https://www.iea.org/reports/co2-emissions-in-2022.
4 SBTi. n.d. "Companies taking action" Science Based Targets Initiative. Accessed August 8 2024. https://sciencebasedtargets.org/companies-taking-action.

Scope 2 emissions reporting is inconsistent among the companies. According to the GHG Protocol, companies are required to disclose location-based Scope 2 emissions in all cases, and market-based emissions only if applicable. Location-based Scope 2 emissions were reported by 136 companies. A number of companies did not specify whether their Scope 2 emissions related to location-based or market-based. Inconsistent compliance with the guidance is making Scope 2 emission reporting opaque. To enhance transparency, all companies should adhere to the GHG Protocol guidance and clearly label their different categories of emissions and always report Scope 2 location-based.

Of the 200 companies, 148 reported their electricity consumption. The top 10 with the highest consumption levels were reported by companies headquartered in East Asia and the United States (Figure 1.2, left). These ten consumed 51 per cent of the total electricity reported by all companies with their consumption rising 9 per cent in 2022. Four (Alphabet, Amazon, Microsoft and Deutsche Telekom) purchase 100 per cent renewable electricity although they are not always getting it where they need it. Two of the Asian companies (Samsung and TSMC) belong to RE100, a group whose members are committed to procuring 100 per cent renewable electricity.[5] However their target date for reaching 100 per cent is far into the future (2050 and 2040 respectively). The three China headquartered telecommunications operators on the list have not made commitments towards 100 per cent renewable electricity.

Additionally, 103 companies provided data on the proportion of renewables they purchased in 2022. Notably, 16 companies reported sourcing 100 per cent renewable electricity (Figure 1.2, right). The data highlight regional disparities, with companies headquartered in East Asia dominating in electricity consumption, while companies headquartered in Europe lead in renewable electricity usage. Companies headquartered in the United States fit into both categories. This suggests varying levels of availability, emphasis and progress on renewable energy adoption across different regions. Understanding these trends is crucial for developing targeted policies and incentives to encourage greater adoption of renewable energy.

Figure 1.2: Top 10 companies by electricity used and companies purchasing 100 per cent renewable electricity, 2022

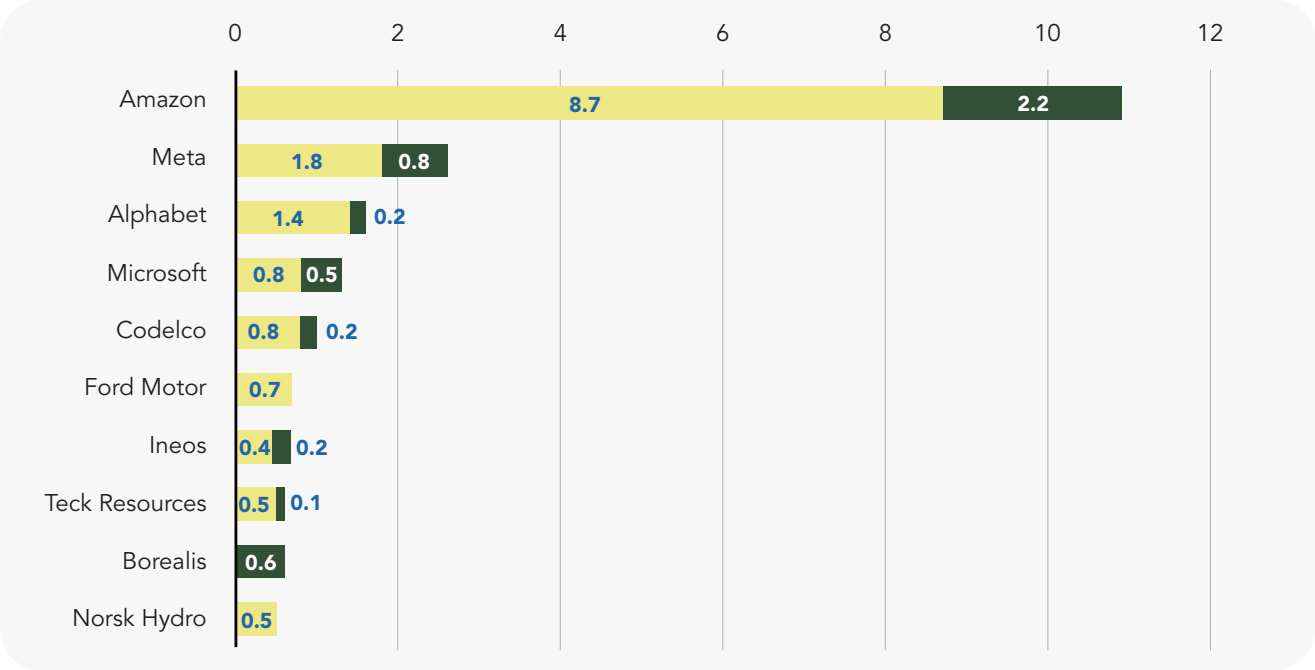


Note: Data for Amazon estimated. * East Asia. ** United States. *** Europe.

5 Climate Group RE100 (https://www.there100.org)

Companies' electricity consumption accounts for a larger portion of global use compared to their emissions. They consumed an estimated 518 TWh in 2022 or 1.9 per cent of global electricity consumption.[6] One reason the global share is higher in electricity compared to emissions is as noted above, a number of the companies contract a high proportion of renewables for their electricity. The top four corporate purchasers of renewable energy in 2022 were digital companies (Figure 1.3). The impact of large electricity consumption by digital companies is impacting energy supply and prices. This has emerged as a notable issue in some countries, especially large data centre hubs, such as Ireland, the Netherlands and Singapore, and where tighter regulations for the construction of data centres have been introduced.[7]

Figure 1.3: Top corporate purchasers of renewable energy, GW, 2022



Source: BloombergNEF. February 9, 2023. "Corporations Brush Aside Energy Crisis, Buy Record Clean Power". https://about.bnef.com/blog/corporations-brush-aside-energy-crisis-buy-record-clean-power

We stand at a critical juncture where the trajectory of digitalization will have profound implications for our environment and the future of our planet. Since 2010, the number of global Internet users has more than doubled, and data traffic has expanded 25-fold.[8] As documented above, this surge in online activities, including streaming videos and social media, has led to increased energy consumption and GHG emissions. E-waste is another growing concern in the digital age. The Global E-waste Monitor 2024 reported an 82 per cent increase in global e-waste from 2010 to 2022, reaching 62 million metric tonnes, where based on current trends, this could reach 82 million metric tonnes by 2030. This equates to approximately 7.8 kg of e-waste per person annually.[9]

6 The global total was reported as 27 080 TWh in 2022. See: International Energy Agency. 2024. "Electricity 2024 – Analysis and Forecast to 2026." https://www.iea.org/reports/electricity-2024.

7 ITU and World Bank. 2024. *Measuring the Emissions and Energy Footprint of the ICT Sector: Implications for Climate Action*. http://documents.worldbank.org/curated/en/099121223165540890/P17859712a98880541a4b71d57876048abb.

8 International Energy Agency. n.d. "Data Centres and Data Transmission Networks." Accessed August 6, 2024. https://www.iea.org/energy-system/buildings/data-centres-and-data-transmission-networks.

9 United Nations Institute for Training and Research (UNITAR), ITU, and Fondation Carmignac. 2024. *The Global E-Waste Monitor 2024*. https://www.itu.int:443/en/ITU-D/Environment/Pages/Publications/The-Global-E-waste-Monitor-2024.aspx.

Current policies and pledges are insufficient to maintain global warming within the 1.5°C limit set by the International Panel for Climate Change (IPCC). Slightly over half the 200 digital companies have submitted a Scope 1 and 2 emissions reduction goal to the Science Based Target initiative (SBTi). Of those, only 72 have been validated committing the company to achieving the target. These validated targets only account for 19 per cent of the 200 companies' total emissions. That means 81 per cent of the 294 million tons of operational emissions are not covered by a target.

As our lives become more intertwined with digital technology, the energy required to power data centres and the disposal of e-waste have significant environmental consequences. AI-driven technologies significantly impact energy consumption, efficiency, and sustainability within data centre operations, with growing demand for AI workloads expected to further drive energy usage and GHG emissions (Spotlight 1). Increasing use in AI necessitates careful planning and sustainable practices to mitigate environmental impact, especially as regions with low-carbon grids will gain a competitive edge in AI investment. Digital companies must adopt proactive approaches to sustainable technologies to mitigate their environmental impact. Companies that prioritize sustainable and circular practices are likely to be better positioned for long-term success as the demand for sustainable technology grows. Leading digital companies are already making strides in sustainable innovation, from using renewable energy to power data centres to developing eco-friendly products.

While digital technologies have the potential to support climate change mitigation,[10] digital companies must address their environmental footprint and improve reporting, particularly since digital technologies can have negative indirect effects, such as induced consumption and rebound effects.[11] By adopting sustainable practices and leveraging innovations, the digital sector can play a pivotal role in achieving global climate goals and ensuring a sustainable future for the planet.

10 World Bank. 2023. *Green Digital Transformation: How to Sustainably Close the Digital Divide and Harness Digital Tools for Climate Action*. http://hdl.handle.net/10986/40653

11 GSMA. n.d. "The Enablement Effect 2021." https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/wp-content/uploads/2022/04/The-Enablement-Effect-2021.pdf.

Spotlight 1: Impact of AI on GHG emissions and energy consumption

Transparency regarding the GHG emissions associated with the rapidly growing field of AI is becoming increasingly critical. Data centres, essential for AI operations, consume substantial energy not only through electricity use to power computing equipment, but also through the continuous operation of air conditioning systems necessary to prevent overheating of computers and servers. The International Energy Agency (IEA) projects a significant rise in power demand from data centres by 2026. After globally consuming an estimated 460 TWh in 2022, data centres' total electricity consumption could rise to between 620 and 1 050 TWh by 2026, depending on technology trends and efficiency improvements.[12] At the upper end of the range, this demand is roughly equivalent to the electricity consumption of Japan.

The extent to which AI is responsible for data centre energy consumption remains unclear, complicating efforts to assess and manage the environmental impact of AI. The current trajectory suggests an increasing carbon footprint as AI models grow in size and complexity. The energy-intensive nature of graphic processing units (GPUs), commonly used in operating generative AI models, particularly in training, exacerbates the strain on energy resources. For example, NVIDIA data centre GPUs have seen a growing power density increase from 300 W in 2017[13] to 1 000 W in 2024.[14] One study finds at current trends NVIDIA will be producing 1.5 million AI server units per year by 2027.[15] Operating at full capacity, the servers would use at least 85 terawatt-hours of electricity about what Chile uses in a year. Given the uncertainty surrounding the climate impacts of AI, one study calls for energy usage and GHG emissions to be included as key metrics when evaluating AI models.[16]

Post-training, large language models (LLMs) consume significant energy during inference, the process of generating responses to user queries. The energy consumption during inference may surpass that of training because of the frequent and iterative nature of user interactions with these models. Amazon Web Services (AWS), one of the leading global cloud providers, reports that inference accounts for 90 per cent of total machine learning cloud computing costs.[17] Similarly, a 2021 Meta report indicated that a third of the company's internal end-to-end machine learning carbon footprint is due to model inference, with the rest attributable to data management, storage and training.[18] Meta is also an example of a company showing good practice by openly publishing detailed training energy use and GHG emissions data.[19] In line with this, a 2022 study by Google found that 60 per cent of its machine learning energy consumption is attributed to inference, while training accounts for the remaining 40 per cent.[20] According to Goldman Sachs, a ChatGPT query needs almost ten times as much electricity to process as a Google search.[21]

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12 International Energy Agency. 2024. "Electricity 2024 – Analysis and Forecast to 2026." https://www.iea.org/reports/electricity-2024.

13 NVIDIA. 2020. "NVIDIA V100 TENSOR CORE GPU." https://images.nvidia.com/content/technologies/volta/pdf/volta-v100-datasheet-update-us-1165301-r5.pdf.

14 NVIDIA. 2024. "NVIDIA GH200 Grace Hopper Superchip." https://resources.nvidia.com/en-us-grace-cpu/grace-hopper-superchip?ncid=no-ncid.

15 Leffer, Lauren. 2023. "The AI Boom Could Use a Shocking Amount of Electricity." Scientific American, October 13, 2023. https://www.scientificamerican.com/article/the-ai-boom-could-use-a-shocking-amount-of-electricity/.

16 Patterson, David, Joseph Gonzalez, Quoc Le, Chen Liang, Lluis-Miquel Munguia, Daniel Rothchild, David So, Maud Texier, and Jeff Dean. 2021. "Carbon Emissions and Large Neural Network Training." arXiv. https://doi.org/10.48550/arXiv.2104.10350.

17 Jeff Barr. 2019. "Amazon EC2 Update – Inf1 Instances with AWS Inferentia Chips for High Performance Cost-Effective Inferencing." AWS News Blog (blog). December 3, 2019. https://aws.amazon.com/blogs/aws/amazon-ec2-update-inf1-instances-with-aws-inferentia-chips-for-high-performance-cost-effective-inferencing/.

18 Wu, Carole-Jean, Ramya Raghavendra, Udit Gupta, Bilge Acun, Newsha Ardalani, Kiwan Maeng, Gloria Chang, et al. 2022. "Sustainable AI: Environmental Implications, Challenges and Opportunities." arXiv. https://doi.org/10.48550/arXiv.2111.00364.

19 Meta. 2024. "Meta Llama 3.1 8B Instruct" Accessed 08 August 2024. https://huggingface.co/meta-llama/Meta-Llama-3.1-8B-Instruct.

20 Patterson, David, Joseph Gonzalez, Urs Hölzle, Quoc Le, Chen Liang, Lluis-Miquel Munguia, Daniel Rothchild, David So, Maud Texier, and Jeff Dean. 2022. "The Carbon Footprint of Machine Learning Training Will Plateau, Then Shrink." arXiv. https://doi.org/10.48550/arXiv.2204.05149. Luccioni, Sasha, Yacine Jernite, and Emma Strubell. 2024. "Power Hungry Processing: Watts Driving the Cost of AI Deployment?" In Proceedings of the 2024 ACM Conference on Fairness, Accountability, and Transparency, 85–99. FAccT '24. New York, NY, USA: Association for Computing Machinery. https://doi.org/10.1145/3630106.3658542.

21 Goldman Sachs. 2024. "AI Is Poised to Drive 160% Increase in Data Center Power Demand." May 14, 2024. https://www.

Additionally, many models undergo continuous re-training to improve their performance and update their knowledge base, meaning the process is not a straightforward transition from training to inference. Instead, it involves a cyclical pattern of ongoing training and inference, further increasing the overall energy demands.

Spotlight Table 1: GHG emissions and energy consumption reported from training Meta Llama 3 models of increasing size

	Training time (GPU hours)	Training power consumption (W)	Training energy consumption (MWh)	Training location -based GHG emissions (tCO_2e)*	Training market -based GHG emissions (tCO_2e)	U.S. household daily electrical consumption equivalent**
Llama 3.1 8B	1.46M	700	0.28	420	0	9
Llama 3.1 70B	7.0M	700	1.36	2 040	0	47
Llama 3.1 405B	30.84M	700	6.00	8 930	0	208

*One traveller on a round-trip flight from New York to San Francisco is 0.99 tCO_2e. Source: Stanford HAI. 2024. The AI Index 2024 Report. Stanford Institute of Human-Centered Artificial Intelligence. https://aiindex.stanford.edu/wp-content/uploads/2024/04/HAI_AI-Index-Report-2024.pdf

** The average U.S. household consumes about 10.5 MWh of electricity per annum. Source: EIA. 2023. Energy use in homes. U.S. Energy Information Administration. https://www.eia.gov/energyexplained/use-of-energy/electricity-use-in-homes.php

Large cloud providers such as Google (subsidiary of Alphabet), Amazon and Microsoft–all of which have their own AI products–are experiencing rapid growth in energy use and consequent emissions. Their operational GHG emissions are up 62 per cent from 2020 reaching 47 million metric tons in 2023. Their electricity use has grown even faster, up 78 per cent over the same period and standing at just over 100 TWh in 2023, around what the entire country of the Philippines uses in a year. Increasing use of cloud services now coupled with fresh AI take-up is driving this astounding rise. Cloud providers hint at the impact of AI in their recent sustainability reports. Google notes: "As we further integrate AI into our products, reducing emissions may be challenging due to increasing energy demands from the greater intensity of AI compute."[22] Microsoft states: "New technologies, including generative AI, hold promise for new innovations that can help address the climate crisis. At the same time, the infrastructure and electricity needed for these technologies create new challenges for meeting sustainability commitments across the tech sector."[23]

The trio have made huge investments to decarbonize their operations: all procure 100 per cent renewable electricity and they were three of the top four corporate purchasers of green energy in 2022. However, they face the challenge that the renewable energy they purchase is not always available where their data centres are located.

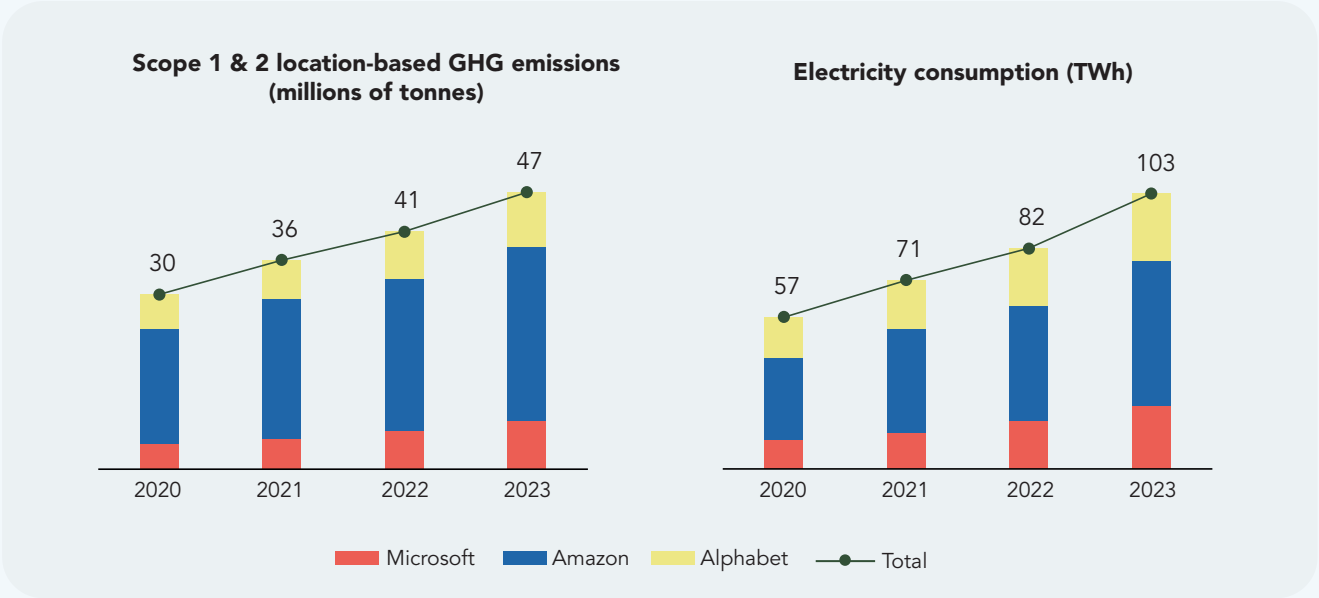
goldmansachs.com/insights/articles/AI-poised-to-drive-160-increase-in-power-demand.

22 Google. 2024. *Environmental Report.* p. 31. https://www.gstatic.com/gumdrop/sustainability/google-2024-environmental-report.pdf

23 Microsoft. 2024. *Environmental Sustainability Report.* p. 4. https://query.prod.cms.rt.microsoft.com/cms/api/am/binary/RW1lMjE

Cloud use was already increasing before the recent surge in AI use. Cloud providers may realize that it is not going to be possible to meet their target goals and are backtracking on their commitments. Amazon has removed its SBTi target commitment, Microsoft has removed its SBTi Net Zero commitment while its existing target does not specify an emissions reduction goal. Alphabet submitted its reduction target to SBTi in 2022 but it has not yet been validated. This has the potential to generate significant climate risks.

Spotlight Figure 1: GHG emissions and electricity use of Alphabet, Amazon and Microsoft



Note: Note these are consolidated data covering all the companies' operations. In the case of Amazon this includes e-commerce. Amazon electricity use estimated for 2023 and 2023 and its Scope 2 emissions estimated for 2020 and 2021. Source: Company reports.

2

Scope 3 emissions

2.1 Introduction

Most companies follow the GHG Protocol Corporate Accounting and Reporting Standard for calculating their CO_2e emissions.[24] The standard identifies three scopes in reference to GHG emissions:

1. Scope 1 emissions are GHG emissions from sources owned or controlled by an organization, resulting directly from company operations, such as the use of diesel (e.g. in on-site diesel generators) and other fuels.

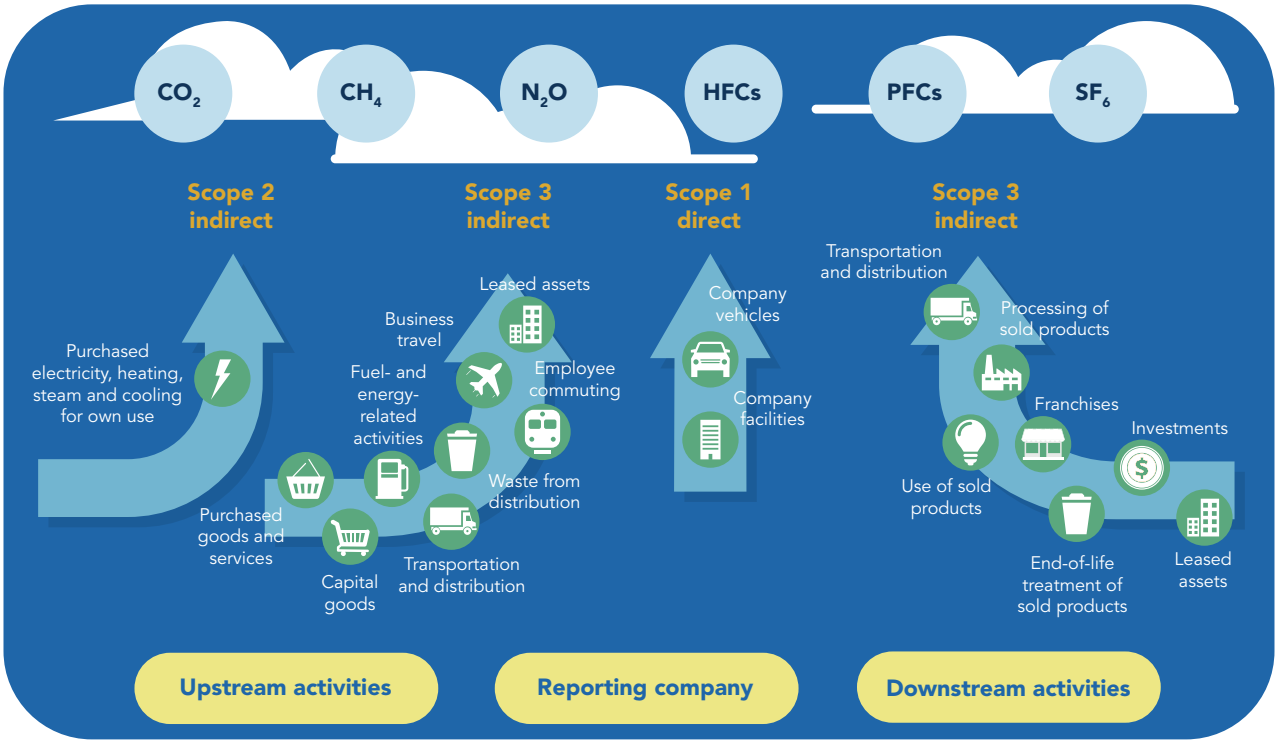
2. Scope 2 emissions are on-site greenhouse gas (GHG) emissions from the generation of electricity, heat or steam that has been purchased by an organization. The main driver of emissions in this scope is electricity use, e.g. electricity supplied to data centres, telecommunication networks, office buildings, factories and other buildings. In 2015, new guidance on Scope 2 emissions was published,[25] based on the difference between the type of electricity that companies purchase (market-based emissions) and what the companies actually receive over the grid (location-based emissions). This was partly an effort to recognize that while some companies were paying for renewable energy, the electricity grid was not always supplying them with it. According to the GHG Protocol, companies must always disclose location-based emissions and market-based when available.

3. Corporate value chain, or Scope 3, emissions are upstream and downstream emissions arising from company activities. This would include, for instance, suppliers that ICT manufacturing companies outsource to for their production needs. It also includes product use emissions from devices such as computers and smartphones manufactured by ICT companies. Note that, while Scope 3 emissions are part of a company overall footprint, they are not part of the company operational emissions but attributable to operational emissions of another company. There are 15 categories of Scope 3 emission. Disclosure of Scope 3 emissions varies from company to company: some do not report them at all, some report just those that are relatively simple to calculate, such as business travel, while others go further and calculate all relevant categories.

24 World Business Council for Sustainable Development and World Resources Institute. 2004. *A Corporate Accounting and Reporting Standard* (Revised Edition). https://ghgprotocol.org/corporate-standard

25 World Business Council for Sustainable Development and World Resources Institute. 2015. *GHG Protocol Scope 2 Guidance: An amendment to the GHG Protocol*. https://ghgprotocol.org/scope_2_guidance

Figure 2.1: Three scopes of emission



Adapted from: https://ghgprotocol.org/standards/scope-3-standard

The greater part of digital companies' total emissions emanates from their value chain, covered by Scope 3. Among companies that report all relevant Scope 3 emissions, Scope 1 accounts for 4 per cent, Scope 2 for 15 per cent and Scope 3 for 81 per cent (Figure 2.2). Given that Scope 3 emissions are, on average, over six times greater than Scope 1 and 2 emissions combined, there is significant potential for carbon reduction in this area. It also highlights the importance for the 125 companies which do not disclose a full Scope 3 emission inventory to track and monitor these emissions.

