GSMA

Rethinking Mobile Phones

The business case for circularity

February 2025

GSMA

The GSMA is a global organisation unifying the mobile ecosystem to discover, develop and deliver innovation foundational to positive business environments and societal change. Our vision is to unlock the full power of connectivity so that people, industry, and society thrive. Representing mobile operators and organisations across the mobile ecosystem and adjacent industries, the GSMA delivers for its members across three broad pillars: Connectivity for Good, Industry Services and Solutions, and Outreach. This activity includes advancing policy, tackling today's biggest societal challenges, underpinning the technology and interoperability that make mobile work, and providing the world's largest platform to convene the mobile ecosystem at the MWC and M360 series of events.

We invite you to find out more at **gsma.com**

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Executive summary

Consumer trends, regulatory requirements and growing impacts of e-waste are converging to challenge the traditional linear business model of the mobile phone industry. While offering short-term revenues, linear models are costly for consumers, require vast energy and mineral resources to maintain and contribute to the growing e-waste problem. Circular business models are gaining traction in the mobile industry and beyond, and offer many commercial opportunities and benefits, including lower costs, new revenue opportunities and customer loyalty. Yet, transitioning to a circular economy is complex and requires buy-in and collaboration across the value chain. This report presents the business case for why and how mobile phones can – and should – move towards circularity.

Rapid technological developments and growing demand for mobile connectivity contribute to significant environmental and social impacts from the production, use and disposal of mobile phones. More than 1.2 billion new smartphones were sold in 2024, emitting more than 60 million tonnes of CO_2e from manufacturing alone. After they are used, billions of phones are sitting unused in desk drawers and many ultimately end up in landfills or incinerated, resulting in the loss of critical minerals that could have been recycled and reused. The informal treatment of e-waste in low-income countries is also having irreversible health impacts on workers, communities and the environment.

> "Circular business models – such as repair services, refurbished devices and trade-ins – offer a range of commercial benefits for the industry, including cost savings, new revenue opportunities, greater customer loyalty, improved brand reputation and supply chain resilience."

Circularity is a critical lever in reducing the environmental impacts of mobile phones since most of them come from materials sourcing and manufacturing. The circularity of mobile phones can be increased in three main ways:

1. Using recycled materials and renewable energy;

2. Increasing the lifespan of phones by repairing, reusing and refurbishing existing phones, designing phones to be more durable and repairable, and providing adequate software and security support;

3. Ensuring no device ends up as waste by recovering and recycling phones that cannot be reused.

Consumer and regulatory trends are driving the shift toward a more circular economy, albeit with significant variation between countries and regions. The GSMA Global Consumer Survey on Circularity and other market research show that: Consumers are keeping their devices longer, with average upgrade cycles slowing to around 3.5 years globally. 70% of consumers surveyed were willing to pay a premium for a more environmentally friendly phone. Used and refurbished phone sales rose 15% between 2021 and 2023, while new smartphone sales fell 15%. Some governments are introducing regulations to support circularity, including eco-design and right-to-repair legislation. In the European Union, new regulations covering eco-design requirements related to repair and reuse, durability, recycling and transparency will enter into force in June 2025.

Circular business models – such as repair services, refurbished devices and trade-ins – offer a range of commercial benefits for the industry, including cost savings, new revenue

opportunities, greater customer loyalty, improved brand reputation and supply chain resilience. The growing market for refurbished devices and repair services – projected to exceed $150 billion globally by 2027 – offers new revenue streams for manufacturers and operators. Producing and supporting durable and repairable devices fosters customer satisfaction and loyalty, strengthens brand image and resonates with environmentally conscious consumers and investors. Supply chain vulnerabilities and price volatility can be mitigated by using renewable energy, improving material efficiency and reducing reliance on critical minerals through repair, refurbishment and recycling.

