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Market Insight Report: 5G Sustainability — CSPs

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SHELLY KRAMER
Principal Analyst + Founding Partner

RON WESTFALL
Senior Analyst + Research Director

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Introduction and Market Description

The Communications Service Provider (CSP) 5G sustainability market consists of the strategic commitment that CSPs make to fulfill their organization-wide sustainability goals. For the purposes of this Market Insight Report, we are using the UN World Commission on Environment and Development's definition of sustainability: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

For CSPs meeting their 5G-driven sustainability goals encompasses the integration of environmental health, social equity, and economic vitality that contribute directly to the health, diversity, and resilience of their served markets for this generation and generations to come. As such, the practice of sustainability acknowledges developing a systematic approach which directly advances meeting organization-wide sustainability goals including environmental, social, and governance (ESG) targets.

Market Overview and Key Takeaways

CSPs, especially mobile network operators, are implementing and expanding their 5G Sustainability initiatives on a worldwide basis. This trend is key to assuring these sustainable practices improve their organization-wide environmental, human, and economic outcomes. We find CSPs are making tangible, measurable progress, including attaining science-based targets (SBTs) and developing ways to reduce waste and responsibly managing the lifecycle of their products.

In 2023, we anticipate CSPs making progress in deploying and scaling 5G standalone (SA) networks as they transition away from non-standalone (NSA) implementations that require combining 4F/LTE network capabilities in the deployment of 5G technologies ready for initial deployments such as 5G new radio (NR). 5G NSA requires use of dual connection mode, which entails interworking 5G NR control with 4G/LTE networks in areas such as core and transport.

As a result, while 5G NSA was needed to stimulate nascent 5G implementations across pre-5G mobile networks, it also entailed compromises in areas such as sub-optimal energy efficiencies, more network complexity, and limited flexibility. With 5G SA networks, CSPs can add 5G-specific capabilities and technologies, such as 5G core and transport systems purpose-built for 5G networks, to align with their initial 5G NR implementations as well as accelerate the fulfillment of ambitious sustainability goals.

From our viewpoint, CSPs are now better positioned to fulfill their sustainability missions, including ESG objectives, by actively managing a diverse range of ESG matters, including providing equitable access to connectivity as well as advocating diversity, equity, and inclusion in their workforce. Integral to fulfilling sustainability goals is an ongoing commitment to responsible business practices that promote accountability, transparency, and ethical conduct in meeting sustainability goals.

In 2023 and beyond, we see CSP 5G sustainability initiatives hitting their full stride and potential as 5G SA networks expand and deliver the network-wide and ecosystem support needed to innovate 5G networks to spur 5G-driven sustainability. CSP executive teams and decision makers are instituting and expanding oversight of the execution in fulfilling their sustainability goals including the promotion of cross-functional collaboration between technical and sales and marketing units.

Top CSP 5G Sustainability Market Shapers

In this section, we identify the top market shapers that are driving 5G sustainability programs and initiatives.

Energy Management: Administering power consumption and its impact on sustainability goals frequently requires automated management techniques which minimize output while also assuring service level agreement (SLA) compliance, particularly related to mission-critical 5G enterprise applications.

AI/ML/Analytics = Energy and Cost Savings: We see AI-enabled energy management platforms that are designed to decrease CSP energy consumption and costs by up to 30% without diminishing network performance becoming increasingly deployed throughout highly distributed 5G infrastructures. Such decreases can approach fivefold savings over legacy, pre-AI systems that also require scheduled shutdowns which boost costs.

Network Slicing Efficiencies: To meet service level agreement (SLA) obligations while advancing sustainability objectives, CSPs are deploying AI engines and ML to prioritize mission-critical 5G traffic including network slices. For example, CSPs seek to use automated 5G network slicing to provision virtual private 5G enterprise networks over their physical 5G networks with each slice representing a unique customer network, application, or location assigned an exclusive SLA.

5G SA Network Build: As mobile operators transition to 5G Standalone (SA) networks, they are deploying the 5G core (5GC), 5G RAN, 5G Mobile Edge Computing (MEC), and 5G transport domain technologies that are critical to fulfilling network-wide 5G sustainability targets.