Figure 2.2: Source of digital company emissions, 2022

Note: Unweighted (i.e., simple) average based on 75 companies out of the 200 that were assessed are reporting all relevant Scope 3 categories. They account for 49 per cent of the 2022 revenues for the group.

The GHG Protocol provides overall guidance for Scope 3 emissions,[26] including detailed guidance for calculating them.[27] Additionally, guidance has also been developed for specific digital industries. For instance, ITU together with GSMA and Global e-Sustainability Initiative (GeSI) provide Scope 3 emission guidance for telecommunication operators.[28] GeSI and Carbon Trust have developed Scope 3 guidance for ICT companies based on a lifecycle approach that is related to some Scope 3 categories.[29] Guidance also exists for data centre operators.[30]

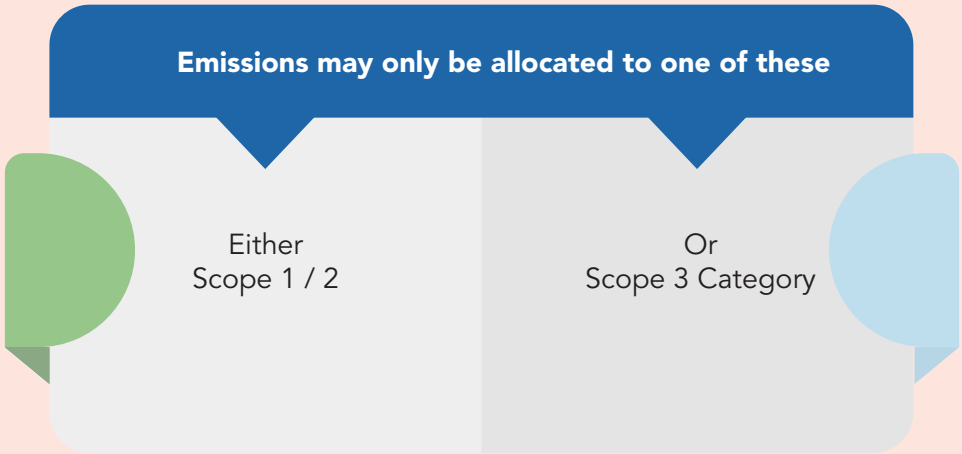
This guidance generally helps companies to allocate emissions to different categories and identify which emission factors to use. This report shows how the guidance has been applied by illustrating which types of digital companies have high emissions (both absolute and relative) in the various categories with explanations. It also identifies which categories are problematic due to potential omission of countervailing Scope 1 and 2 emissions or inconsistency in their application.

Scope 3 emissions are subject to ongoing revisions as companies move to compile and refine their value chain footprint. This sometimes includes reclassifying Scope 1 and 2 emissions to Scope 3 categories with a consequent responsibility shift, as Scope 3 is considered outside company's operational control. The allocation of emissions to Scope 3 categories should be done in adherence with carbon accounting principles and not be used to obfuscate company emissions.

Box 2.1: Emission allocation principles

The GHG Protocol Scope 3 emission categories are intended to be mutually exclusive so that emissions are not double counted by the reporting company. Moreover, if a company has already accounted for emissions in Scope 1 or 2, they shall not be included in Scope 3.

Figure 2.3: Emissions are mutually exclusive



26 World Resources Institute & World Business Council for Sustainable Development. n.d. *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*. https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf

27 World Resources Institute & World Business Council for Sustainable Development. 2013. *Technical Guidance for Calculating Scope 3 Emissions*. https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

28 ITU, GeSI and GSMA. 2023. *Scope 3 Guidance for Telecommunication Operators*. https://www.itu.int/en/action/environment-and-climate-change/Documents/publications/2023/Scope-3-Guidance-2023.pdf

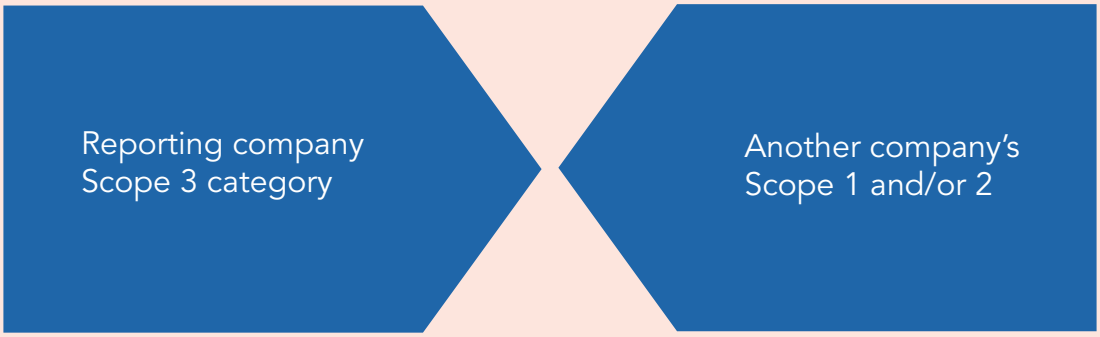
29 GeSI and Carbon Trust. 2017. *ICT Sector Guidance built on the GHG Protocol Product Life Cycle Accounting and Reporting Standard*. https://ghgprotocol.org/sites/default/files/2023-03/GHGP-ICTSG%20-%20ALL%20Chapters.pdf

30 Schneider Electric. 2024. Recommended Inventory for Data Center Scope 3 GHG Emissions Reporting. https://download.schneider-electric.com/files?p_Doc_Ref=SPD_WP53_EN

A second principle is that, in theory, for some Scope 3 category emissions reported by a company (not applicable for instance in Category 3.11), there should be corresponding Scope 1 and/or 2 emissions by another company. For instance, in Category 6 (business travel), the counterpart operational emissions are those attributed to transportation and accommodation companies. Knowing the source of Scope 1 and 2 emissions is relevant since that source can supply the reporting company with the necessary information for compiling its Scope 3 emissions. For instance, transportation companies could inform the reporting company of the emissions resulting from the use of their transportation services. Accuracy will be enhanced compared to trying to estimate the emissions.

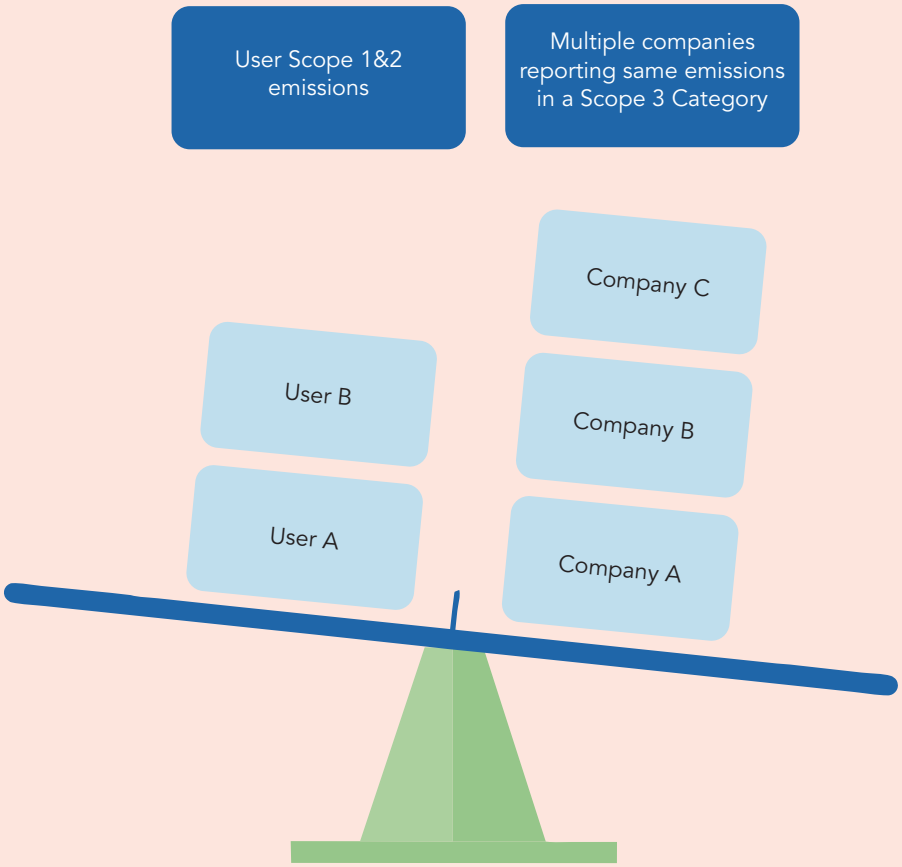
There is, however, a risk that both the reporting company and the counterpart company report the same emissions under Scope 3. This is most likely to occur in Categories 8 (upstream leased assets) and 13 (downstream leased assets). While companies are supposed to consult on who is responsible for the operational emissions, this is not always the case in practice. As a result, the emissions may also "disappear" from company Scope 1 and 2 emissions, creating the potential for greenwashing.

Figure 2.4: Emissions are counterbalanced



A third principle, which is counter intuitive to the preceding one, is that there can be double or more counting within Scope 3 categories. While a single company may not report the same emissions more than once across Scopes 1, 2 and 3, multiple companies can report the same emissions in Scope 3. For instance, more than one company could claim Scope 3 emissions under Category 11 (product use) for the same product, i.e. the manufacturer of the product and the retailer of the product. This is allowed under the GHG Protocol to encourage multiple entities to reduce these emissions. Consequently, the GHG Protocol counsels against aggregating Scope 3 emissions due to the potential for double counting.

Figure 2.5: Double counting allowed



As well as issues of emission attribution, there is also the challenge of what emissions to report under Scope 3. This depends on the emission category and company type. The GHG Protocol calls in some cases for annualized emissions to be reported, while, in other cases, it calls for embedded or future emissions to be reported. For instance, under Category 11 (product use), manufacturers are supposed to report the total emissions over the lifetime of the product sold in the relevant year.

The GHG Protocol is somewhat vague on how to define the relevance to a company of each of the 15 categories of Scope 3 emission. It simply says that relevance is providing information pertinent to internal and external stakeholders of the company. Some categories are not relevant to every type of company, or they are so low as to be considered immaterial (although the proportion to be considered immaterial is not clearly defined). For instance, Nokia, the network equipment manufacturer with headquarters in Finland, reports that 95 per cent of its Scope 3 emissions are from the use of its products, while five categories account for 1 per cent or less.

Figure 2.6: Nokia distribution of Scope 3 emissions, 2022

Emission source	Metric tons CO_2e	% of total	
Energy use in facilities and by fleet	259 400	0.7%	Nokia Scope 1 and 2 emissions
Use of sold products	37 919 200	95%	
Purchased goods and services	683 700	2%	
Capital goods	444 800	1%	
Upstream transportation and distribution	329 800	0.8%	Nokia Scope 3 emissions
Employee commuting	50 100	0.1%	
Business air travel	26 700	0.1%	

Source: https://www.nokia.com/system/files/2023-03/nokia-people-and-planet-2022-sustainability-report.pdf

Companies providing a methodology statement describing the calculation of their Scope 3 emission inventory usually identify which categories are not relevant and why. However, the lack of relevance put forth by the company merits investigation. For instance, Alphabet does not disaggregate certain Scope 3 categories for "business reasons."[31] There are a number of cases where companies report that a category is relevant but has not yet been calculated.

Relevance is often related to the industry in which the digital company operates in. GSMA finds that three quarters of the mobile industry operational and value chain emissions are from Scope 3.[32] Further, more than 90 per cent of mobile industry Scope 3 emissions covered in the GSMA study come from just five categories: 1) purchased goods and services; 2) capital goods; 3) fuel- and energy-related activities; 11) use of sold products; and 15) investments). The guidance documents mentioned above suggest which Scope 3 categories are most relevant for specific industries (Table 2.1).

31 CDP. 2023. *Alphabet - CDP Climate Change Response 2023*. https://www.gstatic.com/gumdrop/sustainability/alphabet-2023-cdp-climate-change-response.pdf

32 GSMA. 2024. *Mobile Net Zero 2024: State of the Industry on Climate Action*. https://www.gsma.com/betterfuture/wp-content/uploads/2024/02/Mobile-Net-Zero-2024-State-of-the-Industry-on-Climate-Action.pdf

Table 2.1: Most relevant categories for digital company industries

		Telecommunication operators	Data centres	Hardware	IT software and services
1	Purchased goods and services	✓	✓	✓	
2	Capital goods	✓	✓		
3	Fuel- and energy-related activities	✓	✓		
4	Upstream transportation and distribution		✓	✓	
5	Waste generated in operations		✓		
6	Business travel		✓		✓
7	Employee commuting		✓		
8	Upstream leased assets	✓	✓		✓
9	Downstream transportation and distribution			✓	✓
10	Processing of sold products				
11	Use of sold products	✓		✓	
12	End-of-life treatment of sold products	✓		✓	
13	Downstream leased assets	✓	✓		
14	Franchises				
15	Investments				

2.2 Analysis by Scope 3 emission category

2.2.1 Purchased goods and services

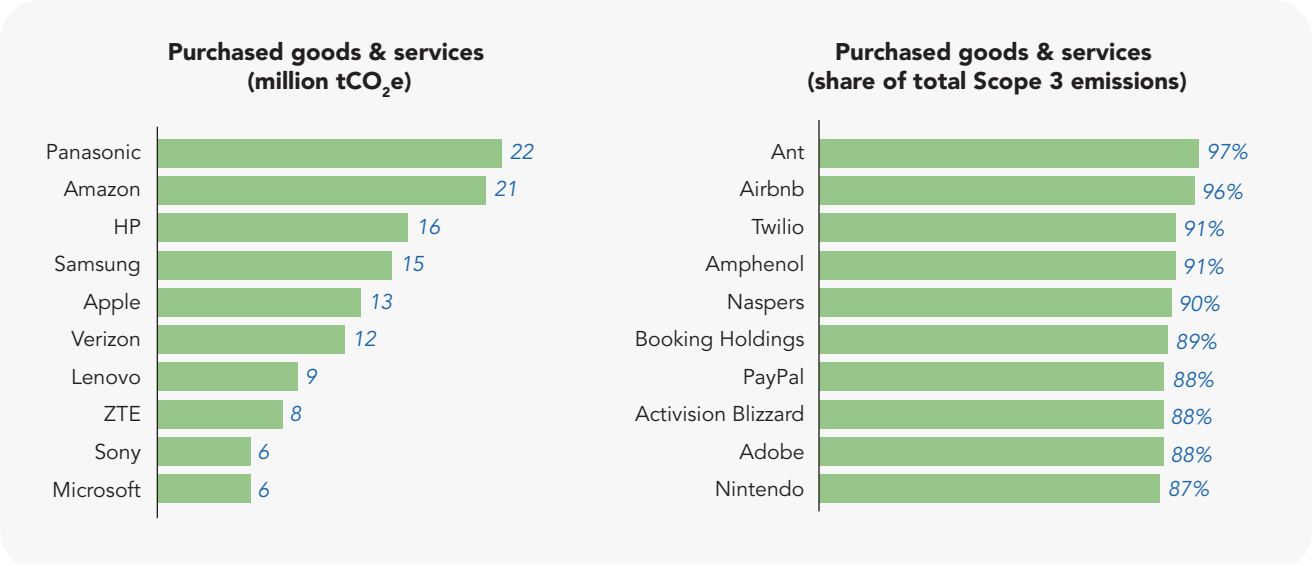
Category 1 covers emissions from goods and services purchased by the company from its supply chain. The corresponding Scope 1 and 2 emissions should be accounted for by suppliers. Note that this category is not meant to include capital goods purchased (e.g. equipment such as base stations, switches, computers, etc.) which are accounted for under Category 2. However, the GHG Protocol is neutral about whether capital goods (Category 2) should be counted here.

Some 101 companies reported this category, the second most reported category after business travel.

This category accounted for almost half (46 per cent) of reporting companies' total Scope 3 emission inventory.

Companies with the highest absolute supply-chain emissions are mainly hardware vendors, illustrating the high degree of outsourcing to manufacture their products (Figure 2.7, left). This group also includes cloud providers such as Amazon and Microsoft. Verizon, a United States-based telecommunication operator, has high Category 1 emissions, owing in part to its inclusion of capital goods in this category. Companies with relatively high supply-chain emissions tend to be IT software and service companies with low overall emissions (Figure 2.7, right).

Figure 2.7: Top 10 companies by absolute and relative emissions, Category 1 - Purchased goods and services, 2022

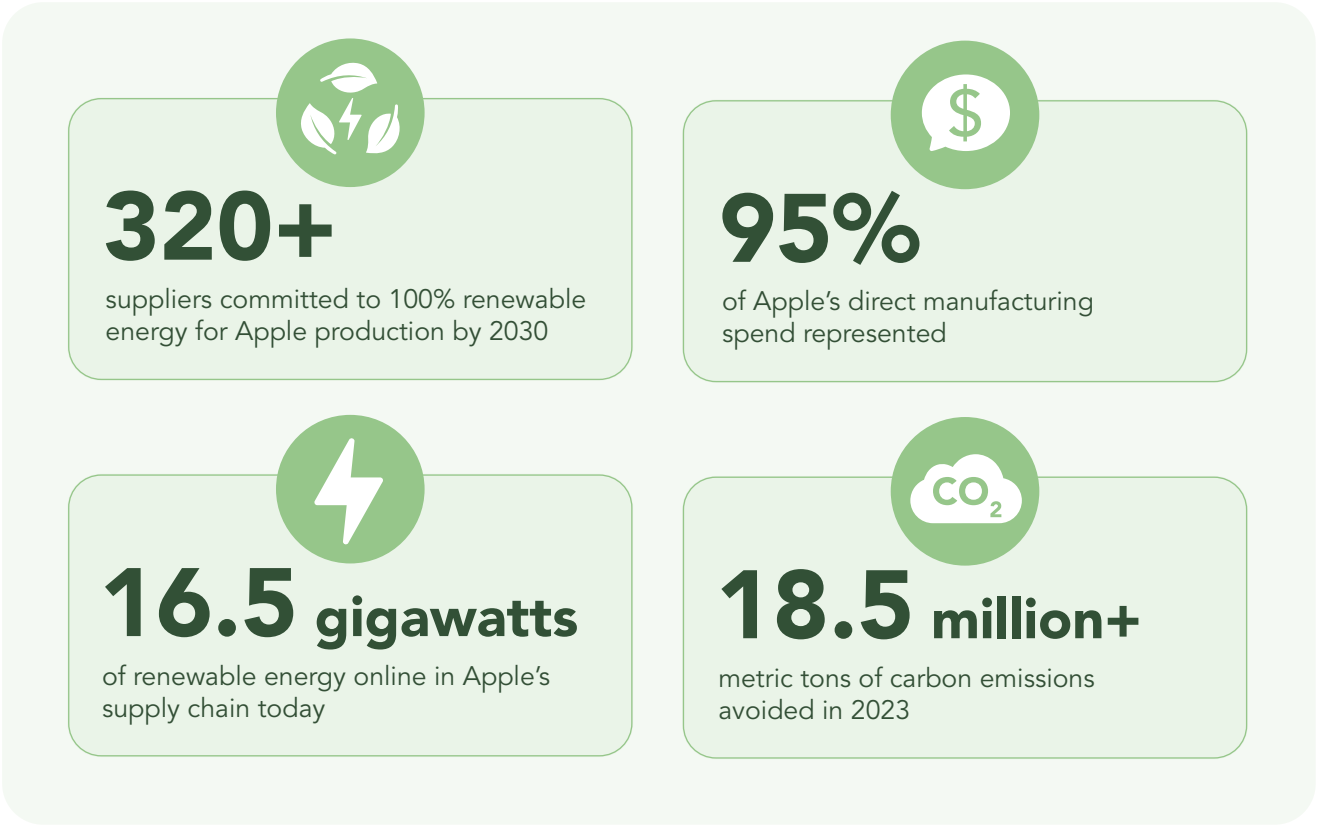


Some companies make lists of their top suppliers publicly available. While these lists do not contain supply-chain emissions of those suppliers, they do shed some light on the types of supplies companies are purchasing and on the extent to which this category might be captured in the Scope 1 and 2 emissions of digital company suppliers. For instance, 16 of the top 100 Intel suppliers are digital companies in scope for this report.[33]

This category is sometimes included in Scope 3 targets for those companies that have an emission reduction target. Often the target relates to convincing suppliers to adopt an emission reduction target. Apple is working with suppliers to help them to commit to using 100 per cent renewable energy for the production of its goods by 2030. Over 320 suppliers have committed to this target as of April 2024 (Figure 2.8).

33 See "Top 100 Production and Service Suppliers" at https://www.intel.com/content/www/us/en/corporate-responsibility/csr-report-builder.html. In scope digital companies included in the Intel supplier list: Analog Devices, Applied Materials, ASML, Broadcom, GlobalFoundries, Hewlett Packard Enterprise, Infosys, Lam Research, Microsoft, Murata, Samsung, SAP, sk Hynix, TSMC and Tokyo Electron.

Figure 2.8: Apple supplier clean energy programme



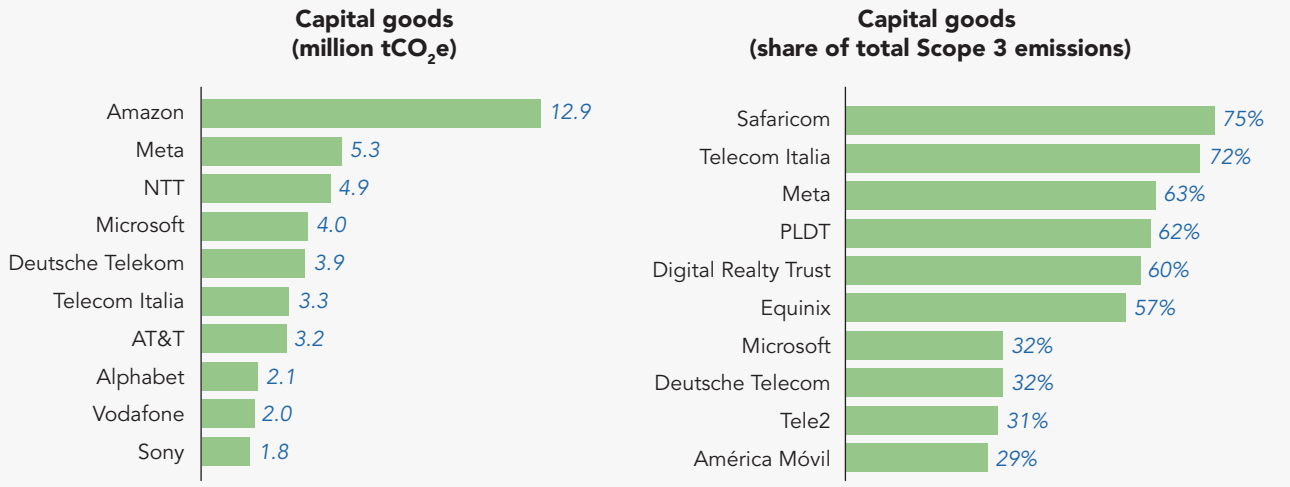
Source: "Apple ramps up investment in clean energy and water around the world." Press Release, 17 April 2024. https://www.apple.com/newsroom/2024/04/apple-ramps-up-investment-in-clean-energy-and-water-around-the-world/

2.2.2 Capital goods

Capital goods (Category 2) are the fixed assets used by companies to produce their goods or services. This can be equated to the capital expenditure made by companies. Note that use of capital goods is accounted for by the company under its Scope 1 and 2 emissions; hence, what should be reported here are the *embedded* (i.e. cradle-to-grave) emissions of the capital good, with the corresponding Scope 1 and 2 emissions accounted for by the manufacturer of the equipment. The GHG Protocol guidance accepts that there may be some difficulties in identifying whether expenses by companies should be reported under Category 1 or 2. Companies are advised to follow their accounting procedures for how to classify the emissions.

Companies with the highest capital-good emissions include large cloud and data centre operators making server purchases in order to handle burgeoning data use. Telecommunication operators also have notable emissions under this category when they upgrade to newer technology, e.g. 5G and optical fibre. Such upgrades usually enable them to handle growing data use more efficiently with lower emissions.

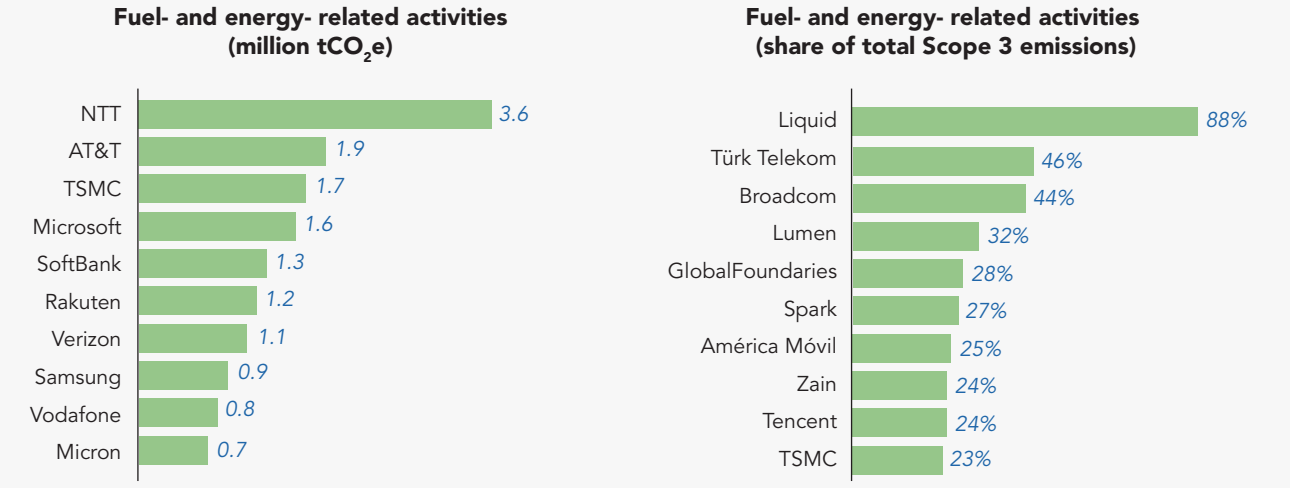
Figure 2.9: Top 10 companies by absolute and relative emissions, Category 2 - Capital goods, 2022



2.2.3 Fuel- and energy-related activities

Category 3 relates to the extraction, production and transportation of fuels and energy purchased or acquired by companies in the reporting year not already accounted for under Scope 1 or 2 emissions. The relevant aspect of Category 3 for digital companies relates to the extraction and production of fuels, and transmission and distribution (T&D) losses largely from the generation of electricity. For instance, in the United States, it was estimated that T&D losses from the electrical grid averaged around 5 per cent between 2018 and 2022.[34] Reporting companies are supposed to account for T&D losses related to their use of energy in this category, while Scope 1 and 2 emissions are accounted for by utility companies.