Circularity also yields significant environmental and social benefits for companies and customers, including achieving climate targets, reducing e-waste, promoting digital inclusion and supporting local economies. Extending device lifespans through repair, reuse and refurbishment significantly reduces carbon emissions for manufacturers and operators. Repaired and refurbished phones typically have 80-90% lower carbon emissions than new phones. Circularity initiatives can also cut e-waste volumes and recycle critical minerals while stimulating local economies by creating jobs in repair, refurbishment and recycling. Refurbished devices can make mobile connectivity more accessible to underserved populations.

Many mobile operators are already developing circular business models, but face barriers in scaling up. Mobile operators responding to the GSMA Operator Survey on Circularity reported facing financial barriers such as high upfront investment costs and pressure to prioritise short-term revenues. Limited consumer awareness of the benefits of circular options such as refurbished phones combined with negative perceptions about the quality of these products also present challenges. Inconsistent regulations and policies globally along with limited incentives for circular practices are making it difficult for companies to transition.

"Circularity also yields significant environmental and social benefits for companies and customers, including achieving climate targets, reducing e-waste, promoting digital inclusion and supporting local economies."

Collaboration is crucial to accelerate the transition to a circular economy for mobile phones. Phone manufacturers, network operators, refurbishers, recyclers, users and governments all play important roles across the mobile phone life cycle and value chain, but no single stakeholder can achieve circularity alone. Joint efforts in areas like device takeback, sourcing recycled materials, facilitating repair services, raising consumer awareness and supportive policies are key to overcoming barriers. Governments need to play a critical enabling role to incentivise and accelerate circularity.

Ultimately, circular business models need to be financially sustainable, advance environmental goals and meet customer needs. The transition to a more circular economy in the mobile phone industry is not just an environmental imperative, but also a strategic opportunity for companies across the value chain to innovate, create value and build a more resilient and sustainable future.

Businesses supporting circularity

Monique Lempers
Chief Impact Officer
FAIRPHONE

At Fairphone, we believe that embracing circularity is not just an environmental imperative but also a strategic business decision. By designing products for longevity and repairability, we reduce electronic waste and create value for our customers. A robust business case ensures that our sustainable practices are scalable and economically viable, driving systemic change within the electronics industry.

Martin Xu
Senior Vice President
HONOR

At HONOR, we firmly believe that circularity is important for building a sustainable future. By integrating sustainability into our strategy, operations, and products – through life-cycle management, eco-friendly materials, recycling initiatives and low-carbon innovation – we aim to peak carbon emissions by 2030 and achieve carbon neutrality in our operations by 2045. We call on the entire industry to join us in embracing transformative solutions and partnerships for a greener, more sustainable world.

Masako Yano
General Manager, Sustainability Management Division
KDDI

KDDI recognises the importance of resource circularity and our role in advancing a circular economy for mobile phones. We are strongly committed to mobile phone recycling, achieving 99.8% through manual disassembly. To make further progress on reuse and recycling, collaboration with key stakeholders is essential, including with manufacturers, customers, distributors and recycling companies. This report highlights key opportunities for collaboration, which we hope will be supported by our sector and beyond.

Georgiann Reigle
CEO
KINGFISHER

Achieving a true circular economy for mobile devices is massive, with the potential to save up to 21.4 million tonnes of CO_2 annually. Getting there requires collaboration: OEMs must design repairable, durable devices that can support future software; operators must offer programs that incentivise and make one-for-one device exchanges seamless; and consumers must choose channels committed to circularity. Operators face competing priorities and device circularity is just one. At Kingfisher, we deliver tailored device programmes that help carriers achieve a one-for-one device future. Through our consultative design process and Katalyst solution, carriers can achieve their circular economy goals while driving growth, reducing subsidies and enhancing loyalty – so they can achieve circularity while reinforcing and maintaining focus on their key business priorities.

Ruben Castano
Vice President of Customer Experience and Design
MOTOROLA MOBILITY

As a Lenovo company, Motorola Mobility is committed to a customer-centric environmental strategy that emphasises circular economy and climate change mitigation, helping to support our customers' sustainability goals. We recognise our role in the mobile phone value chain and see collaboration as a key opportunity to advance on our goals.

