



Green Future Networks Telco Supply Chain Sustainability

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GREEN FUTURE NETWORKS TELCO SUPPLY CHAIN SUSTAINABILITY

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EXECUTIVE SUMMARY

The mobile industry is leading the race towards net-zero emissions, by setting climate action targets in alignment with the Paris Agreement. According to the latest Carbon Disclosure Project (CDP) report, data disclosed by the majority of the operators indicate that a significant portion of emissions are generated in the value chain. This is obviously greater for the network operators that have managed to switch fully to renewable energy in their operations. These emissions are part of those termed 'scope 3' (a company's indirect emissions from its supply chain and from the use of its products by its customers) according to the Greenhouse Gas (GHG) Protocol. Sustainable supply chains should also be guided by the Sustainable Development Goals (SDGs) of the United Nations, with environmental, economic, and social considerations incorporated into all of the supply chain operation areas.

In this publication, the key challenges mobile operators face in developing sustainable supply chains are outlined. A review of the emerging regulatory and standards environment is conducted and approaches and best practices in developing sustainable supply chains are identified by relating the emerging business and regulatory environment to examples of the changes that operators and their supply chain partners may need to make both at a strategic and operational level. The key conclusion is: Integrating sustainability goals into the operator's core objectives is of key importance as well as selecting suppliers whose own sustainability strategies are aligned with these goals.

Finally, a practical checklist (Annex A) based on the best practices in the industry is provided to support operators in developing a sustainable procurement strategy. Examples from across the industry are included that highlight that companies are already embracing many of the concepts identified in this report.

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01 INTRODUCTION

Supply chain emissions account for 80% - 95% of overall emissions for operators using renewable energy

The mobile industry is leading the race towards net zero by setting climate action targets in alignment with Paris Agreement ^[1].

According to GSMA's Mobile Net Zero 2022 report, 82% of the operators by revenue disclose their climate impacts ^[2] and this data shows that a significant portion of emissions are generated in the supply chain. Supply chain emissions account for around 80% - 95% of the overall emissions for the network operators that have managed to switch fully to renewable energy in their operations ^[3].

These emissions form the 'upstream' part of scope 3 according to the Greenhouse Gas Protocol (GHG) ^[4] which sets global standards to measure and manage GHG emissions. GHG protocol defines following categories of carbon emissions:

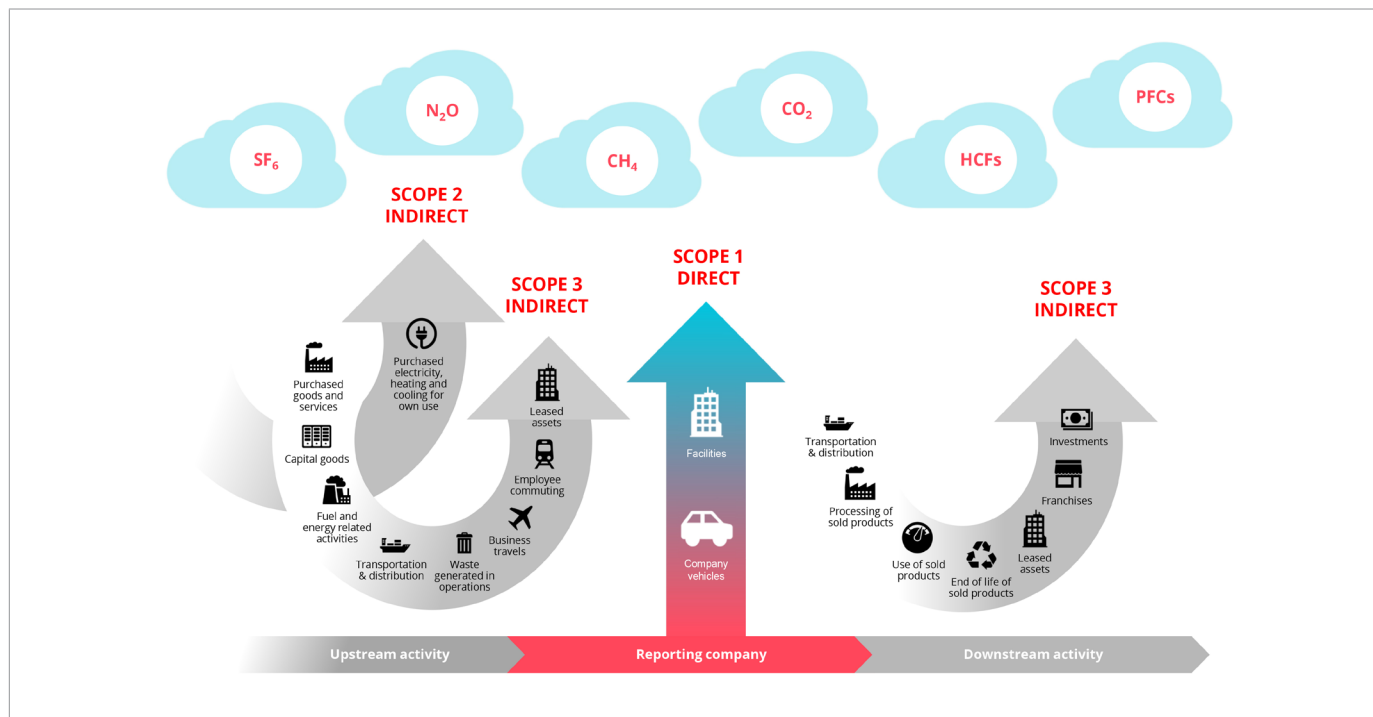


Figure 1-1: Scope 1, 2 and 3 emissions as defined by GHG protocol

SCOPE 1:

Direct emissions from an operator, such as from running its fleet for network maintenance and using diesel to operate base stations in hard-to-reach areas.

SCOPE 2:

Indirect emissions from the generation of purchased energy, from a utility provider. In other words, all GHG emissions released in the atmosphere, from the consumption of purchased electricity, steam, heat, and cooling.

SCOPE 3:

All other indirect emissions that occur in a company's value chain, including manufacturing of purchased goods and services, capital goods, and use of sold products such as user equipment.

Due to size, diversity, and complexity of the supply chain, a number of key challenges, and thereby requirements, exist. These generally relate to integrity and uniformity of the data, but also to the need to balance multiple co-existing goals. The integrity and comparability of the data include the following requirements:

- boundaries within a complex and heterogeneous supply chain
- data availability, disclosure, and granularity
- traceability (of data flow, as well as the product and financial flows)
- uniformity and standard approach in reporting
- insights and visibility in procurement to enable appropriate decisions and actions

In the context of the overall goals and targets, there are existing and growing regulations, with fundamental similarities in different markets. As expected, these regulations mandate social and environmental responsibilities of organizations in their own operations and through their value chains, by identifying, preventing, mitigating, and accounting for their adverse societal rights, and environmental impacts, and having adequate governance, management systems and measures in place. Some of these rules go as far as setting requirements on such aspects as product durability and re-usability, among others.

Furthermore, standardization initiatives provide guidelines, on one hand, and certifiable aligned data, on the other. A number of common and collaborative approaches, such as Carbon Disclosure Project reporting and, Science-Based Targets initiative, among others, complement the key pillars and success factors in energy efficiency, renewable energy, product modularity, lifecycle assessment, and minimization of water and carbon footprints.