Figure 2.10: Top 10 companies by absolute and relative emissions, Category 3 - Fuel- and energy-related activities, 2022



34 EIA. 2023. "FAQs - How much electricity is lost in electricity transmission and distribution in the United States?" Accessed August 8 2024. https://www.eia.gov/tools/faqs/faq.php?id=105&t=3

This category is presumably applicable to all companies since they all use energy for their operations; yet only 70 per cent of those reporting Scope 3 emissions disclose this category. IBM does not consider this category relevant, offering the following explanation:

> "IBM does not attempt to estimate emissions associated with the transportation of energy commodities, transmission of electricity or other upstream emissions associated with the production of fuels and energy commodities purchased and consumed by IBM because there is no basis or reliable data to do so. Estimating these emissions would generate a grossly inaccurate figure at best due to the many needed assumptions and would rob resources to perform carbon accounting for the sake of accounting. Instead, we believe each organization must take responsibility to reduce their energy consumption and direct GHG emissions and accordingly direct their resources to actually reduce emissions."[35]

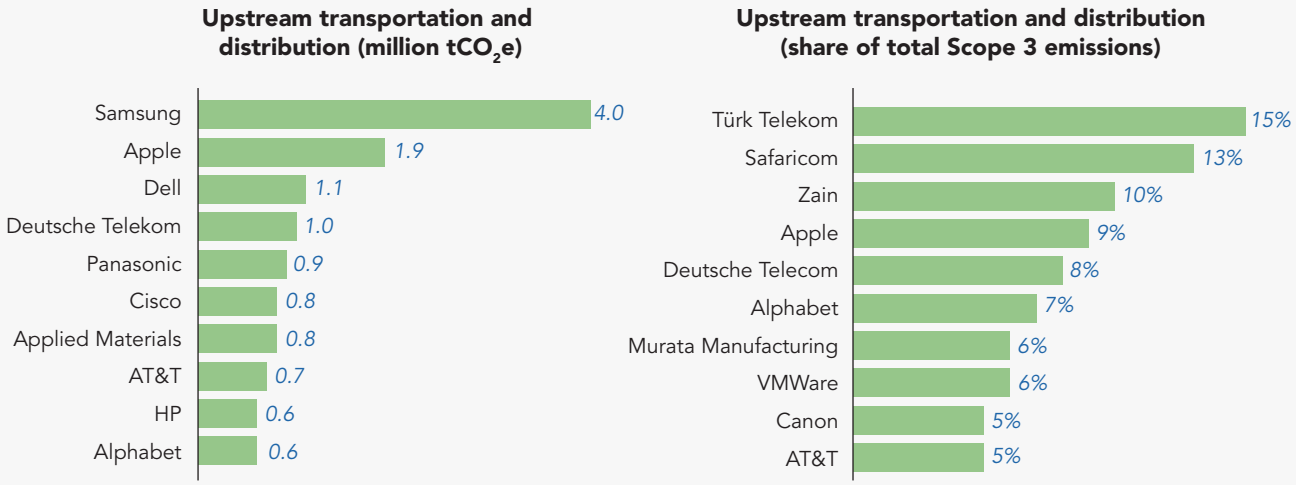
Despite having the fifth highest electricity use among all digital companies, Alphabet does not consider this category relevant: "We estimated that the emissions associated with fuel- and energy-related activities not covered in our Scope 1 and 2 are *de minimis* relative to our overall footprint."[36]

Pan-African telecommunication operator Liquid has by far the highest relative emissions for this category, owing largely to the high T&D losses in sub-Saharan Africa's electricity networks. Estimated at 16 per cent, the T&D losses there are the highest of any region in the world.[37]

2.2.4 Upstream transportation and distribution

Category 4 refers to emissions from the transportation and distribution of goods from the direct suppliers of the reporting company (e.g. Tier 1), corresponding to the Scope 1 and/or 2 emissions of a freight and/or logistics company. Some 79 companies reported this category, of which those with the highest absolute emissions were almost all manufacturers. In relative terms, half of the emissions were from telecommunication operators, likely arising from the transportation of network equipment.

Figure 2.11: Top 10 companies by absolute and relative emissions, Category 4 - Upstream transportation and distribution, 2022



35 IBM. 2023. *CDP Climate Change Questionnaire 2023*. https://www.ibm.com/downloads/cas/7YPWJ5O3

36 CDP. 2023. *Alphabet - CDP Climate Change Response 2023*. https://www.gstatic.com/gumdrop/sustainability/alphabet-2023-cdp-climate-change-response.pdf

37 African School of Regulation. 2023. *Policy Dialogue on Renewable Generation and Regional Power Trade in Africa*. https://africanschoolregulation.org/wp-content/uploads/2023/02/Companion-reading.pdf

2.2.5 Waste generated in operations

Category 5 covers the disposal of solid waste and waste water generated by companies in operations outsourced to third-party organizations, corresponding to the Scope 1 and/or 2 emissions of waste management companies. Most waste emissions are generated from landfills.[38]

Among digital companies, most waste generated in operations is from telecommunication and semiconductor companies. Waste water is a particular challenge for semiconductor companies since it often contains hazardous substances. According to a recent study, toxic semiconductor waste water is increasing.[39]

Despite the fact that all companies generate waste in their operations, this category was only reported by 85 companies (64 per cent of those reporting Scope 3 emission breakdowns). Six of the top 10 companies in this category produce semiconductors; the two biggest by some margin are headquartered in the Republic of Korea. As noted, apart from the emissions generated by waste and waste water, the latter has environmental implications if it is discharged without being treated. The use of water by semiconductor firm SK Hynix increased by 23 per cent between 2019 and 2022.[40] While 35 per cent of water is reused, the remainder is discharged. The company aims to decrease water use through efficiency measures as well as increase water reuse facilities and is also making strides in innovative waste management (Box 2.1).

Box 2.2: Innovative waste management

SK Hynix has developed wafer regeneration technology to recycle wafers, typically disposed of due to defects, by converting them into high-quality test wafers, which can be reused 100 times more than previously used reclaim wafers. SK Hynix is also one of the first semiconductor companies to establish a roadmap for recycled and renewable materials, which has a goal of increasing recycled materials in products to 25 per cent by 2025 and to 30 per cent by 2030. To achieve this, the plan highlights the need to acquire recycling technologies and build necessary infrastructure.[41]

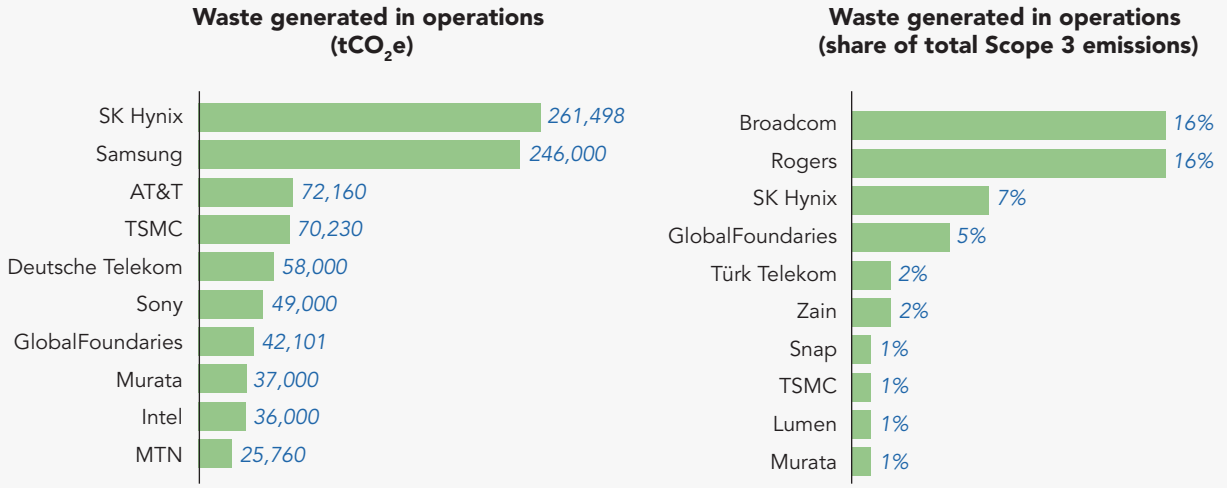
38 For instance WM, a large United States-headquartered waste management company, disclosed 13.7 million tonnes of GHG emissions from landfill, or 90 per cent of its total operational emissions. See: WM. 2023. *Sustainability Report*. https://sustainability.wm.com/downloads/WM_2023_SR.pdf

39 Jeonghoo Sim, Jonghun Lee, Hojung Rho, Kwang-Duck Park, Youngkwon Choi, Deokhwan Kim, Hyeonbin Kim and Yun Chul Woo. 2023. "A review of semiconductor wastewater treatment processes: Current status, challenges, and future trends." *Journal of Cleaner Production*. https://doi.org/10.1016/j.jclepro.2023.139570.

40 SK Hynix. 2023. Sustainability Report. https://sustainability.skhynix.com/datacenter?section=sustainReport

41 SK Hynix. 2024. "World Environment Day: SK hynix's Waste Management & Recycling Initiatives Pave a Greener Road Ahead" Accessed August 8 2024. https://news.skhynix.com/sk-hynix-waste-management-paves-a-greener-road-ahead/

Figure 2.12: Top 10 companies by absolute and relative emissions, Category 5 - Waste generated in operations, 2022

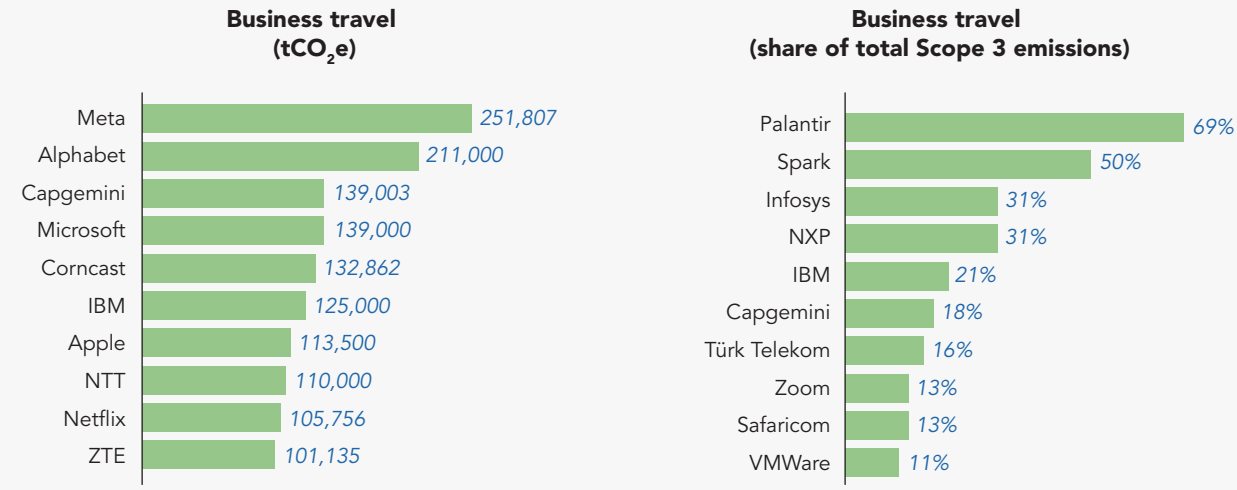


2.2.6 Business travel

Category 6 covers Business travel undertaken by company employees. It recorded the highest level of disclosure, with 111 companies (84 per cent of those disclosing Scope 3 emissions) reporting emissions for this category. Companies face fewer challenges disclosing under this category given they have records of their own travel. Emissions relate to air, rail, bus, automobile and other transportation services, as well as, optionally, accommodation. The corresponding Scope 1 and 2 emissions would be reported by transportation and accommodation companies.

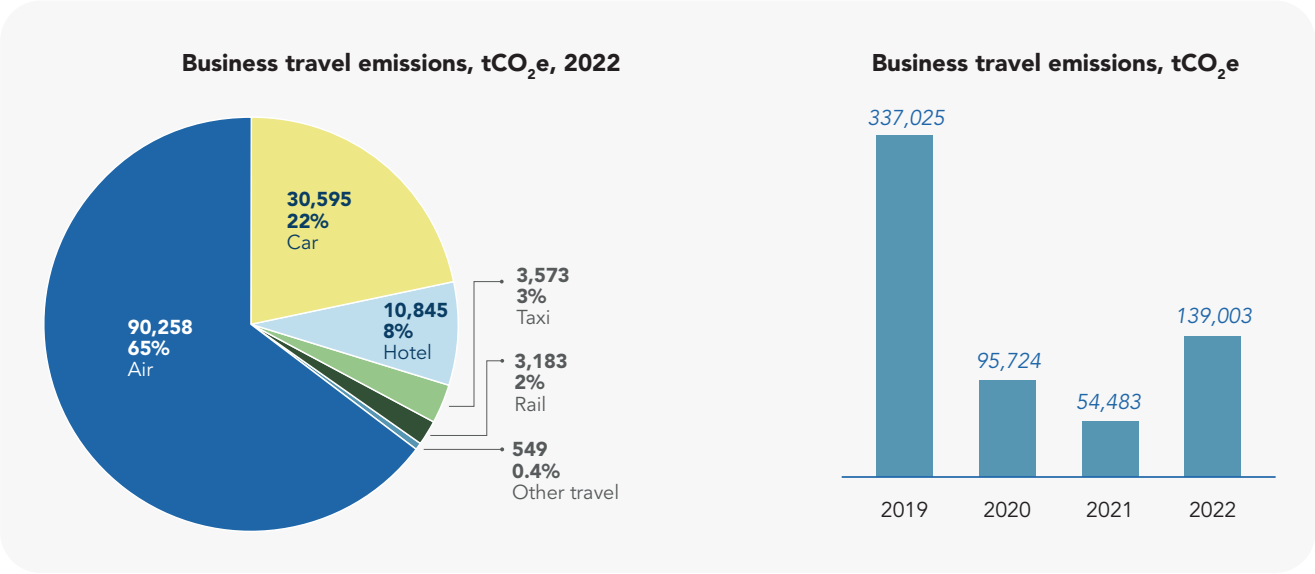
This category of emission amounts to less than 1 per cent of all Scope 3 emissions for 72 of the reporting companies. Large multinationals (e.g. Meta, Alphabet, Microsoft, etc.) have the highest business travel emissions. The companies with the highest emissions in relative terms include several software consultancies (e.g. Infosys, IBM and Capgemini).

Figure 2.13: Top 10 companies by absolute and relative emissions, Category 6 - Business travel, 2022



Capgemini, the IT consulting company with headquarters in France, provides a breakdown of its business travel emissions (Figure 2.14, left). In 2022, air travel accounted for 65 per cent of its business travel emissions, while hotel emissions, which are optional under the GHG Protocol Scope 3 guidance, accounted for 8 per cent. There was a notable drop in business travel during the COVID-19 pandemic, with emissions from this category declining 72 per cent from 2019 to 2020 (Figure 2.14, right).

Figure 2.14: Capgemini business travel emissions



Note: Other travel refers to bus, tram and motorcycle.

Source: Capgemini. 2023. *Environmental Sustainability Performance Report 2022/23*. https://www.capgemini.com/wp-content/uploads/2023/07/ES-Report-25th-July-i-2023.pdf

Box 2.3. Intel employee business travel

Intel employee business travel contributes 33 000 metric tCO_2e, including emissions from air travel, car rentals and hotel stays.[42] Interestingly, Intel operates its own fleet of planes for inter-office commuting, which is reported under Scope 1 emissions. Intel had previously operated 13 flights daily, allowing employees to travel between offices in Oregon, California, and Arizona, before lowering the schedule to eight flights after the COVID-19 pandemic.

42 Intel. 2023. *2022-23 Corporate Responsibility Report*. https://csrreportbuilder.intel.com/pdfbuilder/pdfs/CSR-2022-23-Full-Report.pdf

2.2.7 Employee commuting

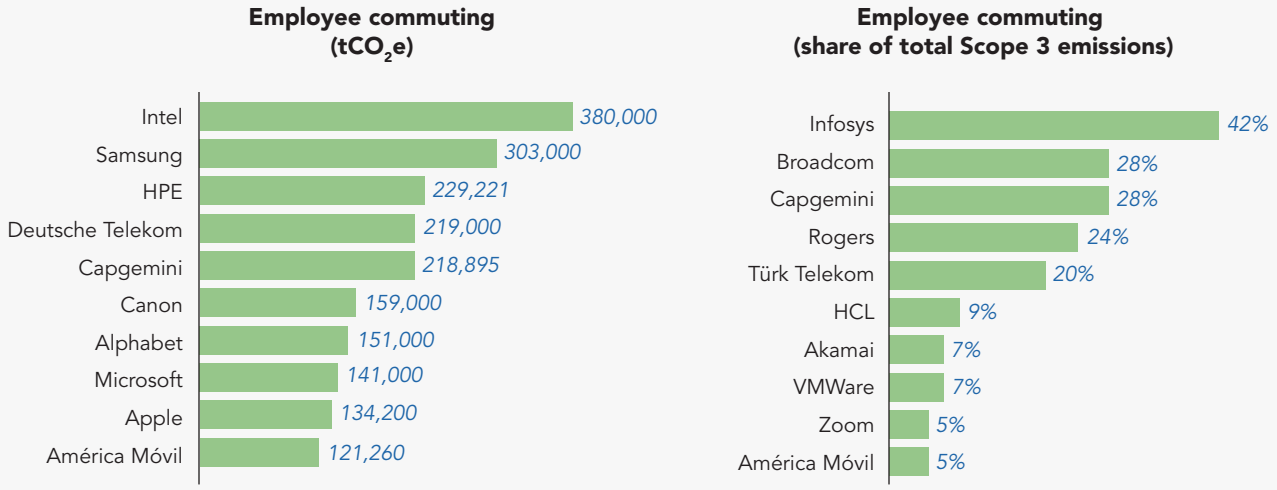
Category 7 covers the transportation (e.g. driving, public transport, etc.) emissions of employees from their home to the company worksites. Reporting companies can optionally include the emissions of employees working from home in this category. Corresponding Scope 1 and 2 emissions are those of the employees or transportation companies. The GHG Protocol lists three methods for calculating employee commuting: 1) fuel-based, where the amount of fuel used for commuting is multiplied by the appropriate emission factor for that fuel (e.g. petrol or diesel); 2) distance-based, where data are collected from employees on commuting patterns and emission factors for the modes of transport used are applied; and 3) an average, where employee commuting is based on national commuting. Elisa, the telecommunication operator with headquarters in Finland, uses the second method by having its employees complete an annual commuting survey, which also asks how many days they worked from home.[43]

Note that work-from-home emissions would be affected by the regions the companies operate in as heating and cooling of homes depend on the climate.

Some 97 companies reported this category or 76 per cent of all companies disclosing a breakdown of Scope 3 emissions. This is a lower share than business travel, likely because it is more complex to calculate (e.g. often requiring a survey of employee commuting habits).

Companies recording the highest employee commuting emissions have large numbers of staff: of the top ten, all but one have over 100 000 employees (Figure 2.15, left).

Figure 2.15: Top 10 companies by absolute and relative emissions, Category 7 - Employee commuting, 2022



Indian-headquartered Infosys leads in relative emissions, with employee commuting accounting for 42 per cent of its total Scope 3 emissions. A major reason is that it includes work-from-home emissions in its reporting.[44] Notably, company commuting emissions rose during the COVID-19 pandemic, owing to the large number of staff working from home (Figure 2.16, left). In 2022, work-from-home emissions accounted for 78 per cent of Infosys employee commuting emissions. Companies should include their work-from-home emissions and

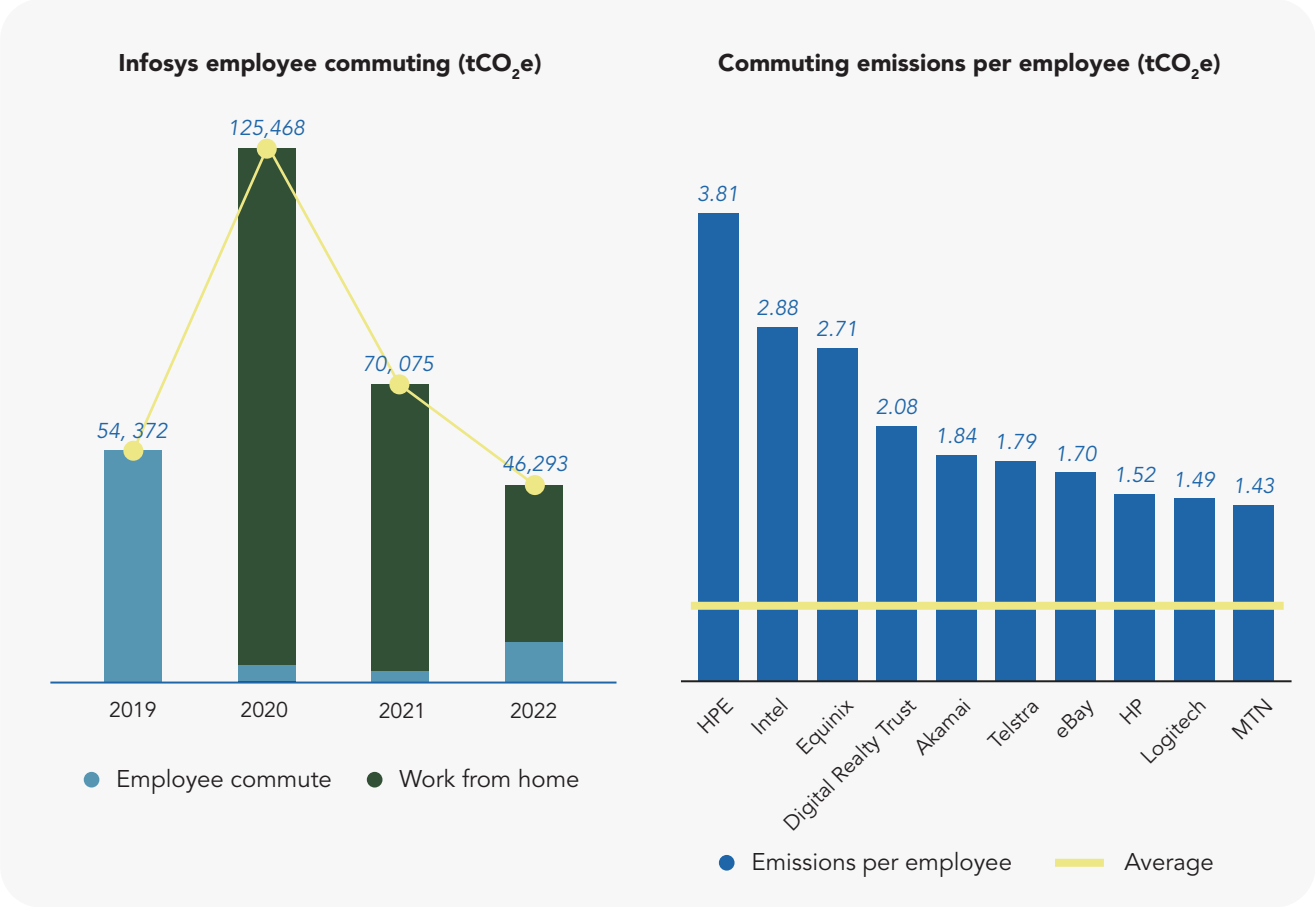
43 Elisa. 2023. *Elisa ESG Disclosure 2023*. https://static.elisa.com/v2/image/2tqybbhjs47b/1RbxX6mps0S5cgmUfwkszH/Elisa_ESG_Disclosure_2023%201.pdf

44 It is worth noting that one reason this category is high for Infosys is that it discloses seven Scope 3 categories and does not explicitly state whether the others are not relevant. See: https://www.infosys.com/sustainability/documents/infosys-esg-databook-2022-23.pdf

disclose it separately in order better to understand this category.

Another relevant metric for this category is average commuting emissions per employee. Among digital companies reporting this category the figure was 0.65 tCO_2e in 2022 (Figure 2.16, right).

Figure 2.16: Infosys employee commuting emissions; and top 10 companies by commuting emissions per employee, 2022



Note: In the right chart, the line represents the average of all companies reporting the data.

Source: Company reports.

2.2.8 Upstream leased assets

Category 8 covers emissions from the reporting company (the lessee) use of assets owned by another company (the lessor). Emissions from this category should correspond to the Scope 1 and 2 emissions of the lessor. There is a risk with this category that lessors count their emissions under Category 13 (downstream leased assets), meaning that there are no corresponding Scope 1 and 2 emissions, unless lessees report these emissions as their own Scope 1 and 2 emissions rather than under this category. Another consideration is that some reporting companies account for these emissions as Category 1 supply-chain emissions.