Jean-Luc Vallejo
SVP Devices Circularity and Sustainability,
ORANGE

At Orange, the transition to a circular economy is essential to ensure the sustainability of our long-term economic performance and to achieve our goal of net zero carbon by 2040. This transformation

requires an evolution in our approach and business models. Orange is committed to promoting the eco-design of its products and services, using refurbished equipment, encouraging repair, collecting used equipment and managing e-waste.
This transformation can only be achieved with the collaboration of all stakeholders: operators, manufacturers, public authorities, users and citizens. The GSMA report is a valuable contribution to this effort, highlighting the economic, environmental and societal benefits of the circular economy while acknowledging the challenges. We look forward to collaborating with all stakeholders on the key recommendations to accelerate the transition to a more circular economy.

Inhee Chung
Vice President,
Corporate Sustainability Center
SAMSUNG ELECTRONICS

Embedding circularity in products and business operations will become increasingly important not just as a sustainability agenda but also for competitiveness. As resource scarcity, climate risks and supply chain disruptions become more likely in a complex and interconnected world, transitioning to a circular economy could transform these vulnerabilities into strengths. However, circular business models also need to demonstrate that they can be a profitable model for companies to move beyond piloting and apply circularity at scale, which requires collaboration across the value chain as well as enabling policies and support from governments. As a company increasingly embedding circularity in our products, we welcome this GSMA study as an important step towards forging multi-stakeholder collaboration and a significant building block for making the business case for circular mobile phones.

Johan Gustafsson
EVP Communications and Sustainability
TELE2

With changing consumer behaviour and requirements, Tele2 sees growing business opportunities in circularity and a key part of reaching our climate targets. The business case for circularity is stronger now than ever and, at the same time, the opportunity to make a significant dent in the growing global mountain of e-waste is a clear motivation for Tele2.

Fernando Valero
Global Supply Chain Director and Global Procurement Transformation Director,
TELEFÓNICA

Achieving circularity across our value chain is essential to addressing environmental challenges while unlocking economic opportunities. At Telefónica, we are embedding circularity principles at every stage of the product lifecycle within our supply chain – from transforming our procurement processes and fostering supplier collaboration to developing innovative programmes that facilitate takeback, reuse and recycling, all while leveraging technology. By scaling circular business models, we can significantly reduce our environmental footprint, strengthen supply chain resilience and support our goal of net zero emissions by 2040, including our entire value chain. This report underscores the critical role of collaboration and a strong business case in scaling circularity and advancing our shared sustainability objectives.

Dominique Rousseau
Group Device Director
VODAFONE GROUP

At Vodafone, we believe that the circular economy for devices is responding to consumer needs and greater awareness on e-waste and environmental issues in general. It will also contribute to achieving our net zero targets. By promoting sustainability and extending device lifecycles, services like trade-in programmes and the sale of refurbished devices are expected to grow. Telecoms operators and manufacturers are playing key roles in this sustainable transition.

01 Introduction

Objectives and research questions

The objective of this report is to develop a compelling business case for why and how mobile phones can – and should – move towards circularity.

The report explores the following research questions:

1. **Current status:** How linear or circular are mobile phones, and how have relevant trends evolved over the past few years? What are the most common business models for phones used by mobile operators?

2. **Adapting to emerging trends:** How are consumer preferences and regulations accelerating the transition towards circularity? How are manufacturers, operators and other stakeholders responding?

3. **Scaling circular business models:** Which circular business models are most promising for mobile operators, and how can they be scaled up? What are the roles of operators, manufacturers, refurbishers and other stakeholders in overcoming barriers?