To transition to sustainable value chains, companies need to move from linear value chains to circular ones. This means rethinking and reconnecting supply chains - looking at adding value to complete systems rather than individual process steps. Furthermore, novel approaches

in the design of products are needed, including extending the life of products from the outset and ensuring that re-use and re-cycling is built in. The impact of choice of material or product choices should be considered for company operations as well as in the use of the offered products and services. Taken together, these changes represent a paradigm shift for the industry.

This publication also contains several 'best practices' contributed by industry players who helped develop this publication. These best practices highlight that many companies in the mobile industry are already implementing end-to-end measures. These measures encompass considerations including eco-design, management systems, energy efficiency and renewable energy usage, product modularity and recycling, reduction of waste, as well as organizational focus and supplier engagement.

Achievement of net-zero targets is becoming a clear commitment, though it still needs the collective work of all players in the value chain, and the alignment of the entire ecosystem.



This publication primarily focuses on telecom supply chain sustainability

02 SUSTAINABLE SUPPLY CHAIN CHALLENGES

There are many **challenges for the operators striving to reduce supply chain emissions** since they are generated outside of their organizational boundaries.

Below are some of the significant challenges faced by the operators

CHALLENGE #1

DATA AVAILABILITY AND GRANULARITY

It is difficult for operators to get the data if vendors do not disclose emissions via CDP or other platforms. It therefore follows that one of the biggest challenges in supply chain emission accounting concerns data. Suppliers might not provide accurate emission data or provide something based on standard emissions which are averaged across the industry thus representing a general value and not an exact one. This is also a matter of transparency: when collecting data internally versus data reported externally.

CHALLENGE #2

DATA INTEGRITY, STAKEHOLDER DYNAMICS, AND THE NEED FOR STANDARDS

A second key challenge is that of data integrity and stakeholder dynamics. Although operators often work closely with and engage their suppliers on a long-term basis, they are still separate organisations and as such are subject to their own organisational dynamics and incentives - setting their objectives and strategies based on their own views of how the market and business environment (including regulations) are developing. These dynamics make for challenges in the integrity of data for example due to different suppliers having different net-zero plans and taking different approaches to measuring and declaring the carbon footprint of their products and services.

A key challenge is to encourage an industry wide, standardised approach to how carbon emissions are measured and reported to minimise the transaction costs to both sides (operators and suppliers) of gathering and communicating this key information. The Value Chain Carbon Transparency Pathfinder initiative led by the World Business Council for Sustainable Development on scope 3 emission transparency and decarbonization provides one such approach^[5]. Among its key merits, this initiative helps connecting different stakeholders across the value chain to facilitate data transparency regarding verified product-specific primary emission data and secure data exchange through open technology standards.

Finally, as data analytics, smart sensors and blockchain technologies are further adopted by operators' supply chains to optimize operations and processes, further improvements in measuring, reporting, and tracing of carbon emissions across the supply chain should be possible.

CHALLENGE #3

VISIBILITY AND DECISION SUPPORT IN THE SUPPLY CHAIN

Procurement needs the required insight / visibility, simulation and optimization capabilities and hands-on access to data and projections to support appropriate decision-making. Planning Analytics capabilities could provide the required tooling but needs appropriate data to be provided through supply chain and equipment providers.

Procurement is not the sole decision maker in most operators especially during the eco-design phase, where many other environmental parameters, such as energy efficiency, are important. Marketing departments play key roles and need to be aligned with supply chain requirements to both support and reinforce sustainability principles. The need for an operator to fully align its operations and its supply chain to its sustainability objectives and strategy is further explored in chapter 5.

CHALLENGE #4

ORGANISATIONAL

Reporting of Scope 3 data may come across as a challenge for it requires dedicated staff, expertise and proper processes which are seldom available simultaneously. It is ultimately a question of securing appropriate leadership support to coordinate efforts from different part of the organizations.

03 SUPPLY CHAIN EMISSIONS REDUCTION LEVERS FOR TELCOS

The SBT Value Chain report ^[6] outlines seven key industry agnostic levers that can be used to reduce supply chain carbon emissions.

These levers can be applied to the telco sector as follows:

Business Model Innovation: Business Model Innovation can be a driver for enhancing sustainable development capabilities within the telco industry. As we consider not only companies' operational and profit-making strategic approaches, but also value creation processes and the overall technological and economic transformation, our business models must be increasingly resilient to make a difference. In this regard, circular economy considerations are bound to influence more growth business models as Telcos commit more to sustainability goals. Business models including a sustainable share of refurbished products would require adapted supply chain operations and processes to support qualitative and quantitative device sourcing in a highly competitive market (fragmented between OEMs' own refurbished product offers and specialised refurbishing companies).

Supplier Engagement: More and more telcos are engaging with their larger suppliers to align on climate targets. For the suppliers who do not have enough resources or skills to report their carbon emissions in platforms like CDP, several tools are currently being developed to help them understand and report emissions without going through a large set of questionnaires. Some operators also report on the number of suppliers which have committed to reduce their supply chain emissions. In these cases, the best starting point is to identify companies in the supply chain which are the biggest emitters and by that contri-

bute most to the scope 3 upstream emissions. A similar approach can be cascaded further down in the supply chain via the tier 1, tier 2 suppliers and so on. To lower carbon emissions it is effective to set requirements that reach further than only 1st tier. By requesting suppliers to also set public targets to halve absolute emissions by 2030 and align with the 1.5°C-target it is possible to reach further down in the supply chain.

Procurement Policy and Choices: Telcos can significantly reduce their emissions by changing their procurement policy in a way that supports purchasing from the suppliers with lower footprint. This approach should come from the top management of a company in alignment with the procurement team. Implementing sustainability criteria as a part of the weighting besides technical and commercial aspects by telcos creates pressure towards the suppliers as it directly impacts the business of those companies. This publication presents a checklist for operators who plan to implement sustainability criteria in their procurement process. Please see Annex A for details.

Product and Service Design: integrate circular economy principles in products and service design. From an operator perspective, we would expect to see a growing trend of service portfolio and product mix revision, focusing on new and refurbished devices and leveraging the latter at the core of the smart innovation commercial strategy. A paradigm shift in this vein would make sense in light of product eco-design trends that are being confirmed through bespoke policies, such as the EU's upcoming Eco-design for Sustainable Product Regulation (ESPR) regulation, with additional specific requirements for product categories to follow by 2030. In addition, the European Commission has also issued a proposal draft regarding the creation of an EU-wide energy label to complement handsets' (smartphones and tablets) repair index. Such policies are bound to impact circular economy-driven business models and, of course, service offers within commercial strategies in terms of initial and extended warranty, repair and refurbish authorizations to be agreed with OEMs, as

well as early upgrade and/or loan schemes, to name but a few. Therefore, as a first step to prepare for the ESPR change patterns, a review of current LCA in telco portfolios appears as a first-level priority. Furthermore, by aiming to increase product lifespan and contributing to reduce new product-related emissions, telcos may also need to review their relationship with customers as upfront costs are bound to increase, unless there is a shift in the ownership approach. Here again, telcos could push forward a service-driven approach to traditionally bought-and-owned products by promoting loan and early or controlled upgrade schemes.