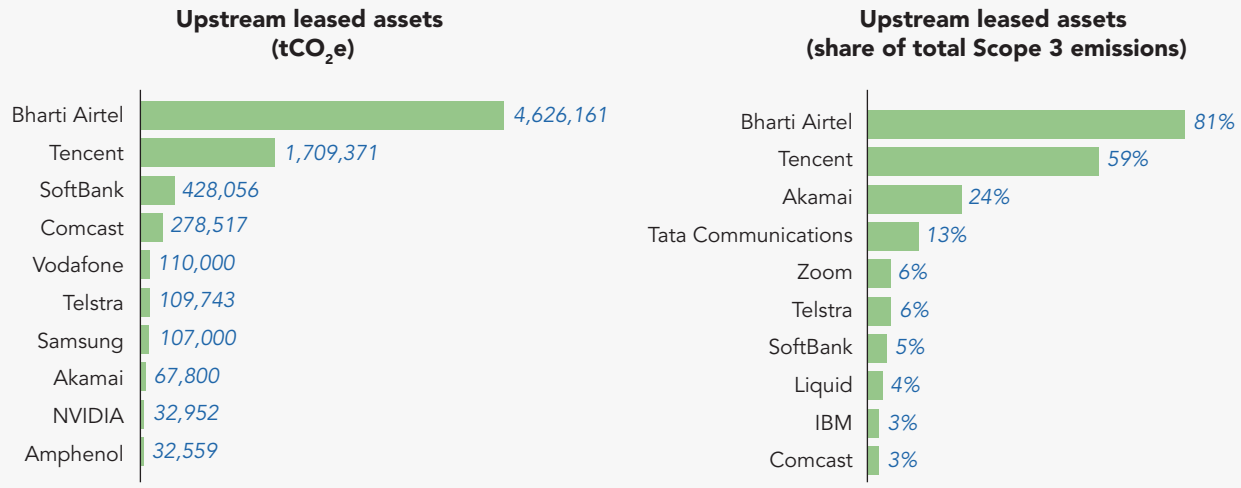
Examples of Category 8 include emissions from the use of data centres or towers. The user lessee reports these emissions under this category, while the data centre operator or tower company should then report them as their Scope 1 and/or 2 emissions.

Companies with the highest emissions in this category include telecommunication operators, owing to their

use of tower company facilities for their base stations. India's Bharti Airtel has the highest emissions among digital companies by some margin for this category, due to its large number of mobile subscribers and its heavy use of towers supplied by other companies.[45]

In addition, there is a high electricity-grid emission factor (tCO_2/MWh) in India. This is also the case in China, which is likely why Tencent has the second highest emissions in this category.[46]

Figure 2.17: Top 10 companies by absolute and relative emissions, Category 8 - Upstream leased assets, 2022



2.2.9 Downstream transportation and distribution

Category 9 covers emissions from the transportation and distribution of products sold by the reporting company in order to reach the end user, corresponding to the Scope 1 and 2 emissions reported by freight and logistics companies. Some 43 companies reported this category while 26 did not consider it relevant.

eBay, the consumer-to-consumer e-commerce company, has the highest absolute and relative emissions in this category (Figure 2.18), as it absorbs the transport emissions for the goods that consumers buy and sell over its platform. eBay has a target to reduce these emissions and is working with logistics providers to provide low- or no-carbon transportation options.[47]

GoTo, a ride-hailing and e-commerce company in Indonesia, ranks second in relative emissions for this category. GoTo notes that emissions in this category relate to the delivery of products from its Tokopedia e-commerce platform, unless they were delivered by its ride-hailing service (Gojek), in which case they are disclosed under Category 11, use of sold products.[48] Alternatively, emissions could be accounted for by online shoppers, which appears to be the assumption of other e-commerce companies that do not disclose or do not consider this category relevant.

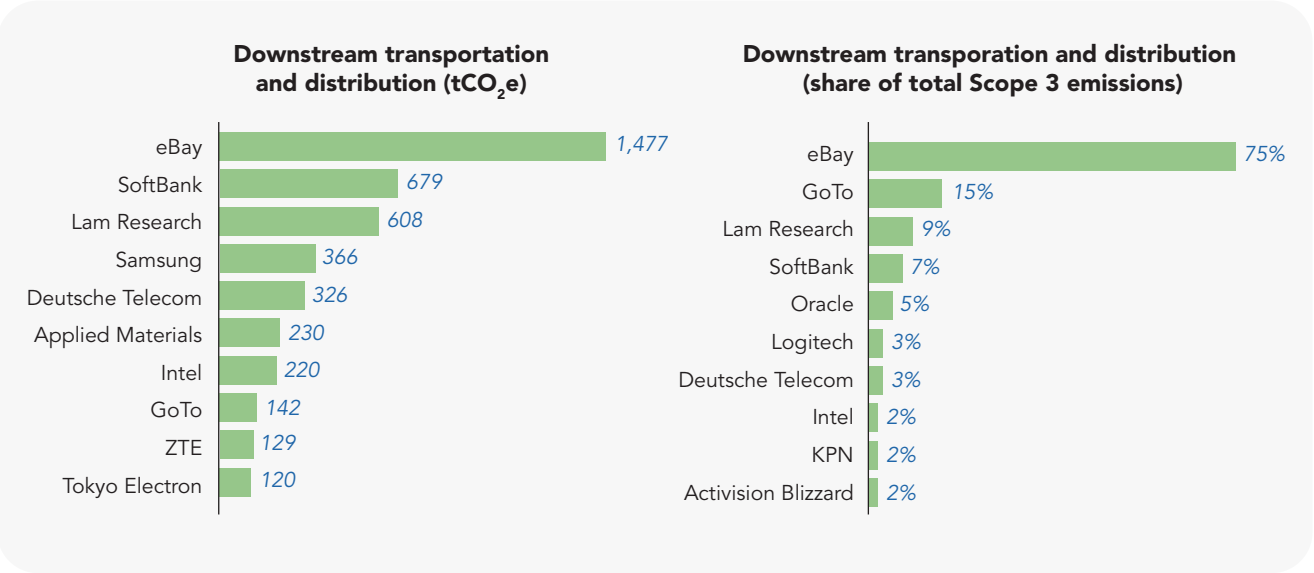
45 Diesel use by tower companies in India appears lows accounting for just 0.3 per cent of the country total in 2021. Source: CRISIL. 2022. *All-India study on sectoral demand for petrol and diesel*. https://ppac.gov.in/uploads/whatsnew/1663838452_ExecutiveSummarySectoralConsumptionStudy.pdf

46 Tsukui, A., Louhisuo, M., and Azuma, M. 2024. *List of Grid Emission Factors, version 11.4*. Institute for Global Environmental Strategies. https://www.iges.or.jp/en/pub/list-grid-emission-factor/en

47 https://www.ebayinc.com/stories/news/science-based-targets-initiative-approves-ebays-ambitious-goal-to-reduce-scope-1-and-2-carbon-emissions-90-by-2030/

48 https://assets.tokopedia.net/asts/GoTo%20Sustainability%20Report%202022_Final.pdf

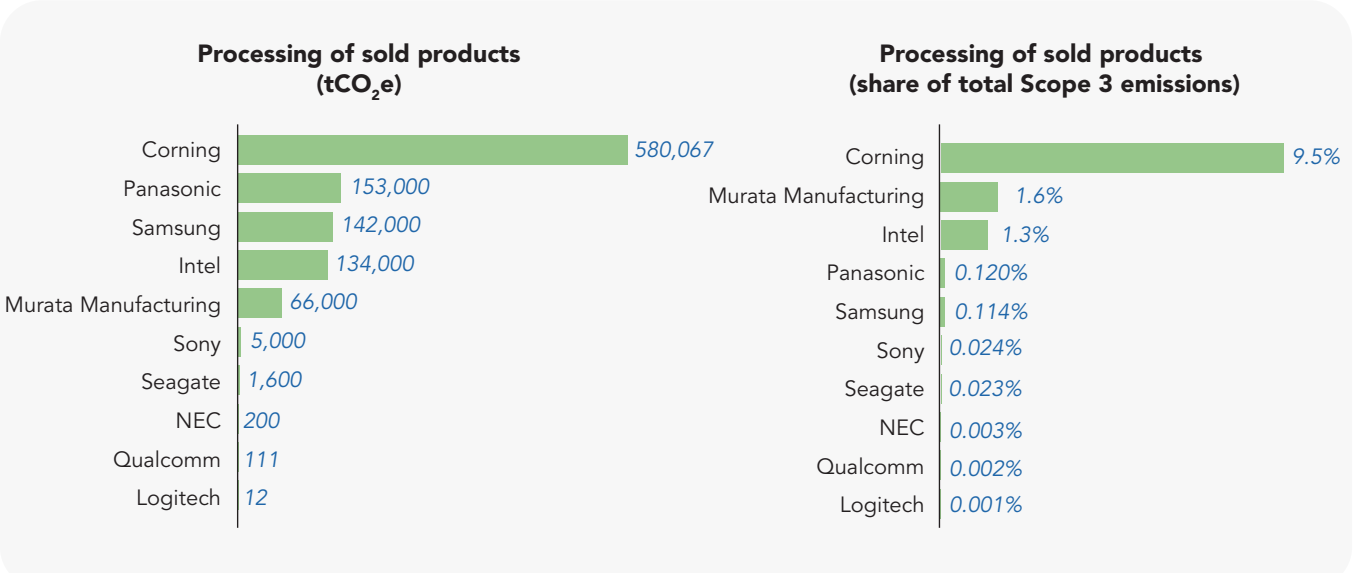
Figure 2.18: Top 10 companies by absolute and relative emissions, Category 9 - Downstream transportation and distribution, 2022



2.2.10 Processing of sold products

Category 10 is used by the reporting company to account for emissions attributable to intermediate goods that require further processing, such as incorporation into another product, e.g. placing a semiconductor in a smartphone or a disk drive in a computer. The counterpart Scope 1 and 2 emissions are generally those of the manufacturer that produced the good. This category appears to be largely immaterial for most digital companies with around 50 stating it is not relevant/applicable. Only 10 companies (all manufacturers) report this category, the second lowest level of disclosure after Category 14, franchises.

Figure 2.19: Top 10 companies by absolute and relative emissions, Category 10 - Processing of sold products, 2022



2.2.11 Use of sold products

Category 11 covers emissions from use of goods and services sold by the reporting company in the reporting year. A reporting company Scope 3 emissions from use of sold products correspond to the Scope 1 and 2 emissions of end users of the product (other organizations) and use emissions from consumers. Products included are those that directly consume energy (fuel or electricity) during their use. There are two main parties in respect to Scope 1 and 2 attribution for this category: products used by companies would be accounted for in their operational emissions – for instance, the use of network equipment, such as mobile base stations, would be accounted for under the Scope 1 and 2 emissions of telecommunication operators; on the other hand, the use of devices such as smartphones and computers by consumers would be reflected in their Scope 1 and 2 emissions, largely reflecting the electricity used to power the devices (or recharge their batteries).

One challenge is that some companies calculate emissions based on the current year, while others include the emissions of the product over its entire lifetime. The GHG Protocol states that the manufacturer of the product should include the total lifetime use emissions for products sold during the reporting year.[49] However, the corresponding Scope 1 and/or 2 emissions of an end user company, would only include their reporting year emissions.

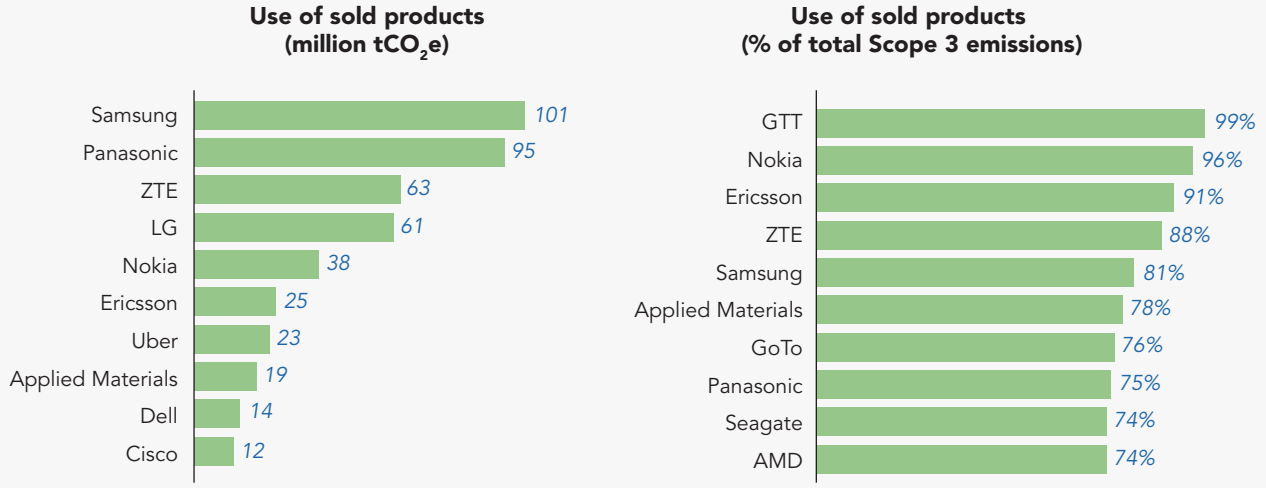
Another challenge is the potential for multiple companies to report this category for the same product. This is allowed under the GHG Protocol on the grounds that each party has different and often mutually exclusive opportunities to reduce emissions throughout society. For instance, the manufacturer of a smartphone, retailer of the smartphone (including telecommunication operators) and creator of the applications running on the smartphone could all claim the same product use emissions for the device.

Hardware manufacturers are among the highest emitters in this category given that they make electrical equipment that consumes electricity (and also diesel fuel in the case of network equipment manufacturers such as Ericsson, Nokia and ZTE). Another reason for their high emissions is that they generally report lifetime use emissions for products they produce in the reporting year.

Notably, Uber and GoTo rank absolutely and relatively high in this category because of petrol emissions from ride-hailing and food-delivery vehicles used by their drivers. One outlier is Tier 1 network provider GTT which ranks first in the proportion of emissions from Category 11. Its emissions largely arise from transporting data for its users over its optical fibre network from one location to another, which would not appear to result in significant emissions.

49 For instance, Cisco notes in 2023 it changed its emissions for product use from the annualized emissions of products currently in use to being the lifetime emissions of products only sold during the reporting year. This impacted its target reporting. https://www.cisco.com/c/m/en_us/about/csr/esg-hub/environment/goals.html

Figure 2.20: Top 10 companies by absolute and relative emissions, Category 11 - Use of sold products, 2022



Ericsson, the telecommunication equipment manufacturer with headquarters in Sweden, has among the highest absolute and relative product use emissions from the use of its telecommunication equipment. These emissions accounted for 91 per cent of the company total Scope 3 emissions in 2022. It has taken various measures to reduce product use emissions.[50] A priority has been improved energy efficiency of its hardware and software. Here it seeks to ensure that the deployment of 5G networks does not lead to an increase in energy consumption. Ericsson also notes that customers have a role to play by procuring renewable energy for their networks and assists customers integrating off-site renewable energy generation at base station sites. The company has an internal target to reduce energy consumption of new mobile base stations by around 40 per cent by 2025 from a 2021 baseline, and a new Science Based Targets initiative (SBTi) target calls for reducing absolute Scope 3 emissions by 50 per cent between 2022 and 2030.

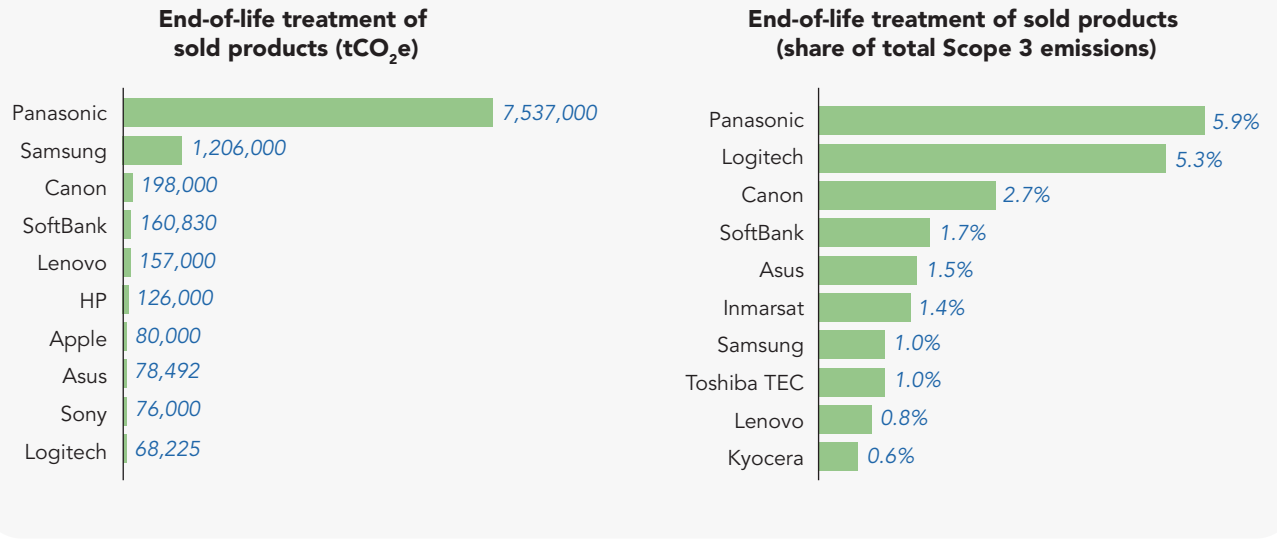
2.2.12 End-of-life treatment of sold products

Category 12 covers emissions from the waste disposal and treatment of products sold by the reporting company at the end of their lifecycle. It differs from Category 5, waste generated in operations, which refers to a company waste. Category 12 is mainly applicable to hardware companies which manufacture goods such as mobile phones, computers and network devices. It can also apply to telecommunication companies that sell or lease devices, creating potential overlap between manufacturers and telecommunication service providers. As under Category 5, the corresponding Scope 1 and 2 emissions would be accounted for by waste management companies or recyclers.

Some 48 companies disclosed data under this category, with the highest reported emissions being from companies that manufacture equipment. This also holds true in relative terms, except for Japanese-headquartered group Softbank, whose high share of emissions likely reflects devices sold and/or leased by its telecommunication operator subsidiary.

50 Ericsson. 2023. *Sustainability and Corporate Responsibility Report 2022*. https://www.ericsson.com/en/about-us/sustainability-and-corporate-responsibility/sustainability-report/sustainability-metrics/previous-scr-reports-and-other-publications

Figure 2.21: Top 10 companies by absolute and relative emissions, Category 12 - End-of-life treatment of sold products, 2022



End-of-life treatment has environmental implications beyond emissions. For instance, there are hazardous materials in waste electronic equipment (e-waste) and recoverable minerals. ITU along with other United Nations agencies report that 62 million tonnes of e-waste was produced in 2022, up 82 per cent from 2010.[51] This includes valuable resources squandered or dumped. GSMA estimates there are five billion unused mobile phones around the world containing significant amounts of copper, silver, gold and cobalt.[52] It has called for a commitment from telecommunication operators to repair, reuse or recycle 100 per cent of the used mobile devices that they recover. Extended producer responsibility (EPR) obliges manufacturers to manage the entire lifecycle of their products, particularly at the end of their useful life. For example, AT&T have a trade-in and recycling programme under which they collaborate with certified e-waste recyclers to handle used mobile devices, thereby achieving higher recycling rates and ensuring compliance with environmental regulations.[53]

Reuse produces far higher carbon savings than recycling, while incineration and landfilling create emissions.[54] Vodafone, the United Kingdom-headquartered telecommunication group, remarks that a refurbished smartphone saves around 50 kg CO_2e or 87 per cent less than a new smartphone.[55] A reused smartphone also avoids the extraction of 77 kg of raw materials. Apple prioritizes the end-of-life design of their products, making them easier to disassemble, recycle or repurpose. Through the Apple Trade In programme, customers can return old devices for credit or free recycling, supporting resource conservation. Apple also uses innovative robots like Daisy and Dave for disassembly and recycling, achieving high standards in material recovery.[56]

51 C. P. Baldé, et al., 2024. International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR). 2024. Global E-waste Monitor 2024. Geneva/Bonn. https://ewastemonitor.info/the-global-e-waste-monitor-2024/

52 GSMA. 2024. *Mobile Net Zero 2024: State of the Industry on Climate Action.* https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/wp-content/uploads/2024/02/Mobile-Net-Zero-2024-State-of-the-Industry-on-Climate-Action.pdf

53 AT&T. n.d. "Recycle or Trade-In Old Devices." Accessed August 5, 2024. https://www.att.com/support/article/wireless/KM1041824/.

54 Elretur. n.d. "Reuse Doubles CO_2 Savings Compared to Recycling." Accessed August 5, 2024. https://elretur.dk/en/more-reuse/reuse-doubles-co2-savings-compared-to-recycling/.

55 Vodafone. 2022. "Vodafone and WWF Announce Global Partnership." *News*, November 22, 2022. https://www.vodafone.com/news/protecting-the-planet/vodafone-wwf-announce-global-partnership.

56 Apple. 2022. Product Environment Report iPhone 14. https://www.apple.com/environment/pdf/products/iphone/iPhone_14_PER_Sept2022.pdf

Reuse and recycling rates for telecommunication operators that disclose this information are shown below. In addition, 16 operators, representing over a billion mobile connections, have committed to two GSMA circularity targets: achieving specific takeback rates by 2030; and ensuring that no devices are sent to landfill or incineration.[57]

Table 2.2: Devices recovered by telecommunication operators, 2022

	Materials recovered		Reused	Recycled	Landfill
	Amount	Unit			
AT&T			89%	11%	0%
BCE	2 326 681	Devices			
KT	5 652	Metric tons		40%	
KPN	7 478	Metric tons			
Telenor	486 200	Devices	68%	32%	0%
Singtel	2 502	Metric tons	0%	84%	0.2%

Source: Company reports.

2.2.13 Downstream leased assets

Category 13 covers emissions from assets owned by the reporting company (lessor) leased to the users of the assets (lessees). Emissions under this category should correspond to the Scope 1 and 2 emissions of the lessees; there is a risk, however, that lessees count their Category 13 emissions under Category 8 (upstream leased assets), meaning that there are no corresponding Scope 1 and 2 emissions (unless lessors report these emissions as their own Scope 1 and 2 emissions), leading to potential double counting.

ITU, GSMA and GeSI guidance underscores this issue:

> "Whenever an organization accounts for an emission under Scope 3 it is important that this emission also be reported by another organisation as either Scope 1 or 2. For most Scope 3 Categories, this matter is often clear, and the allocation occurs automatically. However, in the case of Categories 8 and 13, this allocation is often not straightforward and may, on occasion, either not occur at all, or may lead to a double counting of Scope 1 or 2 emissions."[58]

The ITU, GSMA and GeSI guidance recommends that the lessor and lessee companies agree on how the emissions should be allocated and include carbon-accounting arrangements in the lease contract in order to mitigate discrepancies.

Some 22 companies disclosed data for this category while 40 reported that it was not relevant/ applicable.

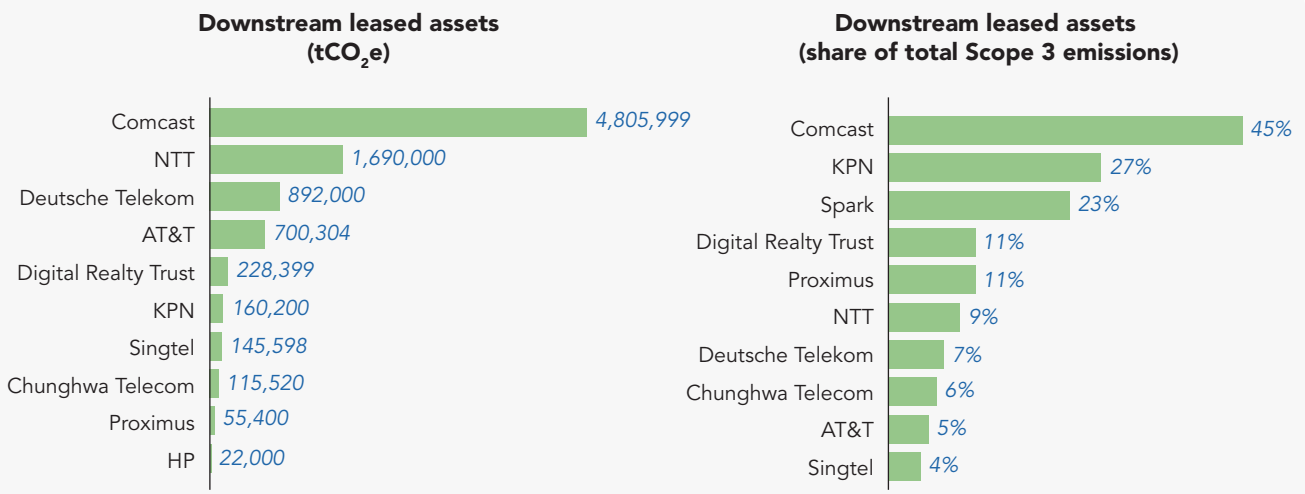
57 GSMA. n.d. "Reuse, Refurbish, Recycle." External Affairs (blog). Accessed August 5, 2024. https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/reuse-refurbish-recycle/.

58 GSMA, GeSI and ITU. 2023. *Scope 3 Guidance for Telecommunication Operators*. https://www.itu.int/en/action/environment-and-climate-change/Documents/publications/2023/Scope-3-Guidance-2023.pdf

This category of emission is reported by tower companies, data centre operators and telecommunication operators to account for customer emissions. Spark New Zealand, for example, includes emissions from "electricity use on-billed to customers in many of our data centres we host customer equipment. This equipment draws electricity which is on-billed to our hosted customers."[59] On the other hand, Equinix, the world's largest data centre operator, accounts for customer energy use within its own operational emissions rather than under Category 13.[60] American Tower reports that it includes customer energy use in Category 13,[61] but it does not provide a breakdown of its Scope 3 emissions in its publicly available reporting. Comcast uses this category to report emissions from customer leased devices (e.g. set-top boxes) and subscription-based services.[62] Note that some other companies classify end-user device emissions under Category 11 (use of sold products).

Companies with the highest emissions in this category consist largely of telecommunication companies, likely due to reporting of emissions for devices leased to customers. It also includes telecommunication operators with large data centre operations.

Figure 2.22: Top 10 companies by absolute and relative emissions, Category 13 - Downstream leased assets, 2022



2.2.14 Franchises

Category 14 covers emissions from franchises (e.g. companies with a license to sell or distribute the reporting company goods or services), corresponding to the Scope 1 and/or 2 emissions of the franchisees.