Cloud is Vital: 5G-driven sustainability progress requires digital operations platforms that support cloud-enabled agility and flexibility. This includes distributing mobile data workloads across cloud environments according to CSP requirements as well as using DevOps frameworks to assure more flexible energy management.

Top 5G Sustainability Criterion

In this section, we identify the 5G sustainability criterion that we see as having the most priority across CSP and 5G network decision makers.

Carbon Emissions Reduction. From our view, CSP 5G sustainability initiatives must target tangible carbon emission decreases across both near and long-term objectives including carbon intensity metrics, especially since decreases in carbon density can contribute toward lower absolute emissions.

Energy Efficiency. To meet 5G-enabled sustainability and ESG goals, we believe CSPs need to make energy efficiency integral to their sustainability strategies since it can help reduce overall greenhouse emissions as well as energy costs. This includes CSPs setting specific targets, pursuing efficiency opportunities across their facilities, transportation systems, and supply chains, as well as working to devise energy management strategies and, finally reporting on efficiency measures and progress in reaching the targets.

Clean Energy Adoption. To help optimize 5G sustainability outcomes, CSPs need to show commitment toward investing in clean renewable energy sources such as solar and wind. Through a specific pledge to use clean energy, we believe CSPs can accelerate fulfillment of their sustainability goals while also stimulating the energy efficiency of their 5G builds.

Organization-wide Sustainability Plan. CSP organizations can gain sustainability progress through encouraging individual units and corporate functions to integrate 5G relevant goals into their strategic sustainability and business planning while holding them accountable. This takes on paramount importance as 5G supports more concurrent connections and greater data throughput than pre-5G generations, resulting in more energy demands to scale much larger traffic loads and processing more intricate tasks swifter.

Meet ESG Reporting Requirements. By meeting ESG reporting requirements such as embedded in the **Global Reporting Initiative** (GRI) and **Sustainability Accounting Standards** (SASB) CSPs can burnish and equally important market the sustainability credentials of their 5G network builds.

5G Sustainability Priorities and Strategies

In this section, we identify the top CSP 5G sustainability priorities and uses that we identify as having the most traction throughout the 5G ecosystem in the near-term (up to 12 months).

Prioritizing Stakeholder Input. We see CSPs enhancing their sustainability initiative and ESG strategies by expanding input from their key stakeholders including especially customers, employees, community partners, suppliers, and shareholders. By harvesting input from a wide array of channels, CSPs are improving their sustainability and ESG strategies to better align with the topmost sustainability goals of the mobile ecosystems.

Sustainable Supply Chains. CSPs are putting more emphasis on ensuring their wide and diverse network of suppliers abide by sustainable supply chain practices. This includes the expectation of sharing the value-based commitment of fulfilling sustainability programs as well as abiding by supplier codes of conduct that govern supplier conduct in areas such as reducing greenhouse gas emissions and water use, responsibly sourcing materials, protecting human rights, and mutually assured customer care.

Focus on Scope 1-3 GHG Reductions. Through commitment to GHG reduction, CSPs are able to validate their sustainability strategies in countering climate degradation by making sustained cuts to GHG emissions including Scope 1 (direct emission generated from CSP facilities), Scope 2 (indirect emissions from purchased electricity required to power all CSP facilities), and Scope 3 (indirect emissions generated from upstream and downstream activities, including the products CSPs sell and the services they use, including organization travel) as set out by the **Greenhouse Gas Protocol** organization.

Sustainable Energy Management. We view sustainability-driven energy management as critical to tracking, administering, and optimizing CSP energy use. This encompasses reducing energy consumption by using innovative technologies that drive energy efficiencies and savings organization-wide including pooling from renewable energy projects.

Futurum Ring of Honor: Today's Foremost 5G CSP Sustainability Program

In this section, we identify what we believe are the top five CSP 5G sustainability programs across the mobile ecosystem today noting why the players are selected based on our analytical perspective, meeting the top sustainability strategy goals and capabilities, as well as ecosystem-wide influence in powering ecosystem cooperation and support.