Customer Engagement – Although not the focus of this publication, to fully develop circular supply chains customer engagement will be critical. Interventions may include education, collaboration, and compensation, or alternatively, marketing strategies to influence behaviour. At minimum, this can foster circular end-of-life treatment of products, but it may also include other aspects such as energy efficiency behaviour. An obvious challenge is limited control, in particular downstream towards customers, once the product leaves the company.

Operational Policies – This lever, in general, includes internal protocols and guidelines to align business goals and general operation policies with GHG reduction measures. These guidelines are particularly important for companies with significant commuting and business travel emissions and companies that produce large amounts of waste.

Conflicting objectives – one challenge are conflicting environmental objectives, or other objectives. How to choose between better energy performance in a new product or the higher resource efficiency achieved by using a refurbished product. These are challenges that need to be handled in systematic way.



04 SUPPLY CHAIN REGULATORY ENVIRONMENT

There is a trend of increasing regulation related to reporting of a company's sustainability performance over the full value chain. **This trend is valid for both environmental and social issues.**

Although many different initiatives exist there are some commonalities. One trend is the use of reporting to drive a wanted behaviour through increased value chain transparency on environmental and social issues.

4.1 SUPPLY CHAIN REGULATIONS

Below is a non-exhaustive list of such rules and regulations, but in addition to these it is also worth mentioning a diverging EU regulatory scene where member states develop their own taxes and reporting schemes.

EU proposal on Corporate Sustainability Due Diligence: the proposed Directive^[7] will set out a horizontal framework to foster the contribution of businesses operating in the single market to respect human rights and environment in their own operations and through their value chains, by identifying, preventing, mitigating, and accounting for their adverse human rights, and environmental impacts, and having adequate governance, management systems and measures in place to this end. The law applies to all companies or organizations located in the EU that employ at least 500 people or have an annual net turnover of EUR 150 million. This law covers the full value chain including suppliers several tiers down in the value chain (supplier of the suppliers).

Supply Chain Act in Germany (Lieferkettensorgfaltspflichtengesetz)

This German law^[8] requires companies to monitor environmental and human right risks in their supply chains. The law will come into effect in 2023, only applying to companies with over 3000 employees in its first year. In 2024, the provisions of the law will extend to apply to all companies with over 1000 employees. Here supply chain includes only direct suppliers and fines are imposed as penalty for violations.



EUs new Corporate Sustainability Reporting Directive (CSRD): From 2024 this Directive will require more detailed reporting by companies regarding environmental rights, social rights, human rights, and governance factors. It also introduces a certification requirement for sustainability reporting^[9].

US SEC rules on Climate Disclosure: These proposed disclosure rules are similar to those that many companies already provide under frameworks such as the Task Force on Climate-Related Financial Disclosures (TCFD) and the Greenhouse Gas Protocol^[10].

EU proposal for Eco-design for Sustainable Products Regulation (ESPR): This will replace the existing eco-design directive and widen the scope to product requirements beyond energy efficiency and make it applicable to a broader range of products. A Digital Product Passport (DPP) is proposed to become the norm for all products regulated under the ESPR and the proposal also includes mandatory transparency requirements which could impact the supply chain. It will also include requirements on product durability and reliability, product re-usability and product upgradability, repairability, maintenance and refurbishment^[11]. In addition, the European Commission has recently proposed draft regulations that would have the effect of including smartphones and tablets as products that will be covered by EU eco-design directives^[12].

Right to repair: ‘Right to repair’ related initiatives have emerged in several markets such as USA and EU but also in Australia, Canada, Philippines, and South Korea. Some of these schemes may become part of the local regulatory environment. The main purpose of “right to repair” is to

avoid early replacement or disposal of products through “right to repair and reuse”, i.e. increasing the possibilities for repair and reuse, including increase of consumers ability to repair products. In most cases, ‘right to repair’ does not cover business to business products. For this reason, telcos would need to work bilaterally with their infrastructure suppliers in order to encourage similar lifecycle extension of the products used in networks (network infrastructure, data centres).

4.2 SUPPLY CHAIN STANDARDS

The following is a non-exhaustive list of standards that relate to sustainable procurement.

ISO sustainable procurement

ISO 20400:2017 provides guidance to organizations, independent of their activity or size, on integrating sustainability within procurement, as described in ISO 26000. It is intended for the stakeholders involved in, or impacted by, procurement decisions and processes.

Sustainability Accounting Standards Board (SASB) standards

Focusing on disclosures and indicators most relevant to our business by drawing from the sector-specific indicators of both the Software and IT Services and the Hardware industry standards.

Global Reporting Initiative’s (GRI)

GRI is the independent, international organization that helps businesses and other organizations take responsibility for their impacts, by providing them with the global common language to communicate those impacts

05 CRITICAL SUCCESS FACTORS FOR SUPPLY CHAIN SUSTAINABILITY

Effectively developing and managing a sustainable supply chain requires that operators build ESG goals into their overall strategic plan and align their organisation and partners around that strategy. This will require changes to the operator's systems and processes; up-skilling of staff; and the development of new business models. Development of more telco industry-specific supply chain sustainability KPIs could be an important follow up activity for a next initiative.

Operators can use **Science Based Targets Initiative (SBTi)**^[13] to align their climate goals with UN targets.

5.1 DEVELOPING ESG GOALS

Successfully developing and managing a sustainable supply chain starts with the operator defining and committing to clear ESG goals and ensuring that these are integrated into the company's overall corporate and business objectives. Essentially the ESG goals should be fully consistent with the company's wider goals and no goal or strategy should conflict with the overall vision of creating an operator with sustainability as one of its core values.

Ensuring that ESG goals are fully integrated into the company's objectives and its strategic plan helps to ensure that the entire operation of the operator - including supply chain management and product/service provision to end-customers will align with the ESG goals.

Set 'Science based Targets' to align climate goals with UN targets: Science-based targets provide companies with a clearly defined path to reduce emissions in line with the Paris Agreement goals. Moreover, Science-based targets provide a clearly defined pathway for companies to reduce greenhouse gas (GHG) emissions, helping to prevent the worst impacts of climate change and to future-proof business growth.

Targets are considered 'science-based' if they are in line with what the latest climate science deems necessary to meet the goals of the Paris Agreement - limiting global warming to well-below 2°C above pre-industrial levels and pursuing efforts to limit warming to 1.5°C. More than 2,000 businesses around the world are already working with the SBTi.



5.2 STRATEGY AND ALIGNING WITH ESG GOALS

In addition to setting clear objectives and goals that meet the operator's business needs and have ESG goals deeply embedded, operators will also need clear strategies to achieve their objectives.

Given the size of the challenges, this will be a multi-year programme that needs to span multiple iterations of products and services (product/service and business model innovation); multiple generations of networking technology; as well as being relevant for entirely new products and services (corporate strategy). To be successful all internal departments and functions (procurement, marketing, finance, human resources, network operations etc); people; as well as external stakeholders (suppliers, customers) will need to be aligned and operating in harmony with the direction set.

5.3 NEW PROCESSES

Ultimately, over time - as strategic alignment around ESG business objectives and strategies is achieved - the operator and their suppliers will need to adopt new processes to ensure that the objectives can be consistently delivered. New processes will be needed across the operator's business.

The following is a non-exhaustive list of new processes organised by impacted departments, functions, and stakeholders. Where possible, existing mobile and ESG industry initiatives that offer tools for companies to adopt and implement new processes are identified.