Franchise emissions appear to be largely irrelevant, with only a few companies reporting under this category and most declaring it as being not relevant/applicable. Only seven companies (5 per cent of those with Scope 3 emission breakdowns) report this category. It is also the Scope 3 category with the

59 Spark New Zealand. 2023. *Greenhouse Gas Inventory Report 2023*. https://www.sparknz.co.nz/content/dam/SparkNZ/pdf-documents/governance/Greenhouse_Gas_Inventory_Report_(2023).pdf

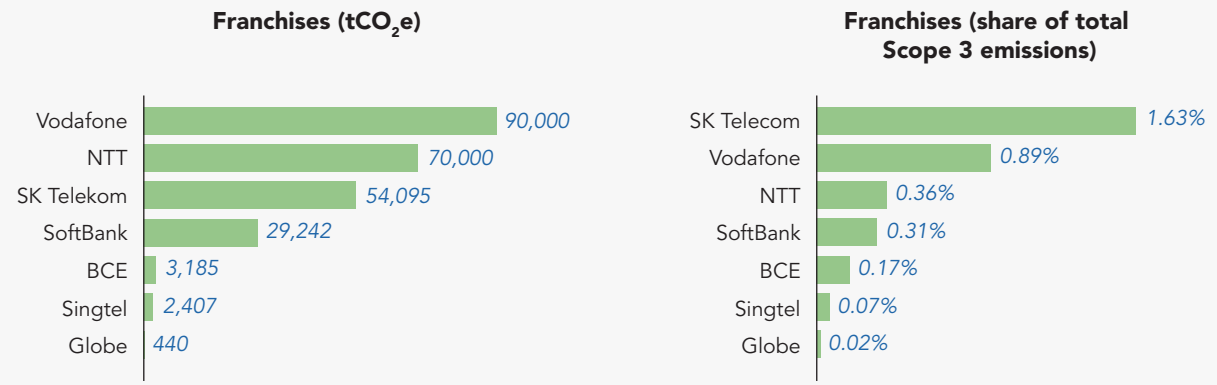
60 CDP. 2023. *Equinix, Inc. – Climate Change 2023*. https://sustainability.equinix.com/wp-content/uploads/2023/09/Equinix_CDP2023.pdf

61 American Tower Corporation. 2022. *Sustainability Report 2022*. https://www.responsibilityreports.com/HostedData/ResponsibilityReports/PDF/NYSE_AMT_2022.pdf

62 CDP. 2023. *Comcast Corporation – Climate Change 2023*. https://www.cmcsa.com/static-files/70d9bc07-c7aa-492b-938f-84ca42f90890

lowest overall emissions among companies reporting breakdowns. Among those which disclose this category (all telecommunication operators), it accounts for less than 1 per cent of total Scope 3 emissions in six of the seven companies, and just 1.6 per cent in the other. Franchisees are largely independent stores that market the company products.[63]

Figure 2.23: Companies by absolute and relative emissions, Category 14 - Franchises, 2022



2.2.15 Investments

Category 15 was intended primarily for financial institutions to report the Scope 1 and 2 emissions of their investees (e.g. "financed emissions"[64]). However, it is used by digital companies to account for the emissions of the companies in their investment portfolio where they do not have a controlling interest. These investees' emissions are not accounted for by the reporting company in its own Scope 1 and 2 emissions. On the other hand, subsidiaries where the company has a controlling stake would be included in the company Scope 1 and 2 emissions.

The leading company in both absolute and relative terms is Japanese-headquartered Rakuten, which reports emissions from investments and loans relating to the financial side of its business (i.e. Rakuten Bank, Rakuten Card, Rakuten General Insurance and Rakuten Life Insurance). Vodafone has the second largest absolute emissions in this category, due to investments in over a dozen joint ventures where it does not have a controlling stake.[65]

Mexican-headquartered telecommunication operator América Móvil illustrates how the change of a subsidiary status altered the way it accounted for emissions. In 2022, it lost operational control of Claro Chile, whose emissions were then transferred from Scope 1 and 2 and captured under Category 15.[66]

The highest share of Scope 3 emissions for telecommunication operator Singtel (Singapore) is under Category 15 (35 per cent). Investments that Singtel has in four telecommunication operators have been included since it does not have operational control of any of them ("regional associates"). The four investees account for 89 per cent of Singtel investment emissions (Table 2.3). Notably, the regional associates' emissions exceed Singtel Scope 1 and 2 emissions (1.1 million tonnes versus 0.5 million tonnes). It is worth noting that the four companies are within scope of this report.

63 Vodafone. n.d. "Vodafone Franchise Opportunities." Accessed 9 August 2024. https://www.vodafone.co.uk/mobile/franchise
64 Wrighton, B. 2024. *Financed emissions: What is PCAF and why is it the industry gold standard?* Ecoact. https://eco-act.com/blog/pcaf-financed-emissions/
65 Vodafone. 2024. "Vodafone Group Holding Structure" Accessed 9 August 2024. https://investors.vodafone.com/~/media/Files/V/Vodafone-IR/documents/performance/financial-results/2025/vodafone-group-holding-structure-30-07-2024.pdf
66 América Móvil. 2022. *Sustainability Report 2022*. https://sustentabilidad.americamovil.com/portal/su/pdf/2022-Sustainability-Report.pdf

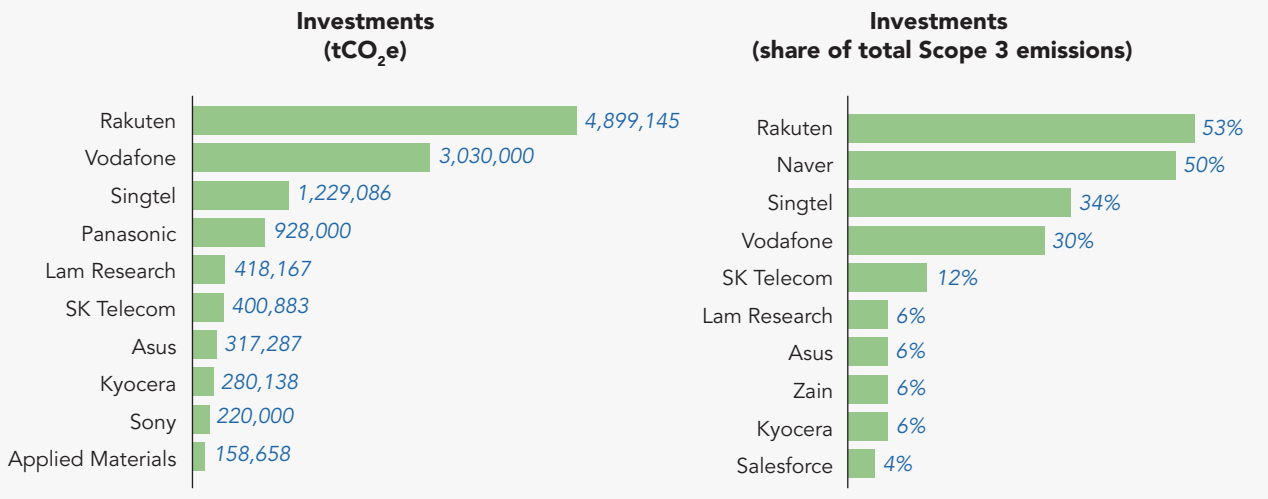
Table 2.3: Singtel investment emissions, 2022

Company	HQ	Scope 1 and 2 emissions	Singtel ownership	Singtel share of emissions
AIS	Thailand	675 497	23%	155 364
Bharti Airtel	India	1 066 045	29%	313 417
Globe	Philippines	562 408	22%	125 417
Telkomsel	Indonesia	1 431 092	35%	500 882
Sub-total				**1 095 081**
Singtel Category 15 emissions				1 229 086
Other Investment emissions				134 005

Source: https://cdn.aws.singtel.com/sustainabilityreport/2023/download/01-sub-section-pdfs/02-Climate-Change-and-Environment/2-Climate-Change/Singtel-Group-SR2023-Climate-Change.pdf

Some 27 companies disclose investment emissions or a fifth of those reporting a breakdown of Scope 3 emissions. Given the large number of investments without a controlling stake that many digital companies have, it is surprising that so few report this category. Perhaps they mistakenly believe that it is only oriented towards financial institutions and therefore not relevant.

Figure 2.24: Top 10 companies by absolute and relative emissions, Category 15 - Investments, 2022



2.3 Scope 3 targets

While 103 digital companies covered in this report have submitted an emissions reduction target to SBTi, only 73 have a Scope 3 target. Of those, the scope, quality and transparency of Scope 3 targets vary:

- Some companies do not specify an emissions reduction for Scope 3 but rather commit to suppliers increasing their renewable energy use.
- Some companies restrict their Scope 3 emissions reduction target to only certain categories.
- Some companies use an intensity-based target making it impossible to estimate the end year absolute emissions reduction. While the intensity-based target may be improving, absolute emissions could still be rising.
- Some companies do not provide the base year emissions needed to track the target. Base year emissions often need to be restated due to corporate actions (e.g., mergers, acquisitions, sales of subsidiaries, etc.); improved estimation routines for calculating Scope 3 emissions which then should be applied to previous years; or because the original base year emissions data did not include all relevant categories.
- Some companies have a Scope 3 target even though they do not disclose Scope 3 emissions.

After adjusting for the limitations above, there are only 27 digital companies (i.e., only 14 per cent of the 200 assessed) with a non-intensity based Scope 3 target that covers all relevant categories and for which the base year emissions can be determined (Table 2.4). Eighteen companies are on track with their target with a reduction in Scope 3 emissions from the base line. Scope 3 emissions are rising in the other 9 companies. In aggregate, if companies meet their Scope 3 target, there should be an emissions reduction of 42 per cent (from 180 million tonnes in the base year to 104 by the target year). Nonetheless, it should be borne in mind that the vast majority of digital companies have no or a non-measurable Scope 3 target.

Table 2.4: Companies with measurable Scope 3 targets, 2023

Company	Scope 3 Baseline year	Scope 3 Target (end) year	Scope 3 Reduction (%)	Number of years	Reduction per year	Scope 3 Base year emissions tCO_2e mln	Scope 3 2022 emissions tCO_2e mln	Change from baseline (%)	Change per year	Emissions in target year tCO_2e mln
América Móvil	2019	2030	-14%	11	-1%	4.0	2.7	-32%	-11%	3.4
Apple	2019	2030	-62%	11	-6%	25.0	20.6	-18%	-6%	9.5
Bharti Airtel	2021	2031	-42%	10	-4%	5.4	5.7	5%	5%	3.1
Chunghwa Telecom	2021	2030	-22.5%	9	-3%	1.9	1.8	-5%	-5%	1.5
Elisa	2021	2030	-42%	9	-5%	0.2	0.2	12%	12%	0.1
Far EasTone	2021	2030	-42%	9	-5%	0.4	0.4	-17%	-17%	0.3
HCL	2020	2030	-42%	10	-4%	0.3	0.3	-20%	-10%	0.2
HP	2019	2030	-50%	11	-5%	27.2	26.9	-1%	-0.4%	16.0

Company	Scope 3 Baseline year	Scope 3 Target (end) year	Scope 3 Reduction (%)	Number of years	Reduction per year	Scope 3 Base year emissions tCO_2e mln	Scope 3 2022 emissions tCO_2e mln	Change from baseline (%)	Change per year	Emissions in target year tCO_2e mln
HPE	2020	2030	-42%	10	-4%	8.6	9.5	10%	5%	5.0
Infosys	2020	2025	-12.5%	5	-3%	0.2	0.2	-15%	-7%	0.2
KPN	2014	2025	-20%	11	-2%	0.9	0.6	-37%	-5%	0.8
Kyocera	2020	2030	-46.2%	10	-5%	5.4	5.0	-6%	-3%	2.9
Logitech	2021	2030	-50%	9	-6%	1.6	1.3	-22%	-22%	0.8
Millicom	2020	2035	-20%	15	-1%	1.6	1.6	0%	0%	1.3
Murata	2019	2030	-28%	11	-3%	4.2	3.9	-8%	-3%	3.0
Nokia	2019	2030	-50%	11	-5%	39.3	39.5	0%	0%	19.6
Orange	2018	2025	-14%	7	-2%	5.8	7.1	21%	5%	5.0
Proximus	2020	2030	-60%	10	-6%	0.5	0.5	-1%	-1%	0.2
Qualcomm	2020	2030	-25%	10	-3%	2.8	6.4	132%	66%	2.1
SAP*	2016	2025	-40%	9	-4%	9.2	10.7	16%	3%	5.5
Seagate	2017	2025	-20%	8	-3%	7.5	7.0	-7%	-1%	6.0
SK Telecom	2020	2030	-22.3%	10	-2%	6.9	3.3	-52%	-26%	5.4
SoftBank	2020	2030	-14.8%	10	-1%	3.1	9.4	200%	100%	2.7
Telefonica	2016	2030	-56%	14	-4%	2.9	1.9	-32%	-5%	1.3
Telstra	2019	2030	-50%	11	-5%	2.6	1.8	-31%	-10%	1.3
Tencent	2021	2030	-30%	9	-3%	3.4	2.9	-14%	-14%	2.4
Vodafone	2020	2030	-50%	10	-5%	9.4	10.1	8%	4%	4.7
Total						**180**	**181**	**0.4%**		**104**

Source: Adapted from SBTi and company reports.

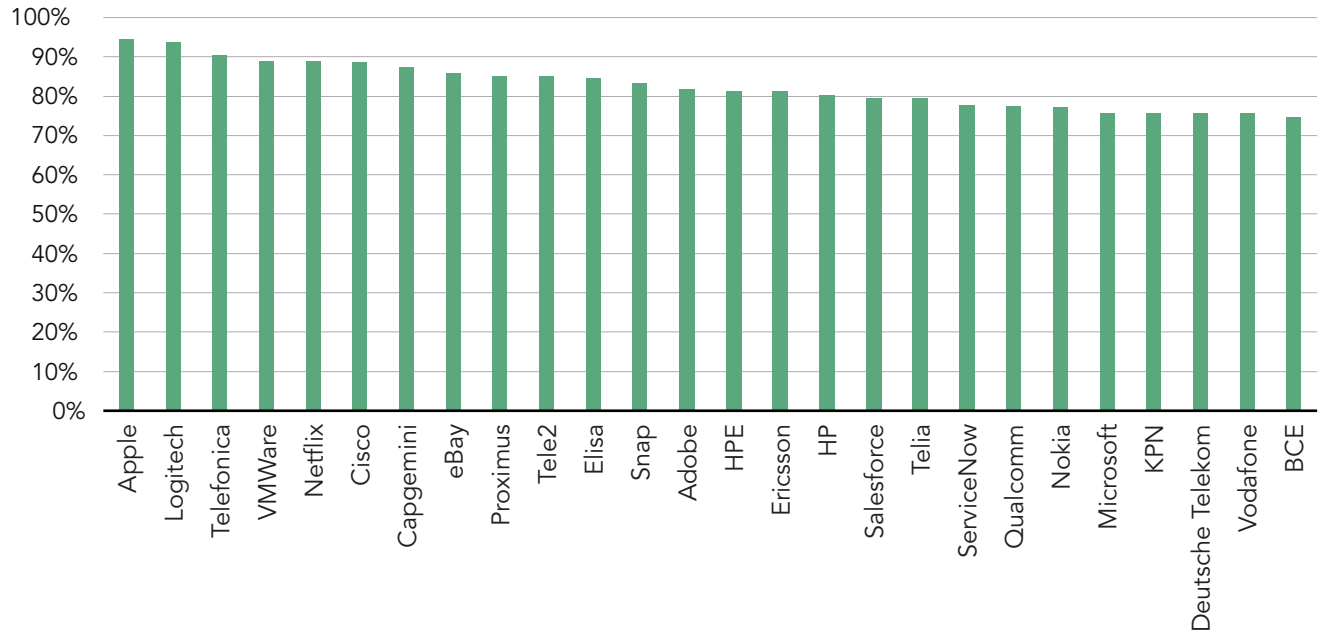
3

Assessment

Each edition of the *Greening Digital Companies* reports has assessed companies on their data disclosure, targets and performance (see Section 6.1). This year the assessment criteria have been modified to only accept emissions reduction targets that have been submitted and validated to the Science Based Target initiative (SBTi). One reason is that the SBTi standardizes disclosure of the target elements, enhancing comparability and transparency. Another reason is that SBTi validation ensures that the target is aligned with the sector's reduction for achieving the goals of the Paris Agreement. Finally, a validated SBTi target *commits* the company to its stated emissions reduction.

No company achieved the highest possible score on the assessment. Three companies scored over 90 per cent (Apple, Logitech and Telefonica). Despite the more stringent target criteria, 26 companies achieved a score of 75% or higher, up four from last year's assessment. Notably, these 26 top performing companies are all headquartered in Europe or North America (Figure 3.1). The median score was just 36 per cent, while 27 companies scored zero. Only 70 companies achieved a passing grade of 50 per cent or above.

Figure 3.1: Companies scoring at least 75 per cent on the climate assessment



Note: VMWare was acquired by Broadcom in late 2023.

4

Conclusions

On average, corporate value chain (Scope 3) emissions account for over 80 per cent of a digital company total emissions. Although Scope 3 emissions are outside company control, companies can play an important role in influencing reductions, including through their choice of suppliers and the energy efficiency of their products. Some companies recognize this and have established reduction targets for Scope 3 emissions.

Several issues impact the measurement of Scope 3 emissions, affecting transparency and monitoring. For instance, digital companies frequently change their emission inventories, shifting what were operational emissions to Scope 3 categories or shifting emissions between Scope 3 categories. This inconsistency makes it difficult to assess whether such shifts are justified or if they are a form of "greenwashing" since Scope 3 emissions are, for the time being, often under less scrutiny than operational (Scope 1 and 2) emissions. Furthermore, most digital companies have either no or more moderate emission reduction targets for Scope 3 compared to Scopes 1 and 2.

Disclosure

While 166 companies disclose Scope 1 and 2 emissions, just 134 disclose some Scope 3 categories, and only 75 disclose all relevant Scope 3 categories. Despite an abundance of guidance, the majority of digital companies do not calculate a full Scope 3 emission inventory. This makes it impossible to assess their progress in reducing emissions across their value chain. A 2024 report by GSMA found that nearly all operators disclosing to CDP in 2023 disclosed Scope 3 emissions for that year, with close to 40 operators disclosing 10 or more categories. More than a third of operators reported emissions from all five key Scope 3 categories (1, 2, 3, 11 and 15), which account for over 90 per cent of the industry Scope 3 emissions.[67]

While efforts have been made for suppliers and others to provide data to companies to enable better calculation of Scope 3 emissions, disclosure is still lagging. Ideally, reported sums should also be publicly available to better understand emission flows among digital companies.

Targets

While 103 companies have an SBTi-endorsed target[68] for Scope 1 and 2 emissions, only 73 have some target relating to Scope 3 emissions, and of those, only 42 have committed to reducing absolute Scope 3 emissions across all categories.[69] GSMA also report in their Mobile Net Zero 2024 report that 70 mobile operators representing about 50 per cent of connections have committed to SBTi targets.[70] Given that companies are indirectly responsible for the emissions across their value chain, they should commit to targets and work with relevant parties (e.g. suppliers, utility companies, transportation companies, etc.) to achieve reductions across all categories.

Quality of targets also need to be improved. Intensity-based targets are problematic as it is impossible to measure progress towards the target year. Base year emissions should be provided every year in a company' reporting since they may need to be adjusted due to corporate reorganization or improved carbon accounting methodologies. Scope 3 targets should include all relevant categories.

Methodology

To enhance transparency, companies should provide the methodology used for their Scope 3 emissions, including the kinds of items included in categories. They could make their CDP disclosure publicly available on their own website, a practice adopted by

67 GSMA. 2024. *Mobile Net Zero 2024: State of the Industry on Climate Action.* https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/climate-action/mobile-net-zero-2024/

68 SBTi. 2023. "Scope 3: Stepping up Science-Based Action - Science Based Targets." February 20, 2023. https://sciencebasedtargets.org/blog/scope-3-stepping-up-science-based-action.

69 31 companies have a limited Scope 3 target referring only to certain categories rather than absolute emissions reductions across all categories.

70 GSMA. 2024. *Mobile Net Zero 2024: State of the Industry on Climate Action.* https://www.gsma.com/solutions-and-impact/connectivity-for-good/external-affairs/climate-action/mobile-net-zero-2024/

40 digital companies. In addition, several companies compile standalone GHG accounting reports describing how they calculate the different Scope 3 categories. This is a good practice that all digital companies should be encouraged to follow. Another best practice is third-party verification of Scope 3 emissions.

Relevance is also a concern: companies often report that a category is not relevant, without clarifying whether this means the emissions are zero or immaterial (below a certain percentage threshold). Some companies also omit categories for their own reasons rather than what the guidance calls for.

The GHG Protocol introduced the concept of market-based Scope 2 emissions several years ago. This relates to situations where a company has purchased renewable electricity but does not receive all of it at the location where it needs it. Companies are allowed to report a market-based figure that reflects the emissions adjusted by its purchase of renewable energy. However, the GHG Protocol requires that companies always disclose location-based emissions and market-based only where relevant.

Comparability

Companies have multiple options for emission allocation, hampering comparability. Some continue to use Scope 1 and 2 for emissions that could be allocated to Scope 3, while others have allocated similar emissions to a Scope 3 category. For instance, data centre operator Equinix allocates the emissions of its customers to its operational Scope 1 and 2 emissions, while another data centre operator, Digital Reality Trust, includes them as Scope 3 emissions under Category 13, downstream leased assets. MTN allocates tower emissions to purchased goods and services while other telecommunication operators either include them in their operational emissions or include them in upstream leased assets.

Another challenge is the extent of emissions to allocate to a Scope 3 category. For instance, under Category 11 (product use), producers of digital equipment are supposed to include lifetime emissions, whereas other types of digital companies report annual emissions. This category is also prone to multiple companies reporting emissions for the same product. As a result, categories cannot be aggregated to obtain a total for the digital companies.

"Disappearing" emissions are a concern when there are no countervailing Scope 1 and 2 emissions. This is particularly problematic for leased assets. For example, a tower company could report the emissions from telecommunication operators using its services under Category 13, while the operators report them under Category 8; hence, Scope 1 and 2 for these emissions are not reported by either party.

The concept of market-based emissions was first introduced under Scope 2 emission reporting, where companies are required to disclose location-based emissions, and market-based emissions only if relevant. However, some companies only disclose market-based Scope 2 emissions. This practice now extends to Scope 3 where there is often a confusing mix of location- and market-based emissions depending on the source of data for a category. Related to this is that energy use for Scope 3 categories is not required, reducing the potential for deeper analysis.

These comparability issues could be reduced by digital industry stakeholders (i.e. manufacturers, telecommunication operators, tower companies, data centre and cloud operators and IT software and service companies) agreeing on standard emission allocation principles that all digital companies should follow. In addition, as called for by the GHG Protocol, companies should also report location-based Scope 3 emissions supplemented by market-based emissions where relevant.

Third-party verification and assurance

For digital companies, Scope 3 emission data often represent the greater part of their carbon footprints. The importance of third-party verification and assurance cannot be overstated. Independent audits of Scope 3 emission data ensure accuracy, consistency and adherence to recognized standards such as the GHG Protocol. This verification process not only enhances the credibility of the reported data but also instils confidence among stakeholders. Companies such as Google and Microsoft, for example, have adopted third-party verification to validate their emission data, demonstrating a commitment to transparency and accountability. This practice helps in identifying areas for improvement and mitigating risks associated with inaccurate reporting.

Engaging stakeholders is critical for digital companies to improve Scope 3 emission transparency and reduction efforts. Investors are increasingly prioritizing environmental, social and governance (ESG) criteria, with emission data being a key component of their investment decisions. Transparent and verified emission data can attract responsible investors and enhance corporate reputation. Customers, in particular large enterprises and public sector clients, are demanding higher sustainability standards from their suppliers. By providing detailed and verified emission data, digital companies can meet customer expectations and differentiate themselves in the marketplace. Regulatory bodies are also tightening emission reporting requirements.

Emerging technologies and innovations

Emerging technologies such as blockchain and AI hold significant promise for improving Scope 3 emission management in digital companies. Blockchain technology can provide transparency in the supply chain by creating an immutable ledger of transactions. Every step of the supply chain is tracked, making it easier to trace emissions back to their source. AI can enhance emission tracking by analysing large datasets to identify patterns, predict future emissions and recommend reduction strategies. For example, IBM is leveraging its Envizi platform, which integrates AI to provide real-time emission tracking and management.[71] These technologies can enable digital companies to manage their emissions more effectively and make data-driven decisions to reduce their environmental impact.

Other environmental impacts

Some Scope 3 emission categories have significant environmental impacts beyond GHG emissions. For example, Category 5 (waste generated in operations) and Category 12 (end-of-life treatment of sold products) affect land, water use and e-waste. When relevant, companies should expand on the environmental impacts of these emission categories by reporting water use and recycling efforts. Companies should also disclose steps they are taking to address these impacts.

Future outlook and regulatory landscape

Existing and upcoming policies and regulations are increasingly demanding more detailed and accurate GHG emission reporting. Regulations (Table 4.1) such as the European Union's Corporate Sustainability Reporting Directive (CSRD), which came into force in 2023, require comprehensive emission disclosures, including Scope 3 emissions.[72] Digital companies must stay informed of such regulatory changes and invest in robust emission tracking and reporting systems to prepare for compliance. This involves setting up internal processes for data collection, engaging suppliers for accurate data and ensuring that all reported emissions are verified by third parties. The trend towards improved Scope 3 emission reporting and reduction is gaining traction among digital companies. As more companies recognize the significance of Scope 3 emissions, the industry is likely to see increased transparency, better data accuracy and more effective emission reduction strategies.

71 IBM. 2024. "AI-Infused Sustainability Planning and Forecasting with Envizi." IBM Blog (blog). May 21, 2024. https://www.ibm.com/blog/announcement/envizi-ai-planning-forecasting/.