T-Mobile. We find T-Mobile's 5G sustainability program, embedded in its ESG materiality assessment, provides a comprehensive and timely assessment including an analysis of emerging ESG trends and standards, survey responses from employees, and stakeholder interviews to identify and prioritize the most significant ESG issues for its business. For example, T-Mobile has attained RE100 recognition as verified by the Climate Group, in alliance with CDP, whose mission is to accelerate transformation towards zero carbon grids at scale. T-Mobile uses science-based targets (SBTs) that address its Scope 1, 2, and 3 emissions. From our viewpoint, T-Mobile's SBTs help ensure that the targets the company sets can drive meaningful outcomes in the mission to mitigate the risks of climate degradation.

T-Mobile has also led **Green America's Wireless Scorecard** three years consecutively, and the company recently received a top grade in the **2021 CDP Climate Change** questionnaire. Such validation gives T-Mobile the network and operations foundation to meet ambitious sustainability goals such as decreasing combined absolute Scope 1 and Scope 2 GHG emissions 95% as well as Scope 3 GHG emissions 15% per T-Mobile customer by 2025 from a 2016 base year. Also, T-Mobile is committed to reducing its energy consumption by 95% per petabyte of data traffic by 2030 from a 2019 baseline. From our view, T-Mobile's identification of sustainable and responsible supply, GHG reduction, energy and natural resource management, waste & recycling improvements, and product lifecycle management aligns with the topmost sustainability goals of the mobile ecosystem. We view T-Mobile as standing out in the direct alignment of its overall sustainability strategy with the distinct requirements of 5G networks due primarily to its pace setting in 5G network build.

Vodafone. We see Vodafone's approach to ESG as integral to the company's overall sustainability strategy across its three main purpose pillars: Planet, Inclusion for All, and Digital Society. Vodafone is committed to supporting the delivery of the **UN Sustainable Development Goals** (SDGs) across its sustainability initiatives. Specifically, Vodafone's Planet pillar targets reducing environmental impact by reaching net zero emission across its entire value chain, aiding customers in reducing their own carbon emissions by 350 million tons by 2030, and driving action to reduce device waste and progressing against its own target to reuse, resell, or recycle 100% of network waste. For example, since 2020 Vodafone estimates saving customers 22.7 million tons of carbon emissions with its IoT service offer, including logistics & fleet management and smart metering, has proven central in delivering these savings. We expect that Vodafone IoT services, further augmented by 5G build and AI/ML augmentation, can enable organizations to monitor operational processes, identify waste and address the cause, and improve overall cost and carbon savings.

Vodafone has identified two priority SDGs: SDG 9 which focuses on building resilient infrastructure and innovation, and SDG 17 which targets strengthening the means of implementation and partnerships for sustainable development. From our perspective, SDG fulfillment throughout its 5G/4G environments can enable Vodafone and its partners to find enduring solutions that meet social, economic, and environmental challenges and help accelerate the delivery of additional SDGs. For example, Vodafone's M-Pesa mobile money platform, designed to enable financial inclusion, has 52.4 million active customers, contributing toward inclusive and sustainable digital societies aligned with advancing 5G-enabled sustainability.

Orange. Orange's sustainability strategy is purpose aligned with UN SDGs with a focus on sustainable and inclusive economic development. In combination with mobile infrastructure that focuses on AI-enabled 5G/4G network advancement, Orange stresses that technical and application innovation can become broader, benefiting international trade and more efficient use of resources. Orange identified six SDGs (SDGs 9/10/12/13/16/17) that fully align with its organization-wide sustainability strategy. For Orange, SDG 13 (Climate Action) affirms its environmental commitment, including focus on energy and transport efficiency programs, switching to renewable energy as well as integrating recycle-driven circular economy into operations from eco-design to mobile recycling and waste recovery, promoting responsible uses and ensuring transparent environmental reporting.