05 CRITICAL SUCCESS FACTORS FOR SUPPLY CHAIN SUSTAINABILITY

5.3.1 SUPPLY CHAIN MANAGEMENT AND PROCUREMENT

Operators will need to adapt (and potentially introduce new) supply chain processes as follows:

Supplier Selection Processes: Supplier selection processes should be adapted to ensure that suppliers are chosen for their ability to provide the supplied products and services whilst also meeting the operator's requirements around ESG goals and in particular reduction of carbon emissions. Operators will need to update their RFQ/RFP processes to include specific sections on ESG and will need to develop a scoring mechanism that provides sufficient weighting to ESG aspects whilst ensuring overall commercial goals in relation to supplier selection can be met. For example, to ensure the operator can accurately determine the carbon emissions of its products and services, operators will require their suppliers to provide data on the carbon emissions of their products and services.

Operators could encourage sharing information through CDP: Carbon Disclosure Project is a global organisation driving disclosure of Sustainability data and has become a de facto standard for company transparency regarding sustainability performance. ESG ratings (if included in the RFP/RFQ) should be based on an independent trusted source.

Supplier Management Processes: In addition to supplier selection, operators will need to manage their suppliers with ESG in mind throughout their ongoing supplier relationships. This includes working with (and selecting) products and suppliers that help the operator to meet its goals with respect to its own product and service development (see 5.3.2). Operators should have a supplier code of conduct and should have processes in place to regularly audit suppliers to ensure that the code of conduct is being fulfilled. The Responsible Business Alliance (RBA) is a useful resource for developing supplier codes of conduct^[14].

5.3.2 PRODUCT / SERVICE DEVELOPMENT / DEVICES

In many countries, operators are the primary channel through which consumers buy their smartphones and service subscriptions. Operators will need to adapt (and potentially introduce new) product and service development processes as follows:

Policy on extending device / product life: Operators should work with their device suppliers to encourage them to extend the life of devices. Potential solutions to be considered include embracing modular design (which could enhance repair-ability and enable easier recycling). As operators are often the major channel for retailing devices to consumers device manufacturers and operators will need to work together to ensure sufficient forward and reverse logistics are in place to meet the needs of consumers who want to buy such devices and be able to easily get the device repaired and/or buy new parts. (Please see also 5.3.4).

Eco-Packaging: Operators should work with their suppliers to reduce packaging and as far as possible use bio-degradable materials in place of plastics.

Business Model innovation - moving towards 'Product as a Service': Given the need to extend the life of physical products such as smartphones, routers and IoT devices as well as to encourage their re-use and recycling it may be useful for operators to consider offering devices as a 'service'. This could enable the operator to have greater control over when devices are returned and to better manage customer expectations in relation to the lifecycle of the device.

E-waste management and reverse logistics: Operators should have processes and plans in place to aim for full circularity and reduce e-waste.

In working with suppliers to develop new sustainable products there are two frameworks that are useful in determining the environmental footprint of a product:

Lifecycle Analysis (LCA): LCA is a systematic tool that allows for analysis of environmental loads of a product (and service) in its entire life cycle and the assessment of its potential impacts on the environment. The main purpose of LCA is to identify environmental hotspots to structure improvement work; it is not well suited for comparing products in a purchasing decision. For products that are part of a system, such as network products, the usage of LCA on a product level is not always useful. There are four phases in an LCA, goal and scope definition, life cycle inventory analysis, life cycle impact assessment and life cycle interpretation.

The ISO 14044:2006 standard, Life Cycle Assessment, addresses quantitative methods for the assessment of the environmental aspects of a product or service in its entire life cycle stages. Other comparable standards include: The International Reference Life Cycle Data System (ILCD) handbook (EU), which was developed by the European Commission Joint Research Centre. Furthermore PAS 2050 (UK) provides a method and guidelines for calculating greenhouse gas emissions “within the life cycle of goods and services.” The BPX 30-323 series (France) describes the method for assessing the life cycle environmental impact of various products. EcoLeaf (Japan) describes the methodology for assessing the environmental impact of products throughout their life cycle. Carbon footprint of products (CFP) (Korea) provides guidelines for assessing the life cycle carbon footprint of products.

PCF - Production Carbon Footprint from an IT equipment perspective — PAIA (product attributes to impact algorithm) is one way to calculating PCF for IT equipment^[15]. It is a set of streamlined methodologies and tools. Although it can be seen that through models like PAIA, there is an effort by the industry to standardize PCF models there is still variety in terms of individual configurations, origin of integrated components, specific shipping situation and also the overall distance between manufacturing site and deployment site.



05 CRITICAL SUCCESS FACTORS FOR SUPPLY CHAIN SUSTAINABILITY

5.3.3 MARKETING AND COMMUNICATIONS

Operators will need to adapt (and potentially introduce new) marketing and communications processes as follows:

Brand: Consider updating the brand to support efforts around marketing and communication of sustainability credentials to all stakeholders (customers, suppliers, investors, government).

Communicating sustainable products/services to customers: In addition to brand updates, operators will need methods to be able to clearly articulate and communicate the sustainability of the products and services they offer. Device eco-ratings (whereby devices are labelled according to a sustainability metric) can offer one way of simplifying communication for customers (see for example [16]). Operators will also need ways to measure and communicate the sustainability of their network and the services available to their customers to enable them to maximise the reparability of their device and to recycle devices or their constituent parts where appropriate.

5.3.4 LOGISTICS

Operators will need to – working with their channel partners and suppliers - adapt (and potentially introduce new) logistics processes as follows:

Traceability: Operators need assurance that the products they are buying (devices, network infrastructure) meet their sustainability requirements in relation to the use of scarce resources (e.g., rare earth metals) and in relation to the carbon footprints of the constituent parts of the product. This implies that systems will be required to track and trace products and their constituent parts right through the value chain from raw materials to the end customer. Given that all industries are facing a similar challenge it would make sense to pursue and use systems that are not specific to any given industry, and which do not lock-in stakeholders in the chain to a particular set of business relationships. The 3 main axes in terms of flows of a Supply Chain are products flow, data flow &

financial flow. For an efficient and optimized Supply Chain management, the ability to trace those flows of finished goods is vital not only on ecological and environmental considerations but also on economic as well as corporate and social responsibility levels.

Recycling: Operators will need to expand their recycling operations to include not only device recycling but potentially also the recycling of device parts.

Repairs: If devices are increasingly designed to enable repairs, then operators will need to ensure that repair options are available to their customers. This would involve establishing and ensuring sufficient capacity at repair centres; determining contractual relationships and the legal framework for the repair (e.g., what is an ‘approved’ repair and what warranties are offered to the customer by the operator and/or manufacturer in relation to the repair).

5.3.5 PEOPLE AND HUMAN RESOURCES

People provide the driving force behind most businesses. To ensure that the operator can meet its ESG and wider business goals, people related processes will need to be adopted to ensure the operator has the right job roles to get the work done; the right people to fill these roles; that people have the right skills; and that sufficient incentives and policies are in place to ensure the organisation as a whole moves forward on its journey to being a sustainable business.

In addition, operators will need to be aware of cultural transformation needs of the organisation and will need to foster sustainable thinking and acting within the workforce. Training and development programmes and workshops may be a useful tool in helping to develop the organisation’s culture.