Target audiences and key takeaways

The report is primarily intended for mobile network operators (MNOs), phone manufacturers and refurbishers to work together to develop and scale circular business models for mobile phones. Mobile operators will be able to learn from real-world examples of other operators that have developed circular business models. Phone manufacturers and refurbishers will gain insights into the role of MNOs in advancing circularity and identify priority areas for collaboration.

Other important audiences include national and local governments, recycling companies, researchers and circularity practitioners in other sectors. Policymakers and regulators may gain insights into how they can support the transition to circularity with enabling regulations and incentives across the value chain.

Key data sources

In addition to desk research, this report draws on the results of two global surveys conducted by the GSMA in 2024:

- **Consumer survey on mobile phones and circularity:** a survey of more than 10,000 mobile phone users from across 26 countries asking consumers about their current and previous phones, key factors in their next phone purchase decision and interest in refurbished phones. Details on the survey methodology are available in Appendix A: Consumer survey.

- **Operator survey on circularity:** a survey of 31 mobile operators representing all major regions and around 30% of global mobile connections, with questions about mobile phone business models and the benefits and challenges in scaling up circular business models. Additional information is available in Appendix B: Operator survey.

02
Current mobile phone market

02 Current mobile phone market

Global mobile phone market

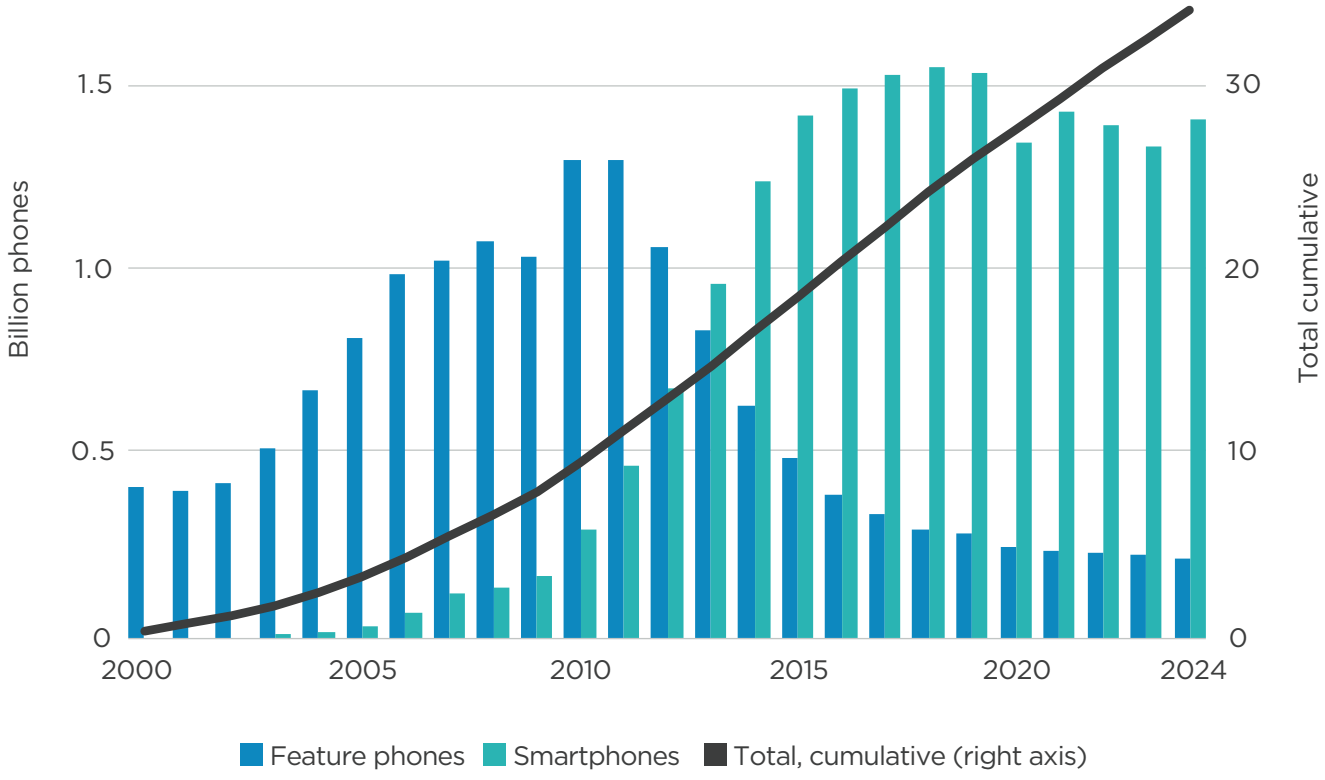
Global trends

Around 33 billion phones have been sold worldwide since 2000, propelled by two growth phases (Figure 1). The adoption of feature phones surged in the mid-00s, with annual sales peaking at 1.3 billion phones in 2010. The release of the first iPhone in 2007 helped to kickstart the mainstream adoption of smartphones in the 2010s. New smartphone sales peaked at around 1.5 billion units in 2017.