72 European Commission. 2024. "Corporate sustainability report." https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en#legislation

Table 4.1 Current and emerging Scope 3 emission disclosure requirements

Regulation/standard	Region	Type of company	Timeline
Corporate Sustainability Reporting Directive (CSRD)	EU	Large/mid-sized companies, SMEs; EU and non-EU with significant EU activity	Implemented January 2023. Phased reporting from 2025-2028
Corporate Sustainability Due Diligence Directive (CSDDD)	EU	Large EU-based, non-EU within scope; SMEs not yet affected	Approved in April 2024. Phased implementation from 2027-2029
Climate Corporate Data Accountability Act (SB 253)	California	Private and public companies with >$1B revenue	Signed into law in October 2023. Phased reporting from 2026-2030
International Sustainability Standards Board (ISSB)	Global	As specified by country	Effective January 2024 with phased-in Scope 3
	UK	Most economically significant UK companies	Mandated in 2023 company annual reports
	Australia (proposed)	Large, medium and small companies	Phased reporting from 2024-2027
	Canada (proposed)	To be determined	To be determined

5

Annex

The data refer to the assessment year 2022.[73] The list of companies refers to those assessed in WBA Digital Inclusion Benchmark (DIB) for the year 2023.[74] Note that since then some of the companies have been acquired by other companies.

Table 5.1 provides background information on the companies, such as their ownership and headquarters. Table 5.2 shows the results of the company data disclosure, targets and performance assessment. Table 5.3 lists companies' SBTi targets.

Additional data covering company energy use and operational (Scope 1 and 2) emissions and corporate value chain (Scope 3) emissions is available in electronic format. To request the data please contact: info.sdg2000@worldbenchmarkingalliance.org.

Table 5.1: Company overview

Company	WBA ID	Corporate name	HQ	Region	Industry
Acer	PT_00017	Acer Incorporated	Taiwan, China	East Asia & Pacific	Electronics
Activision Blizzard	PT_02157	Activision Blizzard, Inc.	United States	North America	IT Software & Services
Adobe	PT_00024	Adobe, Inc.	United States	North America	IT Software & Services
Airbnb	PT_00055	Airbnb, Inc.	United States	North America	IT Software & Services
AIS	PT_00026	Advanced Info Service Plc	Thailand	East Asia & Pacific	Telecommunications
Akamai	PT_00058	Akamai Technologies Inc	United States	North America	Telecommunications
Alibaba	PT_00069	Alibaba Group Holding Ltd	China	East Asia & Pacific	IT Software & Services
Alphabet	PT_00075	Alphabet Inc.	United States	North America	IT Software & Services
Altice	PT_00078	Altice France Holding SA	Luxembourg	Europe & Central Asia	Telecommunications
Amazon	PT_00081	Amazon.Com, Inc.	United States	North America	IT Software & Services
AMD	PT_00027	Advanced Micro Devices, Inc.	United States	North America	Electronics
América Móvil	PT_00085	América Móvil, S.A.B. De C.V.	Mexico	Latin America & Caribbean	Telecommunications
American Tower	PT_00094	American Tower Corporation	United States	North America	IT Software & Services
Amphenol	PT_00100	Amphenol Corporation	United States	North America	Electronics
Analog Devices	PT_00105	Analog Devices, Inc.	United States	North America	Electronics
Ant	PT_02052	Ant Group Co., Ltd.	China	East Asia & Pacific	IT Software & Services
Apple	PT_00125	Apple Inc.	United States	North America	Electronics

73 For companies whose fiscal year does not end in December 2022, reports for the period where the majority of activities took place in 2022 are used. For example, for a company whose fiscal year ends in March, the report ending 31 March 2023 is used since nine months of the activity were in 2022.

74 https://www.worldbenchmarkingalliance.org/publication/digital-inclusion/

Company	WBA ID	Corporate name	HQ	Region	Industry
Applied Materials	PT_00126	Applied Materials, Inc.	United States	North America	Electronics
ASML	PT_00146	ASML Holding NV	Netherlands	Europe & Central Asia	Electronics
Asus	PT_00153	AsusTek Computer Inc.	Taiwan, China	East Asia & Pacific	Electronics
AT&T	PT_00154	AT&T Inc.	United States	North America	Telecommunications
ATH	PT_02064	Amalgamated Telecom Holdings Ltd	Fiji	East Asia & Pacific	Telecommunications
Axiata	PT_00173	Axiata Group Berhad	Malaysia	East Asia & Pacific	Telecommunications
Baidu	PT_00179	Baidu, Inc.	China	East Asia & Pacific	IT Software & Services
BBK Electronics	PT_00228	BBK Electronics	China	East Asia & Pacific	Electronics
BCE	PT_00230	BCE Inc.	Canada	North America	Telecommunications
Bezeq	PT_02065	Bezeq The Israeli Telecommunication Corp Ltd	Israel	Middle East & North Africa	Telecommunications
Bharti Airtel	PT_00250	Bharti Airtel Limited	India	South Asia	Telecommunications
Block	PT_02549	Block, Inc.	United States	North America	IT Software & Services
BOE Technology Group	PT_00264	BOE Technology Group Co Ltd	China	East Asia & Pacific	Electronics
Booking Holdings	PT_00268	Booking Holdings Inc.	United States	North America	IT Software & Services
Broadcom	PT_00282	Broadcom Inc.	United States	North America	Electronics
BT Group	PT_00284	BT Group plc	United Kingdom	Europe & Central Asia	Telecommunications
Bytedance	PT_00291	ByteDance Ltd	China	East Asia & Pacific	IT Software & Services
Canon	PT_00312	Canon Inc.	Japan	East Asia & Pacific	Electronics
Capgemini	PT_02156	Capgemini SE	France	Europe & Central Asia	IT Software & Services
China Mobile	PT_00379	China Mobile Limited	China	East Asia & Pacific	Telecommunications
China Satcom	PT_00394	China Satellite Communications Co., Ltd.	China	East Asia & Pacific	Telecommunications
China Telecom	PT_00402	China Telecom Corporation Limited	China	East Asia & Pacific	Telecommunications
China Unicom	PT_00405	China Unicom (Hong Kong) Limited	China	East Asia & Pacific	Telecommunications
Chunghwa Telecom	PT_00420	Chunghwa Telecom Co., Ltd.	Taiwan, China	East Asia & Pacific	Telecommunications
Cisco	PT_00427	Cisco Systems, Inc.	United States	North America	Electronics
Citrix	PT_00431	Citrix Systems, Inc.	United States	North America	IT Software & Services
Cloudflare	PT_00439	Cloudflare, Inc.	United States	North America	Telecommunications

Company	WBA ID	Corporate name	HQ	Region	Industry
Cogent Communications	PT_00449	Cogent Communications Holdings, Inc.	United States	North America	Telecommunications
Cognizant	PT_02155	Cognizant Technology Solutions Corporation	United States	North America	IT Software & Services
Comcast	PT_00454	Comcast	United States	North America	Telecommunications
Corning	PT_00478	Corning Incorporated	United States	North America	Electronics
Delivery Hero	PT_00538	Delivery Hero Group	Germany	Europe & Central Asia	IT Software & Services
Dell	PT_00539	Dell Technologies Inc.	United States	North America	Electronics
Deutsche Telekom	PT_00550	Deutsche Telekom AG	Germany	Europe & Central Asia	Telecommunications
DiDi Chuxing	PT_00554	DiDi Global Inc.	China	East Asia & Pacific	IT Software & Services
Digicel	PT_00556	Digicel Group Ltd.	Jamaica	Latin America & Caribbean	Telecommunications
Digital Realty Trust	PT_00558	Digital Realty Trust, Inc.	United States	North America	IT Software & Services
eBay	PT_00594	eBay Inc.	United States	North America	IT Software & Services
EchoStar	PT_00596	EchoStar Corporation	United States	North America	Telecommunications
Elisa	PT_00616	Elisa Corporation	Finland	Europe & Central Asia	Telecommunications
Equinix	PT_00634	Equinix, Inc.	United States	North America	IT Software & Services
Ericsson	PT_00637	Telefonaktiebolaget LM Ericsson	Sweden	Europe & Central Asia	Electronics
Ethio Telecom	PT_00643	Ethio Telecom	Ethiopia	Sub-Saharan Africa	Telecommunications
Etisalat	PT_00623	Emirates Telecommunications Group Company	United Arab Emirates	Middle East & North Africa	Telecommunications
Eutelsat	PT_00649	Eutelsat Communications	France	Europe & Central Asia	Telecommunications
Far EasTone	PT_00665	Far EasTone Telecommunications Co Ltd	Taiwan, China	East Asia & Pacific	Telecommunications
Foxconn	PT_00854	Hon Hai Precision Industry Co., Ltd	Taiwan, China	East Asia & Pacific	Electronics
GlobalFoundries	PT_00755	GLOBALFOUNDRIES, Inc.	United States	North America	Electronics
Globe Telecom	PT_00756	Globe Telecom, Inc.	Philippines	East Asia & Pacific	Telecommunications
GoTo	PT_02535	PT GoTo Gojek Tokopedia	Indonesia	East Asia & Pacific	IT Software & Services
Grab	PT_00765	Grab Holdings Inc.	Singapore	East Asia & Pacific	IT Software & Services
GTT	PT_00799	GTT Communications, Inc.	United States	North America	Telecommunications
HCL	PT_00824	HCL Technologies Ltd.	India	South Asia	IT Software & Services

Company	WBA ID	Corporate name	HQ	Region	Industry
HP	PT_00863	HP Inc.	United States	North America	Electronics
HPE	PT_02166	Hewlett Packard Enterprise Company	United States	North America	IT Software & Services
Huawei	PT_00867	Huawei Investment & Holding Co., Ltd.	China	East Asia & Pacific	Electronics
IBM	PT_00883	International Business Machines Corporation	United States	North America	IT Software & Services
iFlytek	PT_00887	Iflytek Co., Ltd.	China	East Asia & Pacific	IT Software & Services
Iliad	PT_00890	iliad S.A.	France	Europe & Central Asia	Telecommunications
Infineon	PT_02128	Infineon Technologies AG	Germany	Europe & Central Asia	Electronics
Infosys	PT_00905	Infosys Limited	India	South Asia	IT Software & Services
Inmarsat	PT_00911	Inmarsat Global Limited	United Kingdom	Europe & Central Asia	Telecommunications
Intel	PT_00913	Intel Corporation	United States	North America	Electronics
Iridium Communications	PT_00930	Iridium Communications Inc.	United States	North America	Telecommunications
JD.com	PT_00956	JD.com, Inc.	China	East Asia & Pacific	IT Software & Services
Jio	PT_02039	Reliance Jio Infocomm Limited	India	South Asia	Telecommunications
JOYY	PT_00977	JOYY Inc	Singapore	East Asia & Pacific	IT Software & Services
Jumia	PT_00982	Jumia Technologies AG	Nigeria	Sub-Saharan Africa	IT Software & Services
Juniper Networks	PT_00983	Juniper Networks, Inc.	United States	North America	Electronics
KDDI	PT_00157	KDDI Corporation	Japan	East Asia & Pacific	Telecommunications
Keyence Corporation	PT_01005	Keyence Corp	Japan	East Asia & Pacific	Electronics
KPN	PT_01029	Koninklijke KPN N.V.	Netherlands	Europe & Central Asia	Telecommunications
KT	PT_02044	KT Corporation	Korea, Rep.	East Asia & Pacific	Telecommunications
Kyocera	PT_01042	Kyocera Corporation	Japan	East Asia & Pacific	Electronics
Lam Research	PT_01051	Lam Research Corporation	United States	North America	Electronics
Largan Precision	PT_02159	Largan Precision Co Ltd	Taiwan, China	East Asia & Pacific	Electronics
Lenovo	PT_02040	Lenovo Group Limited	China	East Asia & Pacific	Electronics
LG	PT_02042	LG Electronics, Inc.	Korea, Rep.	East Asia & Pacific	Electronics
Liberty Global	PT_01073	Liberty Global plc	United Kingdom	Europe & Central Asia	Telecommunications
Liquid	PT_02066	Liquid Intelligent Technologies	United Kingdom	Europe & Central Asia	Telecommunications

Company	WBA ID	Corporate name	HQ	Region	Industry
Logitech International	PT_01087	Logitech International S.A.	Switzerland	Europe & Central Asia	Electronics
Lumen	PT_00337	Lumen Technologies, Inc.	United States	North America	Telecommunications
Lyft	PT_01107	Lyft Inc	United States	North America	IT Software & Services
MediaTek	PT_01145	MediaTek Inc	Taiwan, China	East Asia & Pacific	Electronics
MegaFon	PT_01147	JSC MegaFon	Russian Federation	Europe & Central Asia	Telecommunications
Meituan	PT_01151	Meituan Dianping	China	East Asia & Pacific	IT Software & Services
MercadoLibre	PT_01153	Mercado Libre, Inc.	Argentina	Latin America & Caribbean	IT Software & Services
Meta	PT_00662	Meta Platforms, Inc.	United States	North America	IT Software & Services
Microchip Technology	PT_01170	Microchip Technology Inc	United States	North America	Electronics
Micron Technology	PT_01171	Micron Technology, Inc.	United States	North America	Electronics
Microsoft	PT_01172	Microsoft Corporation	United States	North America	IT Software & Services
Millicom	PT_01175	Millicom International Cellular S.A.	Luxembourg	Europe & Central Asia	Telecommunications
MTN	PT_01208	MTN Group Limited	South Africa	Sub-Saharan Africa	Telecommunications
MTS	PT_01191	Mobile Telesystems Public Joint Stock Company	Russian Federation	Europe & Central Asia	Telecommunications
Murata Manufacturing	PT_01213	Murata Manufacturing Co Ltd	Japan	East Asia & Pacific	Electronics
Naspers	PT_01221	Naspers Limited	South Africa	Sub-Saharan Africa	IT Software & Services
Naver	PT_01239	NAVER Corporation	Korea, Rep.	East Asia & Pacific	IT Software & Services
NEC	PT_01241	NEC Corporation	Japan	East Asia & Pacific	Electronics
Nepal Telecom	PT_01243	Nepal Doorsanchar Company Ltd.	Nepal	South Asia	Telecommunications
NetApp	PT_01246	Netapp, Inc.	United States	North America	Electronics
NetEase	PT_01247	NETEASE, INC.	China	East Asia & Pacific	IT Software & Services
Netflix	PT_01248	Netflix, Inc.	United States	North America	IT Software & Services
Nintendo	PT_02043	Nintendo Co., Ltd.	Japan	East Asia & Pacific	Electronics
Nokia	PT_01286	Nokia Corporation	Finland	Europe & Central Asia	Electronics
NTT	PT_01278	Nippon Telegraph and Telephone Corporation	Japan	East Asia & Pacific	Telecommunications
Nvidia	PT_01317	Nvidia Corporation	United States	North America	Electronics
NXP Semiconductors	PT_01319	Nxp Semiconductors NV	Netherlands	Europe & Central Asia	Electronics

Company	WBA ID	Corporate name	HQ	Region	Industry
Ola	PT_01333	ANI Technologies Private Limited	India	South Asia	IT Software & Services
Omantel	PT_01336	Oman Telecommunications Company (S.A.O.G)	Oman	Middle East & North Africa	Telecommunications
Ooredoo	PT_01341	Ooredoo Q.P.S.C.	Qatar	Middle East & North Africa	Telecommunications
Oracle	PT_01343	Oracle Corporation	United States	North America	IT Software & Services
Orange	PT_01344	Orange SA	France	Europe & Central Asia	Telecommunications
OTE	PT_00833	Hellenic Telecommunications Organization S.A.	Greece	Europe & Central Asia	Telecommunications
Palantir	PT_02045	Palantir Technologies Inc.	United States	North America	IT Software & Services
PalTel	PT_01368	Palestine Telecommunications Company P.L.C.	West Bank and Gaza	Middle East & North Africa	Telecommunications
Panasonic Corporation	PT_01369	Panasonic Corp	Japan	East Asia & Pacific	Electronics
PayPal	PT_01373	PayPal Holdings, Inc.	United States	North America	IT Software & Services
PCCW	PT_01375	PCCW Limited	Hong Kong SAR, China	East Asia & Pacific	Telecommunications
Pinduoduo	PT_01406	Pinduoduo Inc.	China	East Asia & Pacific	IT Software & Services
PLDT	PT_01411	PLDT Inc.	Philippines	East Asia & Pacific	Telecommunications
Proximus	PT_01435	Proximus Group	Belgium	Europe & Central Asia	Telecommunications
Qualcomm	PT_01454	QUALCOMM Incorporated	United States	North America	Electronics
Rakuten	PT_01460	Rakuten, Inc.	Japan	East Asia & Pacific	IT Software & Services
Rogers	PT_01494	Rogers Communications Inc.	Canada	North America	Telecommunications
Rostelecom	PT_01502	Rostelecom PJSC	Russian Federation	Europe & Central Asia	Telecommunications
Safaricom	PT_01515	Safaricom PLC	Kenya	Sub-Saharan Africa	Telecommunications
Salesforce	PT_01521	salesforce.com, inc.	United States	North America	IT Software & Services
Samsung	PT_01528	Samsung Electronics Co., Ltd.	Korea, Rep.	East Asia & Pacific	Electronics
SAP	PT_01536	SAP SE	Germany	Europe & Central Asia	IT Software & Services
Seagate	PT_01556	Seagate Technology Public Limited Company	Ireland	Europe & Central Asia	Electronics
ServiceNow	PT_02046	ServiceNow, Inc.	United States	North America	IT Software & Services
SES	PT_01564	SES S.A.	Luxembourg	Europe & Central Asia	Telecommunications
Sina	PT_01608	SINA Corporation	China	East Asia & Pacific	IT Software & Services

Company	WBA ID	Corporate name	HQ	Region	Industry
Singtel	PT_01611	Singapore Telecommunications Limited	Singapore	East Asia & Pacific	Telecommunications
SK Hynix	PT_02005	SK hynix Inc.	Korea, Rep.	East Asia & Pacific	Electronics
SK Telecom	PT_02006	SK Telecom Co., Ltd.	Korea, Rep.	East Asia & Pacific	Telecommunications
Skyworks	PT_02160	Skyworks Solutions, Inc.	United States	North America	Electronics
Snap	PT_01625	Snap Inc.	United States	North America	IT Software & Services
SoftBank	PT_01632	SoftBank Group Corp.	Japan	East Asia & Pacific	Telecommunications
Sonatel	PT_02047	Groupe Sonatel	Senegal	Sub-Saharan Africa	Telecommunications
SONY	PT_01636	Sony Corporation	Japan	East Asia & Pacific	Electronics
SpaceX	PT_01644	Space Exploration Technologies Corp.	United States	North America	Telecommunications
Spark New Zealand	PT_01645	Spark New Zealand Limited	New Zealand	East Asia & Pacific	Telecommunications
Spotify	PT_01648	Spotify Technology S.A.	Sweden	Europe & Central Asia	IT Software & Services
STC	PT_01543	Saudi Telecom Company	Saudi Arabia	Middle East & North Africa	Telecommunications
Stripe	PT_02067	Stripe	United States	North America	IT Software & Services
Sudatel Telecom Group	PT_01681	Sudatel Telecommunications Group Ltd	Sudan	Sub-Saharan Africa	Telecommunications
Swisscom	PT_01711	Swisscom Ltd	Switzerland	Europe & Central Asia	Telecommunications
Tata Communications	PT_02041	Tata Communications Limited	India	South Asia	Telecommunications
TCL	PT_01737	TCL Electronics Holdings Limited	China	East Asia & Pacific	Electronics
TE Connectivity	PT_01740	TE Connectivity Ltd	Switzerland	Europe & Central Asia	Electronics
Tele2	PT_01744	Tele2 AB	Sweden	Europe & Central Asia	Telecommunications
Telecom Egypt	PT_01746	Telecom Egypt Company SAE	Egypt, Arab Rep.	Middle East & North Africa	Telecommunications
Telecom Italia	PT_01747	Telecom Italia S.P.A.	Italy	Europe & Central Asia	Telecommunications
Telefonica	PT_01748	Telefónica, S.A.	Spain	Europe & Central Asia	Telecommunications
Telenor	PT_01751	Telenor ASA	Norway	Europe & Central Asia	Telecommunications
Telia	PT_01753	Telia Company AB	Sweden	Europe & Central Asia	Telecommunications
Telkom	PT_01754	Telkom SA SOC Ltd	South Africa	Sub-Saharan Africa	Telecommunications
Telkom Indonesia	PT_01750	Telecommunications Indonesia	Indonesia	East Asia & Pacific	Telecommunications

Company	WBA ID	Corporate name	HQ	Region	Industry
Telstra	PT_01756	Telstra Corporation Limited	Australia	East Asia & Pacific	Telecommunications
Tencent	PT_01760	Tencent Holdings Limited	China	East Asia & Pacific	IT Software & Services
Texas Instruments	PT_01769	Texas Instruments Incorporated	United States	North America	Electronics
Tokyo Electron	PT_01793	Tokyo Electron Ltd	Japan	East Asia & Pacific	Electronics
Toshiba TEC	PT_02154	Toshiba TEC Corp	Japan	East Asia & Pacific	Electronics
Transsion	PT_01818	Shenzhen Transsion Holdings Co Ltd	China	East Asia & Pacific	Electronics
TSMC	PT_01722	Taiwan Semiconductor Manufacturing Company Limited	Taiwan, China	East Asia & Pacific	Electronics
Türk Telekom	PT_01825	Turk Telekomunikasyon AS	Türkiye	Europe & Central Asia	Telecommunications
Twilio	PT_02048	Twilio Inc.	United States	North America	IT Software & Services
Uber	PT_01831	Uber Technologies, Inc.	United States	North America	IT Software & Services
United Internet	PT_01848	United Internet AG	Germany	Europe & Central Asia	Telecommunications
Veon	PT_01877	VEON Ltd.	Netherlands	Europe & Central Asia	Telecommunications
Verizon	PT_01878	Verizon Communications Inc	United States	North America	Telecommunications
Viettel	PT_01884	Viettel Group	Vietnam	East Asia & Pacific	Telecommunications
VMWare	PT_02051	Vmware, Inc.	United States	North America	IT Software & Services
Vodafone	PT_01896	Vodafone Group Plc	United Kingdom	Europe & Central Asia	Telecommunications
Western Digital	PT_01925	Western Digital Corporation	United States	North America	Electronics
X	PT_01828	X Corp.	United States	North America	IT Software & Services
Xiaomi	PT_01961	Xiaomi Corporation	China	East Asia & Pacific	Electronics
Yandex	PT_01970	Yandex NV	Russian Federation	Europe & Central Asia	IT Software & Services
Yunji	PT_01984	Yunji Inc.	China	East Asia & Pacific	IT Software & Services
Zain	PT_01986	Mobile Telecommunications Company K.S.C.P.	Kuwait	Middle East & North Africa	Telecommunications
Zoom	PT_02049	Zoom Video Communications, Inc.	United States	North America	IT Software & Services
ZTE	PT_01998	ZTE Corporation	China	East Asia & Pacific	Electronics

Note: The list of companies refers to those assessed in WBA's DIB for the year 2023. Note that since then some of the companies have been acquired by other companies.

5.1 Assessment methodology

Companies were assessed in three areas: target – existence of an emissions reduction target, target quality and target ambition; data – availability, clarity and verification; and performance. Each of the three assessment areas were awarded a maximum of three points, making the highest possible overall score nine. Note that the assessment was made on information collected for the DIB relating to fiscal year 2022.

5.1.1 Target

This year the assessment criteria have been modified to only accept emissions reduction targets that have been submitted and validated to the Science Based Target initiative (SBTi). Note that the quality and ambition information about the target is only available if it has been validated.

Target: The company has submitted a target to SBTi (1 point).

Quality: The target is not intensity-based (0.5 points); the target includes Scope 3 (0.5 points); the target includes all relevant categories of Scope 3 (0.5 points).

Ambition: The company aims to achieve net zero for its full footprint (i.e. Scope 1, Scope 2 and all relevant Scope 3 categories) by 2040 (0.5 points).

5.1.2 Data

Availability: The company discloses Scope 1 and location- based Scope 2 emissions (0.5). The company discloses Scope 3 emissions (0.5 points), including all relevant Scope 3 categories (0.5 points). The company discloses electricity consumption (0.5 points).

Reporting: The company has a dedicated environmental report or makes its CDP climate report publicly available (0.5 points). To qualify as an environmental report, all emission scopes must be disclosed in detail, including location -based Scope 2 emissions and all applicable Scope 3 categories, with justification for those which are not considered relevant. In addition, the report must be solely dedicated to environmental issues.

Verification: Evidence of third-party verification of emission data (0.5 points). The verification statement must restate the emissions.

5.1.3 Performance

The share of renewables in total electricity consumption, as a fraction (maximum 1 point).

The proportion of (location-based) GHG emissions to USD revenue, normalized to a one-point scale (maximum 1 point).

The proportion of (market-based) GHG emissions to electricity use, normalized to a one-point scale (maximum 1 point).

5.1.4 Assessment example

The example below shows how the assessment was calculated for Apple.

Table 5.2: Assessment calculation for Apple

	Max points	Score	Evidence
Target*	**3**	**3**	
Target submitted to SBTi	1	1	Yes. See: https://sciencebasedtargets.org/companies-taking-action#dashboard
For targets that have been validated by SBTi:			
Target is non-intensity based for Scopes 1 and 2	0.5	0.5	"Apple, Inc. commits to reduce absolute combined scope 1, 2 and 3 GHG emissions 62% by FY2030 from a FY2019 base year."
Aims for net zero by 2040	0.5	0	No mention in target
Company has non-intensity target for Scope 3	0.5	0.5	Yes, see text above
Scope 3 target includes all relevant categories	0.5	0.5	Yes, there is no qualification in the text above
Data	**3**	**3**	
Data availability:	**2.0**	**2.0**	
Scope 1 (tCO_2e)	0.5	0.5	55 200
Scope 2 Location-based (tCO_2e)			1 065 405
Scope 3 (tCO_2e)	0.5	0.5	20 280 000
Scope 3 - All relevant categories (tCO_2e)	0.5	0.5	Categories 2, 5, 8,10 and 13-15 are not relevant for Apple.
Electricity (MWh)	0.5	0 5	3 199 000
Reporting:	**0.5**	**0.5**	
Company has dedicated climate report	0. 5	0.5	*Environmental Progress Report*. Also makes CDP disclosure publicly available on its website.
Verification:	**0.5**	**0.5**	
Third-party verification of emission data	0.5	0.5	Apex verification statement included in environment report.