5.3.6 NETWORKS

In relation to networks, operators - working with their networking equipment suppliers - will need to adopt new processes and technologies in relation to:

Energy Efficiency: Although the consumption of purchased electricity is classed as 'scope 2' in the GHG Protocol operators need to continue to work with their infrastructure suppliers to maximise the energy efficiency of network infrastructure. NGMN Alliance has published a report [17] on the opportunities and challenges of network energy efficiency and continues to work on recommendations for how to increase network energy efficiency.

Migration towards cloud-based solutions for networking infrastructure: Operators are investigating if software-based solutions for networking and use of cloud hosting (public/private/hybrid) may be more energy efficient compared to their existing operations. Disaggregated networking including the move towards the use of cloud-native solutions may further enhance energy efficiency (and thereby reduce carbon emissions) as the technology in theory will allow for greater use of shared resources (pooled compute resource) as well as the ability to scale the network to more closely follow and match user demand. Based on statistics from HPE moving to a cloud-based service not only saves cost and TCO (Total cost of ownership) by 30% but it also saves energy by 33%, mainly because hardware and operation are optimized. Although these efficiency figures are to be welcomed – and demonstrate how the industry is considering energy efficiency – they do however represent only a single data point. As technology evolves and as operators gain more operational insights it can be expected that the industry will have a greater appreciation and understanding of the energy efficiency of cloud-native networks.

In addition, as also outlined in 5.3.2 in relation to devices, operators will also need to work with their infrastructure suppliers to ensure that future infrastructure is eco-designed and that issues such as minimising packaging are considered. NGMN Alliance's report on 'Network Equipment Eco-design and end to end services footprint' [18] provides a number of important recommendations in this area.

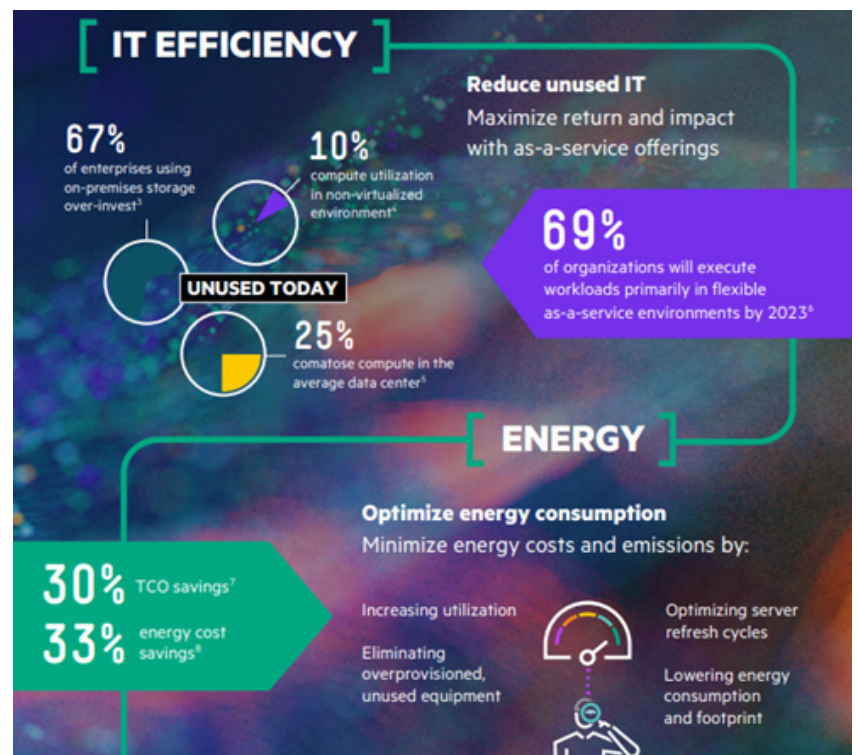


Figure 5-1: IT efficiency in the cloud (source: HPE)

5.4 TOOLS AND TECHNIQUES

Operators should leverage tools and techniques to manage their supply chain sustainability. This includes amongst others, things like supply chain reporting and ESG reporting. It also includes sustainable supply chain simulations and optimizations alongside the holistic picture.

This requires high quality, auditable data, and automated and trusted processes for data collection and integration.

06 CONCLUSIONS

With the climate emergency, all industries are facing the challenge of how to cut their carbon emissions and become carbon neutral. The mobile industry is no different and is already taking action to cut emissions. To facilitate that action, it is important for the industry to collaborate; share best practice; and learn from each other. It is in this context that NGMN Alliance's Green Future Networks initiative seeks to support the industry by providing timely and actionable advice.

In this publication, the issue of 'Telco Supply Chain Sustainability' has been considered. Managing and developing the supply chain in order to ensure climate and wider Environmental, Societal and Governance (ESG) goals can be met is especially important in the mobile industry given that operators report the vast majority of their carbon emissions are in their supply chain. To address this key issue operators will need to re-orientate their businesses; building ESG into their business plans and working with all of their stakeholders (suppliers, customers, investors) to ensure they are aligned in terms of their outlook, plans and approach. Although the scope of this publication is the supply chain, in analysing the impact on the supply chain it is important to consider the wider impacts on the operator as, for example, choices made in relation to product and service development and changes to how the operator sells its products and services will clearly have an impact on their suppliers. For this reason, a methodical approach has been taken to outlining how ESG impacts key activities within an operator.

The following key conclusions and recommendations can be drawn:

- 1.** Adopt ESG goals as an integral part of the operator's objectives.
- 2.** To reduce scope 3 emissions, ensure alignment of major stakeholders (in particular suppliers) with the ESG goals.
- 3.** Update processes (in particular in relation to supply chain management) to include ESG.
- 4.** Encourage suppliers to disclose carbon emissions data.

In support of these recommendations, several tools and resources have been identified as well as a review conducted of existing and emerging regulations. A simple guide to implementing a telco sustainable supply chain is provided in Annex A. In addition, several examples highlighting best practice are offered to highlight the steps the industry is taking on this critically important journey.

As this area evolves - and as the wider transformation of operators into sustainable businesses gets fully underway - NGMN Alliance anticipates that this publication will be updated and maintained as new regulations, processes and tools emerge.



The **NGMN Alliance's Green Future Networks initiative** seeks to support the industry by providing timely and actionable advice

Managing and developing the supply chain in order to ensure climate and wider Environmental, Societal and Governance (ESG) goals can be met is especially important in the mobile industry given that operators report the vast majority of their carbon emissions are in their supply chain.

07 ANNEX A: GUIDE FOR TELCOS TO PROCURE SUSTAINABLE PRODUCTS

Many good practices already exist in the mobile industry which are outlined in the case studies presented in this document. As mentioned in section 3 above, sustainable procurement is one of the key levers for reducing supply chain emissions.

Several key criteria are listed in the table below which could support procurement decisions. It is not an exhaustive list, and it might not be applicable for each supplier either, however it provides a starting point for the purchasing team to understand the sustainability at both the product and supplier level and how to buy lower carbon footprint products.