Overall sales of new mobile phones have plateaued in recent years, stabilising as the user base reaches saturation and existing users hold onto their devices for longer periods. Another key factor has been strong sales growth of used and refurbished phones over the past few years, driven in part by declining consumer purchasing power from high inflation.

Sales of used and refurbished phones rose more than 10% in 2022 and a further 6% in 2023, while new smartphone sales fell 11% in 2022 and 4% in 2023 (IDC, 2024d). New device sales are expected to rebound in 2024, with data through the third quarter indicating both new and used device sales are projected to grow by around 5%.

Figure 1 | New mobile phone sales worldwide, 2000-2024



Source: GSMA analysis based on Canalys, Counterpoint Research, Gartner, IDC and Statista

Manufacturer market shares

The global mobile phone market is dominated by only a handful of companies, with the top five manufacturers accounting for two-thirds of global sales and the top 10 accounting for more than 80% (Canalys, 2024e; Counterpoint, 2024c; IDC, 2024e; StatCounter, 2024).

Apple and Samsung are market leaders in advanced economies, combining for well over half the market share in Western Europe, North America, Japan, South Korea and Australia (Canalys, 2024b; Counterpoint, 2024e, 2024b; IDC, 2024a, 2024c; C.-Y. Kim, 2024; StatCounter, 2024).

In many developing and emerging countries, Xiaomi, OPPO and vivo – in addition to Samsung – are typically among the leading manufacturers. In China, five Chinese manufacturers (vivo, Huawei, Xiaomi, HONOR and OPPO) each account for 15-20% of the country's market, collectively accounting for 75-80% (Counterpoint, 2024a). In India, the top four manufacturers OPPO (including realme, OnePlus), vivo (including iQOO), Xiaomi and Samsung account for more than 70% of the market (IDC, 2024b).

In Southeast Asia, the top four manufacturers – OPPO, Samsung, Transsion, and Xiaomi – account for around two-thirds of the overall market (Canalys, 2024f; Counterpoint, 2023b).

Transsion is the market leader in Africa with half the market share, followed by Samsung (~20%) and Xiaomi (12%) (Canalys, 2024a). Samsung leads the Middle East market, but its lead has narrowed over the past year as market shares for Xiaomi and Transsion have increased (Canalys, 2024d).

In Latin America, Samsung is the market leader with around one-third of the market, followed by Motorola and Xiaomi at around 20% each (Canalys, 2024c; Counterpoint, 2024d).