	Max points	Score	Evidence
Performance	**3**	**3**	
Share of renewables in electricity, scaled to a maximum of 1	1	1	Value 100 normalized to 100/100 = 1. The higher, the better.
Proportion of Scope 1 and Scope 2 (location-based) GHG emissions to USD revenue, normalized to one-point scale**	1	1	2022 revenues (millions): USD $383,285. Scope 1 & 2 location-based GHG / Revenue = 2.9. The lower, the better.
Proportion of (market-based) Scope 2 emissions to electricity use, normalized to one-point scale**	1	1	Value 0. The lower, the better.
TOTAL POINTS	**7.5**	**7**	

Note: * This year the assessment criteria have been modified to only accept emissions reduction targets that have been submitted and validated by the Science Based Target initiative (SBTi). Note that information about the target is only available if it has been validated.
** Normalized based on the quartile group that the number falls in for the 200 companies. The highest quartile is scored 1, the second-highest 0.66, the second-lowest 0.33 and the lowest 0.

Source: Apple. 2023. *Environmental Progress Report*. https://www.apple.com/environment/pdf/Apple_Environmental_Progress_Report_2023.pdf

Table 5.3: Assessment score

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
Apple	8.50	94%	2.50	3.00	3.00
Logitech	8.44	94%	2.50	3.00	2.94
Telefonica	8.15	91%	3.00	3.00	2.15
VMWare	8.00	89%	2.00	3.00	3.00
Netflix	8.00	89%	2.50	2.50	3.00
Cisco	7.97	89%	3.00	2.50	2.47
Capgemini	7.88	88%	3.00	2.00	2.88
eBay	7.73	86%	2.50	3.00	2.23
Proximus	7.66	85%	3.00	2.00	2.66
Tele2	7.66	85%	3.00	2.00	2.66
Elisa	7.62	85%	3.00	2.00	2.62
Snap	7.50	83%	2.00	2.50	3.00
HPE	7.33	81%	3.00	2.50	1.83
Ericsson	7.32	81%	2.00	2.50	2.82
HP	7.21	80%	2.50	2.50	2.21
Salesforce	7.16	80%	2.00	2.50	2.66
Telia	7.16	80%	2.50	2.00	2.66
ServiceNow	7.00	78%	2.00	2.00	3.00
Qualcomm	6.96	77%	3.00	2.50	1.46
Nokia	6.95	77%	2.50	2.50	1.95
Adobe	6.86	76%	2.00	2.50	2.36
Microsoft	6.83	76%	2.00	2.50	2.33
KPN	6.83	76%	2.50	2.00	2.33
Deutsche Telekom	6.83	76%	2.50	2.00	2.33
Vodafone	6.81	76%	3.00	2.00	1.81
Swisscom	6.66	74%	1.00	3.00	2.66
Tokyo Electron	6.57	73%	2.00	2.00	2.57
Cognizant	6.55	73%	3.00	2.25	1.30

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
AMD	6.52	72%	1.50	3.00	2.02
Equinix	6.46	72%	2.00	2.50	1.96
ASML	6.41	71%	2.50	1.00	2.91
Dell	6.25	69%	2.00	2.00	2.25
BCE	6.22	69%	2.00	2.00	2.22
Liberty Global	6.08	68%	2.00	1.50	2.58
SAP	5.99	67%	2.50	1.50	1.99
Meta	5.83	65%	1.00	2.50	2.33
Sony	5.79	64%	2.50	2.00	1.29
NEC	5.73	64%	2.00	2.50	1.23
Seagate	5.66	63%	2.50	2.50	0.66
Digital Realty Trust	5.65	63%	2.00	2.50	1.15
Inmarsat	5.58	62%	2.00	2.00	1.58
TE Connectivity	5.58	62%	1.00	3.00	1.58
Murata Manufacturing	5.57	62%	2.50	2.50	0.57
Applied Materials	5.51	61%	1.00	2.50	2.01
Alphabet	5.49	61%	1.00	2.50	1.99
Comcast	5.45	61%	1.00	3.00	1.45
Orange	5.37	60%	2.50	1.50	1.37
Infosys	5.33	59%	2.50	1.00	1.83
IBM	5.32	59%	0.00	3.00	2.32
KDDI	5.30	59%	2.00	2.50	0.80
Activision Blizzard	5.27	59%	1.00	2.00	2.27
Acer	5.27	59%	1.00	2.50	1.77
SK Telecom	5.08	56%	2.50	2.25	0.33
Akamai	5.04	56%	1.00	2.50	1.54
Lenovo	5.04	56%	1.50	1.50	2.04
Millicom	5.03	56%	2.50	1.50	1.03
Analog Devices	5.02	56%	1.50	2.00	1.52

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
Airbnb	5.00	56%	2.50	1.50	1.00
Verizon	4.91	55%	2.00	2.25	0.66
Safaricom	4.91	55%	2.50	0.75	1.66
Singtel	4.90	54%	2.50	2.00	0.40
AT&T	4.87	54%	1.50	2.50	0.87
Spark	4.75	53%	1.50	1.25	2.00
BT	4.67	52%	1.50	1.50	1.67
Rakuten	4.61	51%	1.00	2.50	1.11
Nvidia	4.60	51%	0.00	2.50	2.10
Oracle	4.59	51%	0.00	2.50	2.09
Kyocera	4.58	51%	2.50	1.75	0.33
Western Digital	4.56	51%	2.00	2.00	0.56
Uber	4.50	50%	2.50	1.00	1.00
Intel	4.43	49%	0.00	2.50	1.93
Lumen	4.39	49%	1.50	2.50	0.39
Asus	4.25	47%	1.50	1.75	1.00
Foxconn	4.24	47%	2.50	1.00	0.74
Delivery Hero	4.24	47%	2.50	0.75	0.99
Amazon	4.23	47%	0.00	2.00	2.23
Canon	4.21	47%	2.00	1.50	0.71
Juniper Networks	4.13	46%	1.00	1.50	1.63
OTE	4.08	45%	1.50	1.25	1.33
Telstra	4.08	45%	2.50	1.25	0.33
American Tower	4.05	45%	2.50	1.50	0.05
Far EasTone	4.00	44%	2.50	1.50	0.00
PayPal	4.00	44%	2.00	1.00	1.00
NTT	3.99	44%	2.00	1.00	0.99
Tencent	3.90	43%	2.50	1.00	0.40
ZTE	3.83	43%	1.00	2.50	0.33

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
Lam Research	3.83	43%	1.50	2.00	0.33
Rogers	3.78	42%	1.00	1.00	1.78
Chunghwa Telecom	3.75	42%	2.50	1.25	0.00
SoftBank	3.66	41%	2.50	0.50	0.66
HCL	3.66	41%	2.50	0.50	0.66
Twilio	3.66	41%	1.00	1.25	1.41
América Móvil	3.62	40%	2.50	0.50	0.62
Telenor	3.58	40%	1.50	1.75	0.33
Bharti Airtel	3.58	40%	2.50	0.75	0.33
Tata Communications	3.51	39%	1.00	2.00	0.51
Palantir	3.50	39%	1.00	1.50	1.00
Panasonic	3.48	39%	2.00	1.00	0.48
GlobalFoundries	3.44	38%	0.00	2.50	0.94
Corning	3.25	36%	2.00	1.25	0.00
MTN	3.25	36%	2.00	1.25	0.00
STC	3.25	36%	2.50	0.75	0.00
Iliad	3.24	36%	1.00	1.25	0.99
Globe	3.18	35%	1.00	2.00	0.18
Cloudflare	3.16	35%	1.00	1.50	0.66
Telecom Italia	3.15	35%	0.00	1.50	1.65
Lyft	3.00	33%	0.00	2.00	1.00
Alibaba	2.98	33%	1.00	1.50	0.48
GoTo	2.91	32%	1.00	1.25	0.66
LG	2.91	32%	2.00	0.25	0.66
Naspers	2.75	31%	1.50	0.25	1.00
Block	2.75	31%	2.50	0.25	0.00
Mercado Libre	2.74	30%	1.00	0.75	0.99
NXP	2.68	30%	1.00	1.00	0.68
Eutelsat	2.67	30%	0.00	1.00	1.67

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
Samsung	2.64	29%	0.00	2.00	0.64
Microchip	2.61	29%	0.00	2.00	0.61
Türk Telekom	2.58	29%	0.00	2.00	0.58
Micron	2.52	28%	0.00	2.50	0.02
Texas Instruments	2.50	28%	0.00	2.00	0.50
Booking Holdings	2.50	28%	1.00	0.50	1.00
NetApp	2.50	28%	1.00	0.50	1.00
Jio	2.50	28%	2.00	0.50	0.00
Nintendo	2.42	27%	0.00	1.00	1.42
United Internet	2.41	27%	0.00	0.75	1.66
Amphenol	2.37	26%	0.00	1.50	0.87
Zain	2.25	25%	1.00	1.25	0.00
Iridium	2.24	25%	0.00	1.25	0.99
Broadcom	2.24	25%	0.00	1.25	0.99
SK Hynix	2.13	24%	0.00	1.50	0.63
TSMC	2.10	23%	0.00	2.00	0.10
Zoom	2.00	22%	0.00	1.00	1.00
KT	2.00	22%	0.00	1.00	1.00
Grab	1.94	22%	0.00	1.50	0.44
Ant	1.89	21%	0.00	1.00	0.89
Etisalat	1.83	20%	1.00	0.50	0.33
Axiata	1.75	19%	1.00	0.75	0.00
Infineon	1.74	19%	0.00	0.75	0.99
TCL	1.71	19%	0.00	1.00	0.71
Yandex	1.71	19%	0.00	1.00	0.71
JD.com	1.70	19%	0.00	1.00	0.70
Spotify	1.66	18%	0.00	1.00	0.66
Naver	1.66	18%	0.00	1.00	0.66
Altice	1.58	18%	0.00	0.50	1.08

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
Xiaomi	1.50	17%	0.00	0.50	1.00
Telkom	1.50	17%	1.00	0.50	0.00
Toshiba TEC	1.41	16%	0.00	0.75	0.66
Huawei	1.41	16%	0.00	0.75	0.66
Veon	1.36	15%	0.00	1.00	0.36
NetEase	1.25	14%	0.00	0.25	1.00
MediaTek	1.25	14%	0.00	0.25	1.00
Transsion	1.25	14%	0.00	0.25	1.00
SES	1.25	14%	1.00	0.25	0.00
Baidu	1.08	12%	0.00	0.75	0.33
Rostelecom	1.08	12%	0.00	0.75	0.33
PLDT	1.02	11%	0.00	1.00	0.02
Twitter	1.00	11%	1.00	0.00	0.00
PCCW	0.83	9%	0.00	0.50	0.33
Bezeq	0.83	9%	0.00	0.50	0.33
China Mobile	0.75	8%	0.00	0.75	0.00
China Unicom	0.75	8%	0.00	0.75	0.00
China Telecom	0.75	8%	0.00	0.75	0.00
Telkom Indonesia	0.75	8%	0.00	0.75	0.00
BOE	0.75	8%	0.00	0.75	0.00
Liquid	0.52	6%	0.00	0.50	0.02
GTT	0.50	6%	0.00	0.50	0.00
Skyworks	0.33	4%	0.00	0.00	0.33
MTS	0.25	3%	0.00	0.25	0.00
AIS	0.25	3%	0.00	0.25	0.00
Digicel	0.25	3%	0.00	0.25	0.00
KEYENCE	0.25	3%	0.00	0.25	0.00
Ooredoo	0.25	3%	0.00	0.25	0.00
Sonatel	0.25	3%	0.00	0.25	0.00

Company	Total score (out of 9 points)	TOTAL score (%)	Target score (out of 3 points)	Data score (out of 3 points)	Performance score (out of 3 points)
Omantel	0.00	0%	0.00	0.00	0.00
Citrix	0.00	0%	0.00	0.00	0.00
Jumia	0.00	0%	0.00	0.00	0.00
ATH	0.00	0%	0.00	0.00	0.00
BBK Electronics	0.00	0%	0.00	0.00	0.00
ByteDance	0.00	0%	0.00	0.00	0.00
China Satellite	0.00	0%	0.00	0.00	0.00
Cogent	0.00	0%	0.00	0.00	0.00
DiDi	0.00	0%	0.00	0.00	0.00
EchoStar	0.00	0%	0.00	0.00	0.00
Ethio Telecom	0.00	0%	0.00	0.00	0.00
iFlytek	0.00	0%	0.00	0.00	0.00
JOYY	0.00	0%	0.00	0.00	0.00
Largan Precision	0.00	0%	0.00	0.00	0.00
MegaFon	0.00	0%	0.00	0.00	0.00
Meituan	0.00	0%	0.00	0.00	0.00
Nepal Telecom	0.00	0%	0.00	0.00	0.00
Ola	0.00	0%	0.00	0.00	0.00
PalTel	0.00	0%	0.00	0.00	0.00
Pinduoduo	0.00	0%	0.00	0.00	0.00
Sina	0.00	0%	0.00	0.00	0.00
SpaceX	0.00	0%	0.00	0.00	0.00
Stripe	0.00	0%	0.00	0.00	0.00
Sudatel	0.00	0%	0.00	0.00	0.00
Telecom Egypt	0.00	0%	0.00	0.00	0.00
Viettel	0.00	0%	0.00	0.00	0.00
Yunji	0.00	0%	0.00	0.00	0.00

Table 5.4: Science Based Target initiative (SBTi) emissions reduction target

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Acer	Yes	Committed		
Activision Blizzard	Yes	Committed		
Adobe	Yes	Targets Set		Adobe Inc. commits to reduce absolute scope 1 and 2 GHG emissions 35% by 2025 from a 2018 base year. Adobe commits to reduce absolute scope 3 GHG emissions from business travel 30% over the same timeframe. Adobe also commits that 55% of its suppliers by spend covering purchased goods and services and capital goods, will have science-based targets by 2025.
Airbnb	Yes	Targets Set		Airbnb, Inc. commits to reduce absolute scope 1 and 2 GHG emissions 78.4% by 2030 from a 2019 base year. Airbnb, Inc. also commits to increase annual sourcing of renewable electricity from 0% in 2019 to 100% by 2030. Airbnb, Inc. further commits to reduce scope 3 GHG emissions 55% per M USD of gross profit by 2030 from a 2019 base year.
AIS	No			
Akamai	Yes	Committed		
Alibaba	Yes	Committed		
Alphabet	Yes	Committed		
Altice	No			
Amazon		Removed		
AMD	Yes	Targets Set		Multinational semiconductor company AMD commits to reduce scope 1 and 2 emissions 20% by 2020 from a 2014 base-year. AMD also commits to improve the compute performance per watt of energy consumed by their mobile APU processors by 2500% by 2020 from a 2014 base-year. AMD also has a goal for suppliers' wafer foundry scope 1 emissions to stay 30% below the Semiconductor Industry Association average, and for wafer foundry electricity use to stay 40% below the industry average, using a normalized manufacturing index.
América Móvil	Yes	Targets Set		America Movil, S.A.B. de C.V. commits to reduce absolute scope 1 and 2 GHG emissions 52% by 2030 from a 2019 base year. América Móvil also commits to reduce absolute scope 3 GHG emissions 14% by 2030 from a 2019 base year.
American Tower	Yes	Targets Set		American Tower Corporation commits to reduce absolute scope 1, 2 and 3 GHG emissions 40% by 2035 from a 2019 base year.
Amphenol	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Analog Devices	Yes	Targets Set		Analog Devices Inc. commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 from a 2019 base year. Analog Devices Inc. also commits that 66.7% of its suppliers by spend covering purchased goods and services, will have science-based targets by 2025.
Ant	No			
Apple	Yes	Targets Set		Apple, Inc. commits to reduce absolute combined scope 1, 2 and 3 GHG emissions 62% by FY2030 from a FY2019 base year. Apple also commits to continue annually sourcing 100% renewable electricity through FY2030.* *The target boundary includes biogenic emissions and removals from bioenergy feedstocks.
Applied Materials	Yes	Committed		
ASML	Yes	Targets Set		ASML commits to reduce absolute scope 1 and 2 GHG emissions 25.2% by 2025 from a 2019 base year. ASML commits to reduce scope 3 GHG emissions 35.3% per unit of value added within the same timeframe.
Asus	Yes	Targets Set		ASUSTeK Computer Inc. commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 from a 2021 base year.
AT&T	Yes	Targets Set		AT&T commits* to reduce absolute scope 1 and scope 2 GHG emissions 63% by 2030 from a 2015 base year. AT&T also commits that 50% of its suppliers by spend covering purchased goods and services, capital goods, and downstream leased assets will set science-based scope 1 and scope 2 targets by 2024. *The target boundary includes biogenic emissions and removals from bioenergy feedstocks.
ATH	No			
Axiata	Yes	Committed		
Baidu	No			
BBK Electronics	No			
BCE	Yes	Targets Set		BCE Inc. commits to reduce absolute scope 1 and 2 GHG emissions 57% by FY2030 from a FY2020 base year*. BCE Inc. also commits to reduce absolute scope 3 GHG emissions from capital goods, fuel-and energy-related activities, upstream transportation and distribution, waste generated in operations, business travel, employee commuting, downstream transportation and distribution, use of sold products, end-of-life treatment of sold products, franchises and investments 42% within the same timeframe. BCE Inc. further commits that 64% of its suppliers by spend covering purchased goods and services will have science-based targets by FY2026. *The target boundary includes biogenic emissions and removals from bioenergy feedstocks.
Bezeq	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Bharti Airtel	Yes	Target Set		Indian telecommunication company Bharti Airtel commits to reduce absolute scope 1 and 2 GHG emissions 50.2% by FY2031 from a FY2021 base year. Bharti Airtel also commits to reduce absolute scope 3 GHG emissions 42% over the same timeframe.
Block	Yes	Targets Set		Block, Inc. commits to reduce absolute scope 1 and 2 GHG emissions 46.2% by 2030 from a 2019 base year. Block, Inc. also commits to increase active annual sourcing of renewable electricity from 0% in 2019 to 100% by 2030. Block, Inc. further commits to reduce scope 3 GHG emissions 55% per million USD gross profit by 2030 from a 2019 base year.
BOE	No			
Booking Holdings	Yes	Committed		
Broadcom	No			
BT	Yes	Targets Set		Multinational communications company BT commits to reduce GHG emissions* by 87% in tons of CO_2e per unit of gross value added by 2030 from a 2016/2017 base-year. This is in line with current international policy and climate science, being BT's share of the global emissions reductions needed to limit global warming to 1.5°C. The company also commits to reduce supply chain GHG emissions** by 29% over the same time-period. *Here GHG emissions refer to Scope 1 and 2 emissions, as defined in the Greenhouse Gas Protocol, expressed as tonnes carbon dioxide equivalent (tCO_2e) per unit of gross value added (GVA). **Supply chain emissions refer to all upstream Scope 3 emissions (categories 1-8), as defined in the Greenhouse Gas Protocol Scope 3 Standard.
ByteDance	No			
Canon	Yes	Targets Set		CANON INC. commits to reduce absolute scope 1 and 2 GHG emissions 42.0% by 2030 from a 2022 base year. CANON INC. also commits to reduce absolute scope 3 GHG emissions from purchased goods and services, and use of sold products 25.0% within the same timeframe.
Capgemini	Yes	Targets Set	2040	"Overall Net-Zero Target: Company Capgemini SE commits to reach net-zero greenhouse gas emissions across the value chain by 2040 from a 2019 base year. Near-Term Targets: Capgemini SE commits to reduce absolute scope 1 and 2 GHG emissions 80% by 2030 from a 2019 base year. Capgemini SE also commits to increase annual sourcing of renewable electricity from 38% in 2019 to 100% by 2025 and to maintain 100% renewable electricity through 2030. Capgemini SE commits to reduce absolute scope 3 purchased goods and services GHG emissions 50% by 2030 from a 2019 base year. Capgemini SE further commits to reduce scope 3 business travel and employee commuting GHG emissions 55% per employee within the same timeframe. Long-Term Targets: Capgemini SE commits to reduce absolute scope 1 and 2 GHG emissions 90% by 2040 from a 2019 base year. Capgemini SE also commits to reduce absolute scope 3 GHG emissions 90% within the same timeframe."