The above questions should help the purchasing team to evaluate the impact of the products which are to be purchased and this information could be used to further emphasize on areas of improvement for vendors. A separate list of requirements should be ideally drawn up using above criteria based on the product/product-family. In addition, if a company is including the sustainability criteria as a decision-making factor, the steps should be:

- Define scoring methodology including weight for each criteria matching your sustainability strategy
- Define product/product category specific criteria based on the available internationally recognised standards from ITU or ETSI

Sourcing Criteria

Evaluation

Net Zero Targets	Is the vendor/supplier setting net zero targets matching to the operator?
Renewable Electricity usage	Is the product manufactured using as close to 100% renewable electricity as possible (depending on the availability)?
SBTi commitment	Is the vendor/supplier setting science-based targets?
CDP reporting	Is the vendor/supplier reporting emissions in CDP and is this data verified by a trusted third party?
Independent ESG rating tools	Is the vendor able to provide any independent ESG rating matching to the threshold of your strategy
Waste Management	Is the vendor setting targets and KPIs for moving towards zero E-waste?
Water Footprint reporting	Is the vendor reporting the water consumption (during product manufacturing, cooling, etc)?
Product modularity	Is the product modular?
End of lifecycle/Reusability/Recyclability	Is the product reusable/recyclable?
Reselling	Is the vendor enabling the reselling of the product?
Repairability	Is the product repairable?
Take back program	Is the vendor offering a take back option?
Packaging	Is the product packed in an eco-friendly manner (as less material as possible, no single use plastic, recycled material usage)?
Product housing and packaging	Is the product housing and packaging eco-friendly?
Alignment with RBA	Is the supplier aligned with the code of conduct from the Responsible Business Alliance?
LCA availability	Is the product's LCA available according to the recognised standards?
PCF availability	Is the Product Carbon Footprint available according to the recognised standards?
Energy consumption	Is the product energy efficient?
Conflict minerals/hazardous substances	Is the product containing hazardous substances?
Social impact	Is the vendor compliant according to sustainable supply chain conditions including child labour, occupational and health safety, human rights, etc.?

08 LIST OF ABBREVIATIONS

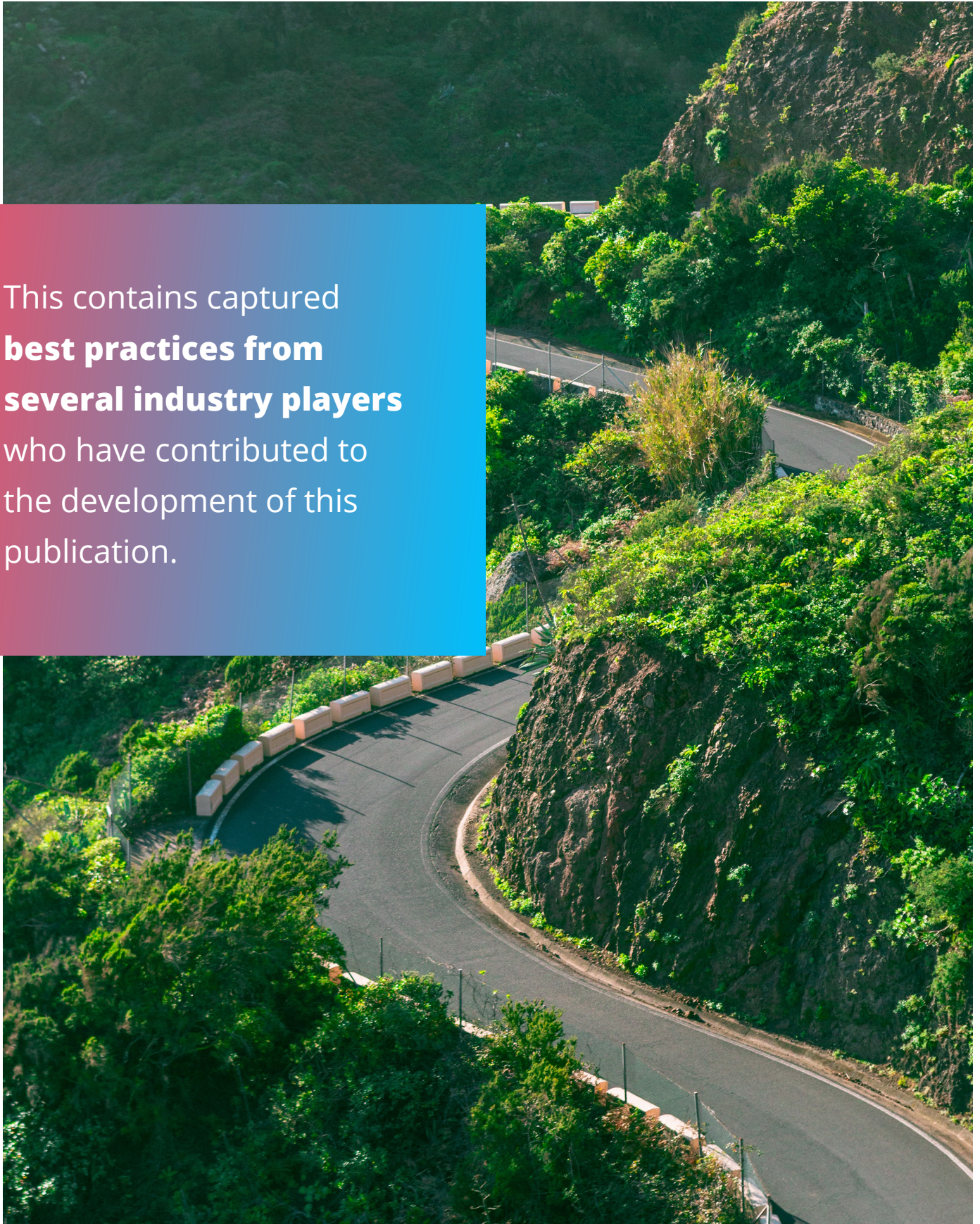
CDP	Carbon Disclosure Project
ESG	Environmental, Social and Governance
ESPR	Eco-design for Sustainable Products Regulation
GARS	Global Asset Recovery Services
GRI	Global Reporting Initiative
LCA	Lifecycle Assessment
OEM	Original Equipment Manufacturer
PAIA	Product Attributes to Impact Algorithm
PCF	Production Carbon Footprint
PELM	Product End of Life Management
RBA	Responsible Business Alliance
RFP / RFQ	Request for Proposal / Request for Quotation
SBTi	Science Based Target initiative
SDG	Sustainable Development Goals
TCO	Total Cost of Ownership