Table 1 | Major phone manufacturers by market share, 2024

Manufacturer (affiliated brands)	**Global market share**	**Notable markets**
Samsung	18-22%	Market leader in South Korea (~75%), South Africa (~50%) and Brazil (~40%)
Apple	16-20%	Market leader with more than 50% share in Australia, Canada, Denmark, Japan, Norway, Sweden and the USA
Xiaomi	12-15%	15-20% market share in China, India, Latin America, Middle East and Southeast Asia
OPPO (OnePlus, Realme)	8-10%	Market leader in India (25-30% including subsidiaries)
Transsion (Itel, Tecno, Infinix)	8-10%	Market leader in Africa (~50%) and among leaders in the Middle East (15-20%)
vivo (iQOO)	6-9%	15-20% market share in China and India
Huawei	4-6%	~18% market share in China
HONOR	4-6%	~15% market share in China ~7% market share in Latin America
Motorola	3-4%	~20% market share in Latin America
Google	~1%	~10% in Japan; 4% in the USA

Note: market shares include subsidiaries and affiliated brands

Source: GSMA analysis based on 2023 and 2024 quarterly shipment data from Canalys, Counterpoint Research and IDC

The mobile phone life cycle and value chain

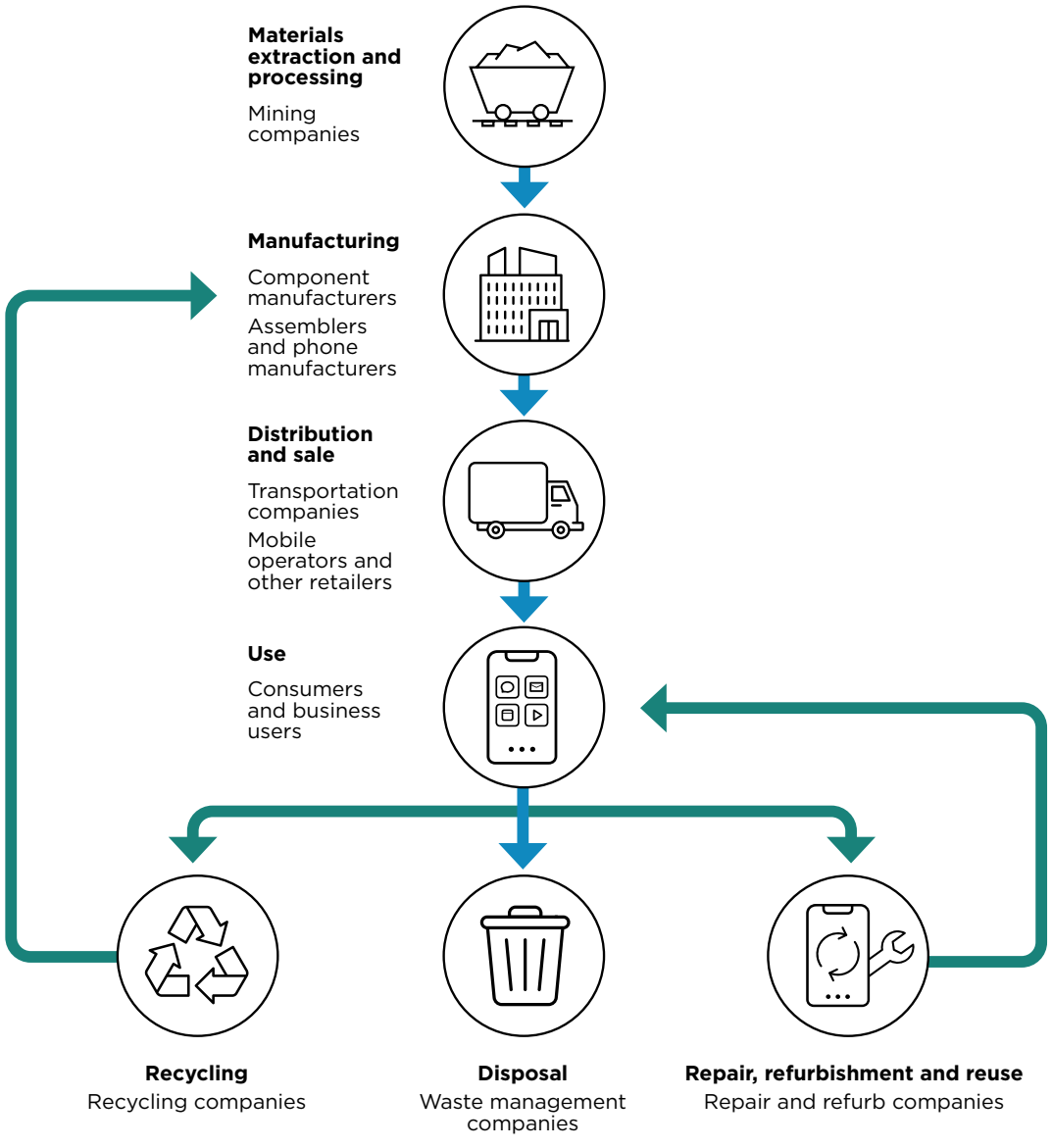
The typical life cycle of a mobile phone begins with the extraction and processing of raw materials and critical minerals, such as copper, gold, cobalt, lithium and rare earth elements (Figure 2). These materials provide inputs for manufacturing key components which are assembled into finished devices.