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
China Mobile	No			
China Satellite	No			
China Telecom	No			
China Unicom	No			
Chunghwa Telecom	Yes	Targets Set		Chunghwa Telecom commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 from a 2020 base year. Chunghwa Telecom also commits to reduce absolute scope 3 GHG emissions 22.5% by 2030 from a 2021 base year.
Cisco	Yes	Target Set	2040	Overall Net-Zero Target Cisco commits to reach net-zero greenhouse gas emissions across the value chain by FY2040 from a FY2019 base year. Near-Term Targets Cisco commits to reduce absolute scope 1 and 2 GHG emissions 90% by FY2030 from a FY2019 base year. Cisco commits to reduce absolute scope 3 GHG emissions from purchased goods and services, upstream transportation and distribution, and use of sold products 30% by FY2030 from a FY2019 base year. Long-Term Targets Cisco commits to reduce absolute scope 1, 2, and 3 GHG emissions 90% by FY2040 from a FY2019 base year.
Citrix	No	Removed		
Cloudflare	Yes	Committed		
Cogent	No			
Cognizant	Yes	Targets Set	2040	Overall Net-Zero Target Cognizant commits to reach net-zero greenhouse gas emissions across the value chain by 2040 from a 2019 base year. Near-Term Targets Cognizant commits to reduce absolute scope 1 and 2 GHG emissions 77% by 2030 from a 2019 base year. Cognizant also commits to reduce absolute scope 3 GHG emissions 47% within the same timeframe. Long-Term Targets Cognizant commits to reduce absolute scope 1, 2, and 3 GHG emissions 90% by 2040 from a 2019 base year.
Comcast	Yes	Committed		
Corning	Yes	Target Set		Corning Incorporated commits to reduce absolute scope 1 and 2 GHG emissions 30% by 2028 from a 2021 base year. Corning Incorporated also commits to reduce absolute scope 3 GHG emissions covering purchased goods and services, capital goods, fuel and energy related activities and upstream transportation and distribution 17.5% within the same timeframe.
Delivery Hero	Yes	Targets Set		Delivery Hero commits to reduce absolute scope 1 and 2 GHG emissions 50.4% by 2032 from a 2022 base year. Delivery Hero commits to reduce scope 3 GHG emissions 58.1% per million euros of gross profit by 2032 from a 2022 base year.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Dell	Yes	Targets Set		Dell Technologies commits to reduce absolute scope 1 and 2 GHG emissions 50% by FY2031 from an FY2020 base year. Dell Technologies commits to reduce absolute scope 3 GHG emissions from purchased goods and services 45% by FY2031 from a FY2020 base year. Dell Technologies commits to reduce absolute scope 3 GHG emissions from use of sold products 30% within the same timeframe.
Deutsche Telekom	Yes	Target Set		German telecommunications company Deutsche Telekom AG commits to reduce absolute Scope 1&2 GHG emissions 90% by 2030 from a 2017 base-year. Deutsche Telekom AG commits to increase annual sourcing of renewable electricity from 41% in 2017 to 100% by 2021. Deutsche Telekom AG commits to reduce Scope 3 GHG emissions 25% per customer by 2030 from a 2017 base-year.
DiDi	No			
Digicel	No			
Digital Realty Trust	Yes	Targets Set		Digital Realty commits to reduce scope 1 and 2 GHG emissions 68% per square foot by 2030 from a 2018 base year and commits to reduce scope 3 GHG emissions from purchased goods and services and fuel- and energy-related activities 24% per square foot within the same timeframe.
eBay	Yes	Targets Set		eBay commits to reduce absolute scope 1 and scope 2 GHG emissions 90% by 2030 from a 2019 base year. eBay also commits to reduce absolute scope 3 emissions from downstream transportation and distribution 20% within the same timeframe.
EchoStar	No			
Elisa	Yes	Targets Set	2040	Overall Net-Zero Target Elisa Corporation commits to reach net-zero greenhouse gas emissions across the value chain by 2040. Near-Term Targets Elisa Corporation commits to reduce absolute scope 1, 2 and 3 GHG emissions 42% by 2030 from a 2021 base year. Long-Term Targets Elisa Corporation commits to reduce absolute scope 1, 2 and 3 GHG emissions 90% by 2040 from a 2021 base year.
Equinix	Yes	Target Set		Equinix, Inc. commits to reduce absolute scope 1 and scope 2 GHG emissions 50% by FY2030 from a FY2019 base year. Equinix, Inc. commits to reduce absolute scope 3 GHG emissions from fuel and energy related activities 50% over the same timeframe. Equinix, Inc. also commits to increase annual sourcing of renewable electricity from 87% in FY2019 to 100% by FY2030. In addition, Equinix, Inc. commits that 66% of its suppliers by emissions covering purchased goods and services and capital goods, will have science-based targets by FY2025.
Ericsson	Yes	Target Set		Multinational networking and telecommunications company Ericsson commits to reduce absolute scope 1 and 2 GHG emissions 35% by 2022 from a 2016 base year. Within the same timeframe, Ericsson also commits to a 35% reduction in the scope 3 emissions from business travel and upstream and downstream transportation, and to a 35% reduction in the energy consumption of comparable sold products in 2016.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Ethio Telecom	No			
Etisalat	Yes	Committed		
Eutelsat	No			
Far EasTone	Yes	Targets Set		Far EasTone Telecommunications Co. Ltd. commits to reduce absolute scope 1 and 2 GHG emissions 42% by 2030 from a 2021 base year. Far EasTone Telecommunications Co. Ltd. also commits to reduce absolute scope 3 GHG emissions 42% within the same timeframe.
Foxconn	Yes	Targets Set	2050	Overall Net-Zero Target HON HAI PRECISION INDUSTRY CO., LTD. commits to reach net-zero greenhouse gas emissions across the value chain by 2050 from a 2020 base year. Near-Term Targets HON HAI PRECISION INDUSTRY CO., LTD. commits to reduce absolute scope 1 and 2 GHG emissions 42% by 2030 from a 2020 base year. HON HAI PRECISION INDUSTRY CO., LTD. also commits to reduce absolute scope 3 GHG emissions 42% within the same timeframe. Long-Term Targets HON HAI PRECISION INDUSTRY CO., LTD. commits to reduce absolute scope 1 and 2 GHG emissions 90% by 2050 from a 2020 base year. HON HAI PRECISION INDUSTRY CO., LTD. also commits to reduce absolute scope 3 GHG emissions 90% within the same timeframe.
GlobalFoundries	No			
Globe	Yes	Committed		
GoTo	Yes	Committed		
Grab	No			
GTT	No			
HCL	Yes	Targets Set		HCL Technologies commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 from a 2020 base year. HCL Technologies also commits to reduce absolute scope 3 GHG emissions 42% within the same timeframe.
HP	Yes	Targets Set		HP Inc. commits to reduce absolute scope 1 and 2 GHG emissions 65% by FY2025 from a FY2015 base year. HP Inc. also commits to reduce absolute scope 3 GHG emissions 50% by FY2030 from a FY2019 base year.
HPE	Yes	Targets Set	FY2040	Overall Net-Zero Target Hewlett Packard Enterprise commits to reach net-zero greenhouse gas emissions across the value chain by FY2040 from a FY2020 base year. Near-Term Targets Hewlett Packard Enterprise commits to reduce absolute scope 1 and 2 GHG emissions 70% by FY2030 from a FY2020 base year. Hewlett Packard Enterprise also commits to reduce absolute scope 3 GHG emissions 42% within the same timeframe. Long-Term Targets Hewlett Packard Enterprise commits to reduce absolute scope 1 and 2 emissions 90% by FY2040 from a FY2020 base year. Hewlett Packard Enterprise also commits to reduce absolute scope 3 emissions 90% within the same time frame.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Huawei	No			
IBM	No			
iFlytek	No			
Iliad	Yes	Committed		
Infineon	No			
Infosys	Yes	Targets Set		Infosys Limited commits to reduce absolute scope 1 and 2 GHG emissions 12.5% by FY2025 and 37.5% by FY2035 from a FY2020 base year. Infosys Limited also commits to reduce absolute scope 3 GHG emissions 12.5% by FY2025 and 37.5% by FY2035 from a FY2020 base year.
Inmarsat	Yes	Targets Set		Inmarsat commits to reduce absolute scope 1 and 2 GHG emissions 64% by 2030 from a 2019 base year. Inmarsat also commits to reduce absolute scope 3 GHG emissions 28% by 2030 from a 2019 base year.
Intel	No			
Iridium	No			
JD.com	No			
Jio	Yes	Targets Set		Reliance Jio Infocomm Limited commits to reduce absolute scope 1 and scope 2 GHG emissions 76% by FY2028 from a FY2020 base year. Reliance Jio Infocomm Limited commits to increase annual sourcing of renewable electricity from 1.19% in FY2020 to 100% by FY 2029 and to continue sourcing 100% renewable electricity through FY2030. Reliance Jio Infocomm Limited commits to reduce absolute scope 3 GHG emissions from purchased goods and services, capital goods, fuel and energy related activities, upstream transportation and distribution, waste generated in operations, business travel and upstream leased assets 66.5% by FY2028 a FY2020 base year.
JOYY	No			
Jumia	No			
Juniper Networks	Yes	Committed		
KDDI	Yes	Targets Set		KDDI commits to reduce absolute scope 1 and 2 GHG emissions 50% by FY2030 from a FY2019 base year. KDDI also commits to reduce absolute scope 3 GHG emissions from purchased goods and services, capital goods and services, and fuel and energy related activities 14% within the same timeframe.
KEYENCE	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
KPN	Yes	Targets Set		Dutch telecommunications company, Royal KPN commits to reduce scope 1 & 2 greenhouse gas emissions 100% by 2030 from a 2010 base-year. The long-term target of the company is to maintain yearly zero emissions from 2030 to 2050. In addition, KPN will reduce its scope 3 emissions 20% by 2025 and 50% by 2040, from a 2014 base-year.
KT	No			
Kyocera	Yes	Targets set		KYOCERA Corporation commits to reduce absolute scope 1 and 2 GHG emissions 46.2% by FY2030/31 from a FY2019/20 base year. KYOCERA Corporation also commits to reduce absolute scope 3 GHG emissions 46.2% within the same timeframe.
Lam Research	Yes	Targets set		Lam Research Corporation commits to reduce absolute scope 1 and 2 GHG emissions 60.6% by 2030 from a 2019 base year. Lam Research Corporation also commits to increase annual sourcing of renewable electricity from 31% in the base year to 100% by 2030. Lam Research Corporation further commits that 69.5% of its suppliers and customers by emissions, covering 46.5% of purchased goods and services emissions and 83% of the use of sold products emissions, will have science-based targets by 2025.
Largan Precision	No			
Lenovo	Yes	Targets Set	FY2050	Overall Net-Zero Target Lenovo commits to reach net-zero GHG emissions across the value chain by FY2049/2050. Near-Term Targets Lenovo commits to reduce absolute scope 1 and scope 2 GHG emissions 50% by FY2029/2030 from a FY2018/2019 base year. Lenovo also commits to reduce scope 3 GHG emissions from use of sold products 35% on average for comparable products within the same timeframe. Lenovo commits to reduce scope 3 GHG emissions from purchased goods and services 66.5% per million US$ gross profit within the same timeframe. Lenovo further commits to reduce scope 3 GHG emissions from upstream transportation and distribution 25% per tonne-km of transported product by within the same timeframe. Long-Term Targets Lenovo commits to reduce absolute scope 1, 2, and 3 GHG emissions 90% by FY2049/50 from a FY2018/19 base year.
LG	Yes	Targets Set		LG Electronics Inc. commits to reduce absolute scope 1 and scope 2 GHG emissions 54.6% by 2030 from a 2017 base year. LG Electronics Inc. also commits to reduce scope 3 GHG emissions from use of sold products 20% per functional unit sold by 2030 from a 2020 base year.
Liberty Global	Yes	Target Set		Liberty Global commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 and 80% by 2050 from a 2019 base year. Liberty Global also commits to reduce absolute scope 3 GHG emissions from the manufacture and use of customer premises equipment 50% by 2030 from a 2019 base year. In addition, Liberty Global commits to reduce scope 3 GHG emissions 50% per home passed over the same target period.
Liquid	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Logitech	Yes	Target Set	2047	Overall Net-Zero Targets: Logitech International S.A. commits to reach net-zero greenhouse gas emissions across the value chain by 2047. Near-Term Targets: Logitech International S.A. commits to reduce absolute scope 1 and 2 GHG emissions 85% by 2030 from a 2019 base year. Logitech International S.A. also commits to increase active annual sourcing of renewable electricity from 88% in 2019 to 100% by 2030. Logitech International S.A. finally commits to reduce absolute scope 3 GHG emissions 50% by 2030 from a 2021 base year. Long-Term Targets: Logitech International S.A. commits to reduce absolute scopes 1 and 2 GHG emissions 90% by 2047 from a 2019 base year. Logitech International S.A. commits to reduce absolute scope 3 GHG emissions 90% by 2047 from a 2021 base year.
Lumen	Yes	Targets Set		This target was approved using a streamlined target validation route exclusive to small and medium-sized enterprises (SMEs). https://sciencebasedtargets.org/faqs-for-smes/ Lumen commits to reduce scope 1 and scope 2 GHG emissions 42% by 2030 from a 2021 base year, and to measure and reduce its scope 3 emissions.
Lyft	No	Removed		
MediaTek	No			
MegaFon	No			
Meituan	No			
Mercado Libre	Yes	Committed		
Meta	Yes	Committed		
Microchip	No			
Micron	No			
Microsoft	Yes	Target Set		American multinational technology company Microsoft commits to continue annually source 100% renewable electricity through 2030. Microsoft also commits to reduce scope 3 GHG emissions intensity per unit of revenue 30% by 2030 from a 2017 base year and to avoid growth in absolute scope 3 emissions.
Millicom	Yes	Target Set		Millicom International Cellular S.A. commits to reduce absolute scope 1 and 2 GHG emissions 50% by FY2030 from a FY2020 base year. Millicom International Cellular S.A. also commits to reduce absolute scope 3 GHG emissions 20% by FY2035 from a FY2020 base year.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
MTN	Yes	Targets Set		MTN Group Limited commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 from a 2021 base year. MTN Group Limited also commits to reduce absolute scope 3 GHG emissions from fuel and energy related activities 50% by 2030 from a 2021 base year. MTN Group Limited commits that 80% of its suppliers by spend covering purchased goods and services and capital goods will have science based targets by 2026.
MTS	No			
Murata Manufacturing	Yes	Targets Set		Murata Manufacturing Co., Ltd. commits to reduce absolute scope 1 and 2 GHG emissions 46% by FY2030 from a FY2019 base year. Murata Manufacturing Co., Ltd. also commits to reduce absolute scope 3 GHG emissions 28% within the same timeframe.
Naspers	Yes	Targets Set		Headline target: Naspers' portfolio targets cover 70% of its total investment and lending by invested capital as of FY2020. As of that year, required activities made up 70% of Naspers' total investment and lending by invested capital while optional activities made up 4% and out of scope activities made up 26%. https://sciencebasedtargets.org/resources/files/Target-language-and-summary_Naspers.pdf
Naver	No			
NEC	Yes	Targets Set		NEC Corporation commits to reduce absolute scope 1 and 2 GHG emissions 55% by FY2030/31 from a FY2017/18 base year. NEC Corporation also commits to reduce absolute scope 3 GHG emissions from purchased goods and services, fuel and energy related activities and use of sold products 33% by FY2030/31 from a FY2017/18 base year.
Nepal Telecom	No			
NetApp	Yes	Committed		
NetEase	No			
Netflix	Yes	Targets Set		Netflix commits to reduce absolute scope 1 and 2 GHG emissions 46.2% by 2030 from a 2019 base year. Netflix also commits to reduce scope 3 GHG emissions 55% per million USD of value added within the same timeframe.
Nintendo	No			
Nokia	Yes	Targets Set		Nokia commits to reduce absolute scope 1, 2 and 3 GHG emissions 50% by 2030 from a 2019 base year.
NTT	Yes	Target Set		NTT Group commits to reduce absolute scope 1 and 2 GHG emissions 80% by FY2030/31 from a FY2018/19 base year. NTT Group also commits to reduce absolute scope 3 GHG emissions from purchased goods and services, capital goods, and use of sold products 15% within the same timeframe.
Nvidia	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
NXP	Yes	Committed		
Ola	No			
Omantel	No			
Ooredoo	No			
Oracle	No			
Orange	Yes	Targets Set		Orange commits to reduce absolute scope 1 and 2 GHG emissions by 29.6% by 2025 from a 2018 base year. Orange commits to reduce its scope 3 emissions 14% by 2025 from a 2018 base year.
OTE	Yes	Targets Set	2050	Overall Net-Zero Target Hellenic Cables commits to reach net-zero GHG emissions across the value chain by 2050 from a 2020 base year. Near-Term Targets Hellenic Cables commits to reduce absolute scope 1 and 2 GHG emissions 50% by 2030 from a 2020 base year. Hellenic Cables also commits to increase annual sourcing of renewable electricity from 24% in 2020 to 80% by 2025 and 100% by 2030. Hellenic Cables further commits to reduce absolute scope 3 GHG emissions from purchased goods and services, employee commuting and use of sold products 25% by 2030 from a 2020 base year. Long-Term Targets Hellenic Cables commits to reduce absolute scopes 1, 2 and 3 GHG emissions 90% by 2050 from a 2020 base year.
Palantir	Yes	Committed		
PalTel	No			
Panasonic	Yes	Targets Set		Panasonic Holdings Corporation commits to reduce absolute scope 1 and 2 GHG emissions 90% by FY2030 from a FY2019 base year. Panasonic Holdings Corporation commits to reduce absolute scope 3 GHG emissions from use of sold products 30% within the same timeframe.
PayPal	Yes	Targets Set		PayPal Holdings, Inc. commits to reduce absolute scope 1 and 2 GHG emissions 25% by 2025 from a 2019 base year. PayPal Holdings, Inc. commits to reduce the absolute scope 3 GHG emissions from fuel and energy-related activities 25% over the same timeframe. PayPal Holdings Inc. also commits that 75% of its suppliers by spend covering purchased goods and services, capital goods, business travel, upstream transportation and distribution will have science-based targets by 2025.
PCCW	No			
Pinduoduo	No			
PLDT	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Proximus	Yes	Targets set	2040	Overall Net-Zero Target Proximus commits to reach net-zero greenhouse gas emissions across the value chain by 2040 from a 2020 base year. Near-Term Targets Proximus commits to reduce absolute scope 1 GHG emissions 95% by 2030 from a 2020 base year. Proximus also commits to continue sourcing 100% renewable electricity annually until 2030. Proximus further commits to reduce absolute scope 3 GHG emissions 60% by 2030 from a 2020 base yea. Long-Term Targets Proximus commits to maintain a minimum of 95% absolute scope 1 and 2 GHG emission reductions by 2030 through 2040 from a 2020 base year. Proximus commits to reduce absolute scope 3 GHG emissions 90% by 2040 from a 2020 base year.
Qualcomm	Yes	Targets Set	2040	Overall Net Zero target Qualcomm Incorporated commits to reach net-zero greenhouse gas emissions across the value chain by FY2040. Near-Term Targets Qualcomm Incorporated commits to reduce absolute scope 1 and 2 GHG emissions 50% by FY2030 from a FY2020 base year. Qualcomm Incorporated also commits to reduce absolute scope 3 GHG emissions 25% within the same timeframe. Long-Term Target Qualcomm Incorporated commits to reduce absolute scope 1, 2 and 3 GHG emissions 90% by FY2040 from a FY2020 base year.
Rakuten	Yes	Committed		
Rogers	Yes	Committed		
Rostelecom	No			
Safaricom	Yes	Targets Set		Kenyan mobile network operator Safaricom PLC commits to reduce absolute scope 1 and 2 GHG emissions 43% by 2030 and 74% by 2050 from a 2017 base year. Safaricom PLC commits to reduce absolute scope 3 GHG emissions 41% by 2030 and 72% by 2050 from a 2017 base year. Safaricom PLC also commits that 10% of its suppliers by spend covering purchased goods and services will set science-based scope 1 and 2 targets by 2023.
Salesforce	Yes	Targets Set		Salesforce.com, Inc. commits to reduce absolute scope 1 and scope 2 GHG emissions by 50% by 2030 from a 2018 base year. Salesforce.com, Inc. commits to reduce absolute scope 3 GHG emissions from fuel and energy related activities by 50% by 2030 from a 2018 base year. Salesforce.com, Inc. also commits that 60% of its suppliers by emissions covering purchased goods and services, capital goods, upstream transportation and distribution, waste generated in operations, and upstream leased assets will set science-based targets by 2024.
Samsung	No			
SAP	Yes	Targets Set		German multinational software corporation SAP commits to reduce total scope 1, 2 and 3 GHG emissions 40% by 2025, using a 2016 base year. This target is an important milestone in reducing emissions 85% by 2050, using a 2016 base year.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Seagate	Yes	Targets Set		American data storage company Seagate Technology LLC commits to reduce absolute scope 1 and scope 2 GHG emissions 20% by 2025 and 60% by 2040 from a 2017 base year. Seagate Technology LLC also commits to reduce absolute scope 3 GHG emissions 20% by 2025 and 60% by 2040 from a 2017 base year.
ServiceNow	Yes	Targets Set		ServiceNow Inc. commits to reduce absolute scope 1 and 2 GHG emissions 70% by 2026 from a 2019 base year. ServiceNow Inc. also commits to reduce scope 3 GHG emissions from business travel and employee commuting 40% per unit of value added within the same timeframe. ServiceNow Inc. further commits that 65% of its suppliers by spend covering purchased goods and services and capital goods, will have science-based targets by 2026.
SES	Yes	Committed		
Sina	No			
Singtel	Yes	Targets Set		Singaporean telecommunications company, Singtel Group commits to reduce its scope 1, 2 and 3 GHG emissions 40% by 2030 from a 2015 base year.
SK Hynix	No			
SK Telecom	Yes	Targets Set		SK Telecom commits to reduce absolute scope 1 and 2 GHG emissions 45.7% by 2030 from a 2020 base year. SK Telecom also commits to reduce absolute scope 3 GHG emissions 22.3% within the same timeframe.
Skyworks	No			
Snap	Yes	Targets Set		Snap Inc. commits to reduce absolute scope 1 and 2 GHG emissions 25% by 2025 from a 2019 base year. Snap Inc. also commits to reduce scope 3 GHG emissions from purchased goods and services, business travel and use of sold products 35% per unit of value added by 2025 from a 2019 base year.
SoftBank	Yes	Targets Set		SoftBank Corp. commits to reduce absolute scope 1 and 2 GHG emissions 82.8% by FY2030/31 from a FY2019/20 base year. SoftBank Corp. commits to reduce absolute scope 3 GHG emissions 14.8% within the same timeframe.
Sonatel	No			
Sony	Yes	Target set	2040	Sony Group Corporation commits to reach net-zero greenhouse gas emissions across the value chain by FY2040 from a FY2018 base year. Near-Term Targets Sony Group Corporation commits to reduce absolute scope 1 and 2 GHG emissions 72% by FY2035 from a FY2018 base year. Sony Group Corporation commits to reduce absolute scope 3 GHG emissions covering use of sold products 45% over the same target period. Sony Corporation also commits that 10% of its suppliers by emissions covering purchased goods and services, will have science-based targets by FY2025. Long-Term Targets Sony Group Corporation commits to reduce absolute scope 1, 2, and 3 GHG emissions 90% by FY2040 from a FY2018 base year.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
SpaceX	No			
Spark	Yes	Targets Set		Spark New Zealand commits to reduce absolute scope 1 and 2 GHG emissions 56% by FY2030 from a FY2020 base year. Spark New Zealand commits that 70% of its suppliers by spend covering purchased goods and services and capital goods will have science-based targets by FY2026.
Spotify	No			
STC	Yes	Targets Set	2050	Overall Net-Zero Target Saudi Telecom Company (STC) commits to reach net-zero GHG emissions across the value chain by 2050. Near-Term Targets Saudi Telecom Company (STC) commits to reduce absolute scope 1 and scope 2 GHG emissions by 50% by 2030 from a 2019 base year. Saudi Telecom Company (STC) also commits to reduce absolute scope 3 emissions by 46.2% within the same timeframe. Long-Term Targets Saudi Telecom Company (STC) commits to reduce absolute scope 1, 2 and 3 GHG emissions 90% by 2050 from a 2019 base year.
Stripe	No			
Sudatel	No			
Swisscom	Yes	Committed		
Tata Communications	Yes	Committed		
TCL	No			
TE Connectivity	Yes	Committed		
Tele2	Yes	Targets Set	2035	Overall Net-Zero Target Multinational Swedish telecommunications company Tele2 AB commits to reach net-zero greenhouse gas emissions across the value chain by 2035 from a 2019 base year. Near-Term Targets Tele2 AB commits to reduce absolute scope 1 and 2 GHG emissions 90% by 2025 and 100% by 2029 from a 2019 base year*. Tele2 AB also commits to reduce scope 3 GHG emissions 60% per subscription by 2029 from a 2019 base year. *The target boundary includes biogenic land-related emissions and removals from bioenergy feedstocks. Long-Term Targets Tele2 AB commits to maintain 100% absolute scope 1 and 2 GHG emissions reductions from 2029 through 2035*. Tele2 AB also commits to reduce absolute scope 3 GHG emissions 90% by 2035 from a 2019 base year. *The target boundary includes biogenic land-related emissions and removals from bioenergy feedstocks.
Telecom Egypt	No			
Telecom Italia	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Telefónica	Yes	Targets Set	2040	Overall Net-Zero Target Telefónica S.A. commits to reach net-zero greenhouse gas emissions across the value chain by 2040 from a 2015 / 2016 base year. Near-Term Targets Telefónica S.A commits to reduce absolute scope 1 and scope 2 GHG emissions 80% by 2030 from a 2015 base year. Telefónica S.A commits to reduce absolute scope 3 GHG emissions 56% by 2030 from a 2016 base year. Long-Term Targets Telefónica S.A commits to reduce scope 1 and scope 2 GHG emissions 90% by 2040 from a 2015 base year. Telefónica S.A commits to reduce scope 3 GHG emissions 90% by 2040 from a 2016 base year.
Telenor	Yes	Targets Set		The multinational telecommunications company Telenor Group commits to reduce absolute scope 1 and 2 GHG emissions 57% by 2030 from a 2019 base year. Telenor Group commits that 68% of its suppliers by spend covering purchased goods and services and capital goods will have science based targets by 2025.
Telia	Yes	Targets Set	2040	Overall Net-Zero Target Telia Company commits to reach net-zero GHG emissions across the value chain by 2040. Near-Term Targets Telia Company commits to reduce absolute scope 1 and 2 GHG emissions 90% by 2030 from a 2018 base year. Telia Company also commits to reduce absolute scope 3 GHG emissions from use of sold products and downstream leased assets 29% by 2025 from a 2018 base year. Telia Company further commits that 72% of its suppliers by emissions covering purchased goods and services and capital goods, will have science-based targets by 2025. Long-Term Targets Telia Company commits to maintain at least 90% absolute scope 1 and 2 emission reductions from 2030 through 2040 from a 2018 base year. Telia Company also commits to reduce absolute scope 3 GHG emissions 90% by 2040 from a 2018 base year.
Telkom	Yes	Committed		
Telkom Indonesia	No			
Telstra	Yes	Targets Set		Telstra commits to reduce absolute scopes 1, 2 and 3 GHG emissions 50% by FY2030 from a FY2019 base year.
Tencent	Yes	Targets Set		Tencent commits to reduce absolute scope 1 and 2 GHG emissions 70% by 2030 from a 2021 base year. Tencent also commits to increase annual sourcing renewable electricity from 2% in 2021 to 100% by 2030. Tencent further commits to reduce absolute scope 3 GHG emission 30% within the same timeframe.
Texas Instruments	No			
Tokyo Electron	Yes	Targets Set		Tokyo Electron Limited commits to reduce absolute scope 1 and 2 GHG emissions 70% by FY2030 from a FY2018 base year. Tokyo Electron Limited also commits to increase active annual sourcing of renewable electricity from 2% in FY2018 to 100% by FY2030. Tokyo Electron Limited further commits to reduce scope 3 GHG emissions from use of sold products 55% per wafer processed by FY2030 from a FY2021 base year.
Toshiba TEC	No			

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Transsion	No			
TSMC	No			
Türk Telekom	No			
Twilio	Yes	Committed		
Twitter	Yes	Committed		
Uber	Yes	Targets Set	2040	Overall Net-Zero Target Uber commits to reach net-zero GHG emissions across the value chain by 2040. Near-Term Targets Uber commits to reduce absolute scope 1 and 2 GHG emissions 42% by 2030 from a 2021 base year.* Uber also commits to reduce scope 3 GHG emissions from use of sold products 34% per service km within the same timeframe. *The target boundary includes biogenic emissions and removals from bioenergy feedstocks Long-Term Targets Uber commits to reduce absolute scope 1 and 2 GHG emissions 90% by 2040 from a 2021 base year.* Uber also commits to reduce scope 3 GHG emissions from use of sold products 97% per service km within the same timeframe. *The target boundary includes biogenic emissions and removals from bioenergy feedstocks
United Internet	No			
Veon	No			
Verizon	Yes	Targets Set		Verizon Communications Inc. commits to reduce absolute scope 1 and 2 GHG emissions 53% by 2030 from a 2019 base year. Verizon Communications Inc. commits to reduce absolute scope 3 GHG emissions 40% by 2035 from a 2019 base year.
Viettel	No			
VMWare	Yes	Targets Set		VMware commits to reduce absolute scope 1 and scope 2 GHG emissions 50% by FY2031 from a FY2019 base year. VMware also commits to increase annual sourcing of renewable electricity from 94% in FY2019 to 100% by FY2021. And commits to continue annually sourcing 100% renewable electricity through to FY2031. VMware commits to reduce absolute scope 3 GHG emissions from employee commuting and fuel-and-energy-related activities 50% by FY2031 from a FY2019 base year. VMware further commits that 75% of its suppliers by spend covering purchased goods and services, capital goods, upstream leased assets and upstream transportation and distribution will have science-based targets by FY2025.

Company	Have the targets been submitted to SBTi? 2022	Near Term Status	Net Zero year	Target text (only available when "Targets Set")
Vodafone	Yes	Targets Set	2040	Multinational technology communications company Vodafone Group commits to reach net-zero GHG emissions across the value chain by FY2040. Vodafone Group commits to reduce absolute scope 1 and 2 GHG emissions 90% by FY2030 from a FY2020 base year. Vodafone Group also commits to increase annual active sourcing of renewable electricity from 26% in FY2020 to 100% by FY2025 and to continue sourcing 100% renewable electricity through FY2030. Vodafone Group further commits to reduce absolute scope 3 GHG emissions 50% by FY2030 from a FY2020 base year. Long-Term Targets: Vodafone Group commits to maintain at least 90% absolute scope 1 and 2 GHG emissions reductions from FY2030 through FY2040 from a FY2020 base year. Vodafone also commits to reduce absolute scope 3 GHG emissions 90% by FY2040 from a FY2020 base year.
Western Digital	Yes	Targets Set		Western Digital commits to reduce absolute scope 1 and 2 GHG emissions 42% by FY2030 from a FY2020 base year. Western Digital also commits to reduce scope 3 GHG emissions from use of sold products 50% per petabyte capacity sold by FY2030 from a FY2020 base year.
Xiaomi	No			
Yandex	No			
Yunji	No			
Zain	Yes	Committed		
Zoom	No			
ZTE	Yes	Committed		

Note: Status as October 2023. Source: SBTi (https://sciencebasedtargets.org/companies-taking-action).

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