09 REFERENCES

- [1] ITU-T L.1023: Assessment method for circular scoring
- [2] 'Mobile Net Zero. State of the industry on Climate Action 2022', GSMA, May 2022, <https://www.gsma.com/betterfuture/wp-content/uploads/2022/05/Mobile-Net-Zero-State-of-the-Industry-on-Climate-Action-2022.pdf>
- [3] 'The next level of emission reductions in telecom operators', OliverWyman, May 2021, <https://www.oliverwyman.com/our-expertise/insights/2021/may/next-level-of-emission.html>
- [4] 'Greenhouse Gas Protocol', <https://ghgprotocol.org>
- [5] 'Value Chain Carbon Transparency Pathfinder: Enabling decarbonization through Scope 3 emissions transparency', WBCSD, March 2021. <https://www.wbcd.org/Programs/Climate-and-Energy/Climate/SOS-1.5/Resources/Value-Chain-Carbon-Transparency-Pathfinder-Enabling-decarbonization-through-Scope-3-emissions-transparency>
- [6] 'Value Change in the Value Chain: BEST PRACTICES IN SCOPE 3 GREENHOUSE GAS MANAGEMENT', Science Based Targets Initiative, November 2018. https://sciencebasedtargets.org/resources/files/SBT_Value_Chain_Report-1.pdf
- [7] Just and sustainable economy: Commission lays down rules for companies to respect human rights and environment in global value chains https://ec.europa.eu/commission/presscorner/detail/en/ip_22_1145
- [8] German Supply Chain Due Diligence Law https://www.bmwk.de/Redaktion/DE/Gesetze/Wirtschaft/lieferketten_sorgfaltspflichtengesetz.html
- [9] Sustainable economy: Parliament adopts new reporting rules for multinationals: Corporate Sustainability Reporting Directive (CSRD). <https://www.europarl.europa.eu/news/en/press-room/20221107IPR49611/sustainable-economy-parliament-adopts-new-reporting-rules-for-multinationals>
- [10] 'Understanding the SEC's proposed Climate Risk Disclosure Rule', McKinsey & Company, June 2022. <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/understanding-the-secs-proposed-climate-risk-disclosure-rule>
- [11] Eco-Design for Sustainable Products Regulation https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products_en
- [12] 'European Commission Consults on New Ecodesign Requirements for Smartphones and Tablets', Latham & Watkins LLP, September 2022, <https://www.globalelr.com/2022/09/european-commission-consults-on-new-ecodesign-requirements-for-smartphones-and-tablets/>
- [13] 'Science Based Targets Initiative', <https://sciencebasedtargets.org/about-us>
- [14] Responsible Business Alliance Code of Conduct https://www.responsiblebusiness.org/media/docs/RBA_CodeofConduct7.0_English.pdf
- [15] 'Product Attributes to Impact Algorithm (PAIA)', Quantis [website accessed Nov 2022], <https://quantis.com/who-we-guide/our-impact/sustainability-initiatives/paia/>
- [16] Device Eco-Ratings scheme: <https://www.ecoratingdevices.com/#about-us>
- [17] "Green Future Networks: Network Energy Efficiency v1.1", NGMN, December 2021 <https://www.ngmn.org/wp-content/uploads/211009-GFN-Network-Energy-Efficiency-1.0.pdf>
- [18] 'Network Equipment Eco-Design and End to End Services Footprint' (V1.0), NGMN, July 2021 https://www.ngmn.org/wp-content/uploads/210719-NGMN_Green-future-Networks_Eco-design-v1.0.pdf

10 BEST PRACTICES

This contains captured **best practices from several industry players** who have contributed to the development of this publication.



DEUTSCHE TELEKOM

Sustainability and social responsibility have played a key role in our corporate activities for more than two decades. We see ourselves as a responsible company and have made that a core element of our Group strategy. To be able to enter into a business relationship with us, suppliers have to register on our supplier portal and undergo a qualification process. Those who do so are fully informed of Deutsche Telekom's fundamental principles and values – also regarding corporate responsibility and sustainability. As of 2022, ~98% of overall emissions from Deutsche Telekom are generated in the supply chain.

SUSTAINABILITY IN PROCUREMENT

Sustainability is considered while making procurement decisions. As of 2022, the sustainability criteria are also being applied to selected (high-volume) invitations to tender for the supply of IT and network hardware products, and for choosing suppliers. Sustainability accounts for a weighting of 20 percent in relation to supplier selection.

SUPPLIER DEVELOPMENT PROGRAM

We collaborate as partners with our suppliers to make sure they are able to meet our high sustainability criteria.

Since 2018, we have continued the former Deutsche Telekom supplier development program as an industry approach (called 'Sustainable Development Program, or SDP'). Telefónica and Swisscom have since joined this program.

BINDING SUSTAINABILITY REQUIREMENTS

Our Supplier Code of Conduct must be accepted by all suppliers. It sets out fundamental human rights, along with our ethical, social, and ecological standards. In addition, specific sustainability criteria are checked and evaluated when selecting suppliers and products.

SUSTAINABILITY REVIEWS

Our suppliers must regularly submit to internal and external sustainability reviews. A standardized auditing process is used to regularly assess the on-site working, social, and living standards, and the environmental situation, particularly for suppliers who are of strategic importance or are associated with higher risk.

SUPPLIER TRAINING SESSIONS

We train our suppliers using specific online training modules, for example, on compliance topics such as corruption prevention and anti-trust law, on human rights, and on other sustainability issues.

Approaching the full supply chain via the Supply Chain Leaders Initiative

By engaging high-emitting and strategically chosen suppliers Ericsson can reach 90% of its downstream supply chain emissions, and not only emissions from 1st tier suppliers.

The aim is for suppliers to halve their emissions. This is done by suppliers setting their own 1.5°C aligned climate targets covering their downstream supply chain emissions. By committing to this, suppliers should halve their emissions by 2030, and publicly communicate on the targets.

The biggest value of this way of working is that it supports a transition of the supply chain for the whole sector since supply chains often are shared between companies in the same industry. Ericsson does this jointly through the 1.5 degree Supply Chain Leaders and the SME Supply Chain Hub which are partnerships under the Exponential Roadmap initiative (<https://exponential-roadmap.org>). It is a tool to engage and facilitate SME's and other suppliers in the transition to low carbon operations. The initiative provides common guidance in setting climate targets, common way of working and support with tools and guidelines. Suppliers should set public 1.5-degree climate targets and promote the initiative towards their own suppliers and request that they also set climate targets. By developing public resources such as guides and tools that anyone can use, not only members, the aim is to support all companies to de-carbonize and engage with their respective suppliers; something our whole industry can benefit from.



OVERVIEW AND APPROACH

With our vision of a climate-resilient and digitally inclusive world, we are committed to developing technology solutions that have a positive social and environmental impact while maximizing the benefits to our customers, shareholders, team members, and communities in which we operate. Our approach enables our customers to reduce the environmental impacts of their infrastructure without compromising performance and to make data-driven decisions that boost the sustainability of their operations and, in many cases, the positive impact of their products and services.

PARTNERING/SUPPLIER TRAINING

Reaching our net-zero goals requires close collaboration with our global manufacturers and suppliers. We actively partner with the top 95% of our supply chain manufacturing spend to help them improve their management of GHG emissions, water, and waste.

Using supply chain data management software we share supplier-facing GHG emissions management dashboards. This provides suppliers with company-specific emissions data, modelled science-based GHG emissions reduction targets, the ability to track progress toward their publicly stated emissions reduction goals, and allows them to view their own performance against that of their peers. In addition we are working with our top-spend suppliers on renewable energy projects.

PRODUCT ECO-LABELS AND MARKET STANDARDS

HPE products have obtained eco-labels such as the Electronic Product Environmental Assessment Tool (EPEAT), ENERGY STAR®, 80 Plus, the China State Environmental Protection Agency (SEPA), and the China Energy Conservation Program (CECP).

BINDING SUPPLY CHAIN SUSTAINABILITY REQUIREMENTS

HPE's industry-first supply chain management program requires our production suppliers—which contribute to nearly 25% of HPE's global carbon footprint—to set science-based emissions reduction targets for their own operations and publicly disclose their emissions and progress annually. These requirements are part of our supplier Social and Environmental Responsibility (SER) scorecards and are referenced in key procurement decision-making which is backed up by regular independent audits and reviews.



COMMITMENT

From its founding over a century ago, IBM has anchored itself in a set of fundamental values that shape and define our company and permeate all our relationships – with employees, investors, clients, communities where we operate, and our global network of suppliers. IBM has long committed to doing business with responsible suppliers.