Key to its sustainability strategy, Orange is committed to attaining net zero carbon emissions by 2040. Orange is using digital technology to meet its zero-carbon emissions target even by a decade ahead of the rest of the telecom sector. This includes achieving a 30% reduction in its emissions by 2025 compared to 2015 emissions. Orange's Green ITN program has already resulted in avoiding approximately 3 million metric tons of CO2 between 2010 and 2019 through improving energy efficiencies in its networks and IT systems. For example, Orange's new data centers in Val ed Reuil (Normandy) and Chartres employ free cooling to enable the decreased use of artificial air conditioning by 80%. Of note, 36.3% of the Orange Group's electricity originates from renewable sources, including sites using solar energy, the expanding use of digital tools to protect biodiversity and a 12.1% decrease in CO2 emissions across Scopes 1 and 2.

Telefónica. Telefónica operates in 12 countries and offers telco services and digital solutions in more than 170 countries through strategic partner agreements. As such, Telefónica's sustainability and ESG objectives have multi-regional impact including emphasis on energy transition to renewables, reduction of CO2 emissions at every level of economic activity with a special focus on the most polluting industries, and the establishment of Net Zero targets. Plus, Telefónica is emphasizing raising social awareness of resource efficiency and transitioning to a circular economy Telefónica three-level sustainability strategy is built on: 1. Managing risks, implementing ISO management systems, and proactive environmental advocacy; 2. Decarbonization and circularity of the company using renewable energies, extending the life of electronic equipment, and reducing CO2 emissions; 3. Digitalization of customers through 5G-IoT, cloud, and AI/ML- driven data analytics capabilities.

We see Telefónica's major environmental targets playing an essential role in executing the company's overall sustainability strategy. These targets include avoiding 12 million tons of CO2 .per year for its customers in 2025, reducing CO2 emissions (Scope 1+2) by 90% across its main markets in 2025 and 80% globally in 2030, reducing CO2 emissions in its value chain by 39% in 2025 compared to 2016 (Scope 3), continue to consumer 100% renewable energy in its main markets and also reach 100% globally in 2030, and become a zero-waste company in 2030 through increased application of eco-design, reuse, and recycling.

SK Telecom. SK Telecom is a long-standing participant in the UN Global Compact (UNGC) providing the foundation for the company's sustainability strategy including ESG responsibilities that comply with UNGC principles for areas such as environment, human rights, and anti-corruption. As a result, SK Telecom dedicates its resources to assure sustainability fulfillment, including ESG responsibilities, integral to its corporate DNA. This includes an ESG Committee to oversee the implementation of ESG performance indicators embedded within its internal Key Performance Indicators (KPIs). SK Telecom also emphasizes compliance with recommendations outlines in the Global Reporting Initiative (GRI) Sustainability Reporting Guidelines and the Framework set by the International Integrated Reporting Council (IIRC) on decisions related to materiality and scope of environmental issues.

Based on the findings from its materiality assessment, SK Telecom selected 29 major issues including climate change response, AI, and digital infrastructure build which we see requires sustained 5G network investment and support. Today we find SK Telecom actively pursuing a sustainability strategy that emphasizes GHG emission reduction and resource conservation. For example, SK Telecom is making constant efforts to cut GHG emissions through integrated operation of network equipment, primarily through Single RAN adoption, the deployment of high-efficiency network equipment, and intelligent administration of office heating and cooling systems. Now SK Telecom is the first Korea-based CSP to receive carbon credits for GHG emissions reduction due to Single RAN implementation across 5G/4G environments. Plus, from our perspective it is the first Korean company to join RE100 with a strategic focus expanding the use of new and renewable energy, while running its infrastructure equipment on low power and increasing the number of solar photovoltaic base stations. Through these efforts, SKT plans to reduce total GHG emissions by 47.7% compared to 2020 by getting over 60 percent of its electricity from renewable sources by 2030 and seeks to achieve RE100 and Net Zero goals by 2050.

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Important Information About This Market Insight Report

CONTRIBUTOR:
Shelly Kramer
Principal Analyst + Founding Partner
Futurum Research

Ron Westfall
Senior Analyst + Research Director
Futurum Research

PUBLISHERS:
Daniel Newman
Founding Partner + Principal Analyst
Futurum Research

Shelly Kramer
Founding Partner + Lead Analyst
Futurum Research

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CONTACT INFORMATION

Futurum Research, LLC | futurumresearch.com | 817-480-3038 | info@futurumresearch.com
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