SUPPLY CHAIN CORPORATE RESPONSIBILITY

(environmental, social, ethical, etc.)

IBM is a founding member (2004) of the Responsible Business Alliance (RBA), a non-profit industry group that helps its members support continuous improvement in the social, environmental, and ethical responsibility of their supply chains. IBM itself adheres to the RBA Code of Conduct (CoC) which contains provisions on labour, health and safety, environmental requirements, ethics, and management systems, and we require our first-tier suppliers of hardware, software, and services to adhere to the RBA CoC.

Through RBA and other business associations, we collaborate with peers and suppliers to build tools, share learning, conduct assessments and audits to continually improve performance and increase transparency across the areas of corporate responsibility.

REQUIREMENTS FOR SUPPLIERS

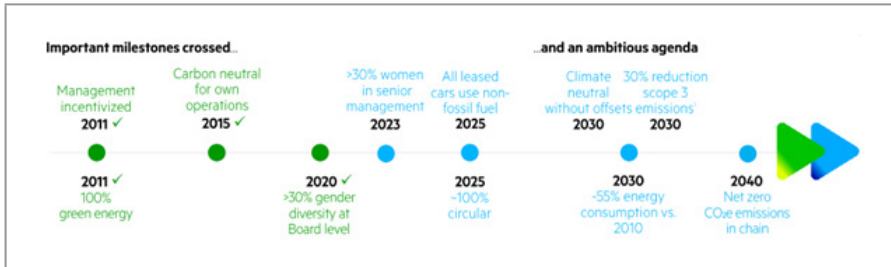
IBM has issued environmental requirements for suppliers dating back nearly 5 decades such as environmental evaluation of suppliers; and has continued to enhance our programs. The following are two more recent examples:

- Since 2010, IBM set new requirements for all of its first-tier suppliers and among them, maintaining a management system to address their social and environmental responsibilities; measuring performance, setting goals and publicly disclosing results; and cascading the requirements to their suppliers who perform work material to the goods and services provided to IBM.
- In 2021, IBM set a goal requiring key suppliers in emissions-intensive business sectors to set an emissions reduction goal by 2022, addressing their Scope 1 and Scope 2 GHG emissions, that is aligned with scientific recommendations from the UN IPCC to limit Earth's warming to 1.5 degrees Celsius above pre-industrial levels.

Find out more here:

<https://www.ibm.com/impact>

KPN is working constantly towards sustainability. KPN has already achieved the target for scope 2 and scope 1 emissions and aims to achieve the goal of carbon neutrality by 2040.



Goal of KPN (Source KPN annual report)

As we can see from the above diagram, KPN has a goal to go net zero CO₂e emissions in the value chain.

COLLABORATION TOWARDS A SUSTAINABLE VALUE CHAIN

Over the past decades, KPN has established itself as one of the world's greenest telecom businesses, motivated by our conviction that sustainable business is better business. KPN upped their target this year to achieve net-zero carbon emissions by 2040. Suppliers and customer participation are critical across the value chain to build the solutions required to reach KPN's ambitious goal of being net zero by 2040.

COLLABORATING TOWARDS ZERO WASTE AND ZERO EMISSIONS

KPN's sustainability strategy is to affect the environmental effect of our whole supply chain, from suppliers to customers. KPN's primary objective is to achieve near-perfect circularity by 2025. KPN has established an objective of redesigning at least 15 typical KPN goods for circularity by 2022, for example, by utilizing recycled material. This covers network equipment as well as in-home devices like modems and set-top boxes. KPN's goal for outflow material is to maximize reuse and recycling while avoiding incineration and disposal. KPN is decreasing CO₂e emissions from our business vehicle fleet by adopting zero-emission cars.

ORANGE

Sustainable sourcing targets are defined both at the Group and country levels to develop long-term and trusted relationships with suppliers, complying with our company's responsibility commitments and our strategy. Altogether, ten key principles govern our responsible sourcing actions: financial equity, focus on strategic suppliers, limitation of risks, deep involvement in the sector, TCO approach, integration of environmental and social aspects, territorial impacts, fair purchasing process, Supplier Relationship Management, trained and certified sourcing and Supply Chain professionals.

From an operational standpoint, in 2020 the Group Supply Chain department has launched an innovative project called O'GREEN to measure and reduce the carbon footprint of the Group's Supply Chain activities, mainly in terms of warehouse energy consumption and deliveries to customers and shops. The O'GREEN project name stands for Orange Gas Reduction Emissions & Energy Indicators.

- Between the end of 2019 and the first semester of 2020, we tested the BEC tool (BearingPoint's Emission Calculator) on Orange France & Orange Romania flows. This tool proved to be optimal for collecting the CO2 emissions data and making computations.
- Since the beginning of 2022: under the coordination of the Group Supply Chain Centre of Excellence, the O'GREEN program successfully achieved a major objective: the measurement of the carbon footprint of all customer equipment distribution flows and warehouse logistics operations, in all European countries, for the years 2019, 2020 and 2021. Additionally, we were able to include the measurement of network flows for Orange France.
- In the beginning of 2022, we started on-boarding MEA Countries to the O'GREEN program, firstly with Orange Morocco, followed by Orange Egypt. In parallel, we have been collecting the data on infrastructure network flows across the Orange footprint in Europe (besides France).

O'GREEN acts on four elements to contribute to Orange Group's Engage 2025 strategy:

- Having reliable KPIs to measure supply chain emissions adequately (logistic flows and warehouse energy consumption).
- Feeding all extra-financial reports in close collaboration with Group CSR teams, and especially feeding the Group's Scope 3 emissions calculation processes.
- Ensuring data reliability (cross-country and historical data per country)
- Enabling a sound action-impact analysis regarding acting directly on supply chain CO2 emissions, by enabling a sound measure of the impact of all actions taken, thanks to the reliable data (cross-country and historical per country).

In a nutshell, the O'GREEN program is key to measuring and reducing supply chain Scope 3 emissions and to achieving Orange's goal of a 14% reduction in scope 3 emissions by 2025 (compared to 2018).

NEXT GENERATION MOBILE NETWORKS ALLIANCE e.V.

NGMN, established in 2006, is a global, operator-led alliance of over 80 companies and organisation spanning operators, manufacturers, consultancies and academia.

VISION

The vision of the NGMN Alliance is to provide impactful guidance to achieve innovative and affordable mobile telecommunication services for the end user with a particular focus on supporting 5G's full implementation, Mastering the Route to Disaggregation, Sustainability and Green Networks, as well as 6G.

MISSION

The mission of the NGMN Alliance is

- To evaluate and drive technology evolution towards 5G's full implementation and the three major priorities for 2021 and beyond:

Route to Disaggregation: Leading in the development of open, disaggregated, virtualised and cloud native solutions with a focus on the end to end operating model.

Green Future Networks: Building sustainable and environmentally conscious solutions.

6G: Emergence of 6G highlighting key trends across technology and societal requirements plus use cases to address.

- to establish clear functional and non-functional requirements for mobile networks of the next generation.
- to provide guidance to equipment developers, standardisation bodies and cooperation partners, leading to the implementation of a cost-effective network evolution
- to provide an information exchange forum for the industry on critical and immediate concerns and to share experiences and lessons learnt for addressing technology challenges
- to identify and remove barriers for enabling successful implementations of attractive mobile services