Once manufactured, the phones are distributed globally through a network of wholesalers, retailers and mobile operators, reaching consumers and businesses.

At the end of their life, mobile phones may be refurbished and reused, recycled or disposed of, with refurbishing and recycling companies playing important roles in promoting phone reuse or recovery of critical minerals.

A wide range of sectors and companies contribute to the mobile phone life cycle, including mining companies, component manufacturers and assemblers, transportation companies, mobile operators, retailers, refurbishers and recycling and waste management companies.

Figure 2 | Life cycle of mobile phones



Source: GSMA

Environmental impacts

The wide-ranging environmental impacts of mobile phones occur across the product life cycle (Table 2). The mining and processing of raw materials and minerals have significant local environmental and human health impacts, including land use change and water use and pollution (GSMA, 2025b). The manufacturing phase, which includes the production of components and the assembly of devices, is highly energy- and carbon-intensive. Manufacturing typically accounts for 70-90% of the life cycle carbon footprint of a mobile phone (Cordella et al., 2021; Eco Rating, 2024; Ercan et al., 2016). The manufacturing of integrated circuits (ICs) accounts for the largest share of life cycle energy use and carbon emissions of mobile phones (Ercan et al., 2016; Sánchez et al., 2024).

Higher-end phones with larger internal storage capacity typically have higher environmental impacts (Eco Rating, 2024). For example, the life cycle carbon footprint of an iPhone 16 512GB is one-third higher than the 128GB model (Apple, 2024a).

> "Manufacturing typically accounts for 70-90% of the life cycle carbon footprint of a mobile phone"

Emissions from transportation and distribution typically account for 4-8% of the life cycle carbon footprint of a mobile phone. The carbon impact of charging and using mobile phones is relatively small compared with other electronic devices and depends largely on the carbon intensity of the grid, as well as usage patterns. A typical smartphone fully charged once a day uses around 6kWh of electricity per year, which is equivalent to just 0.2% of a typical UK household's annual electricity use.

Although mobile phones contain many valuable minerals that can be recycled and reused, many phones ultimately end up in landfills or incinerated.

Table 2 | Environmental impacts of mobile phones

	Materials	Manufacturing	Distribution	Use	End of life
Activities	Extraction and mining of raw materials Mineral processing and refining	Manufacturing of components Phone assembly	Transportation and distribution of products Sale of products	Energy use and climate change	Refurbishment, recycling or disposal
Main environmental impacts	Local impacts on nature and communities, e.g. land use change, water use and pollution Energy use and climate change	Energy use and climate change Use of hazardous materials Waste generation	Energy use and climate change	Energy use and climate change	Refurbishment, recycling or disposal
Typical share of life cycle climate impacts	2-5%	70-90%	4-8%	0-20% (depending on grid)	<1%

Note: use phase excludes impacts of the network. For more details on the direct and indirect nature impacts of the mobile industry, see GSMA (2025), *Nature Guidance for the Mobile Industry.*

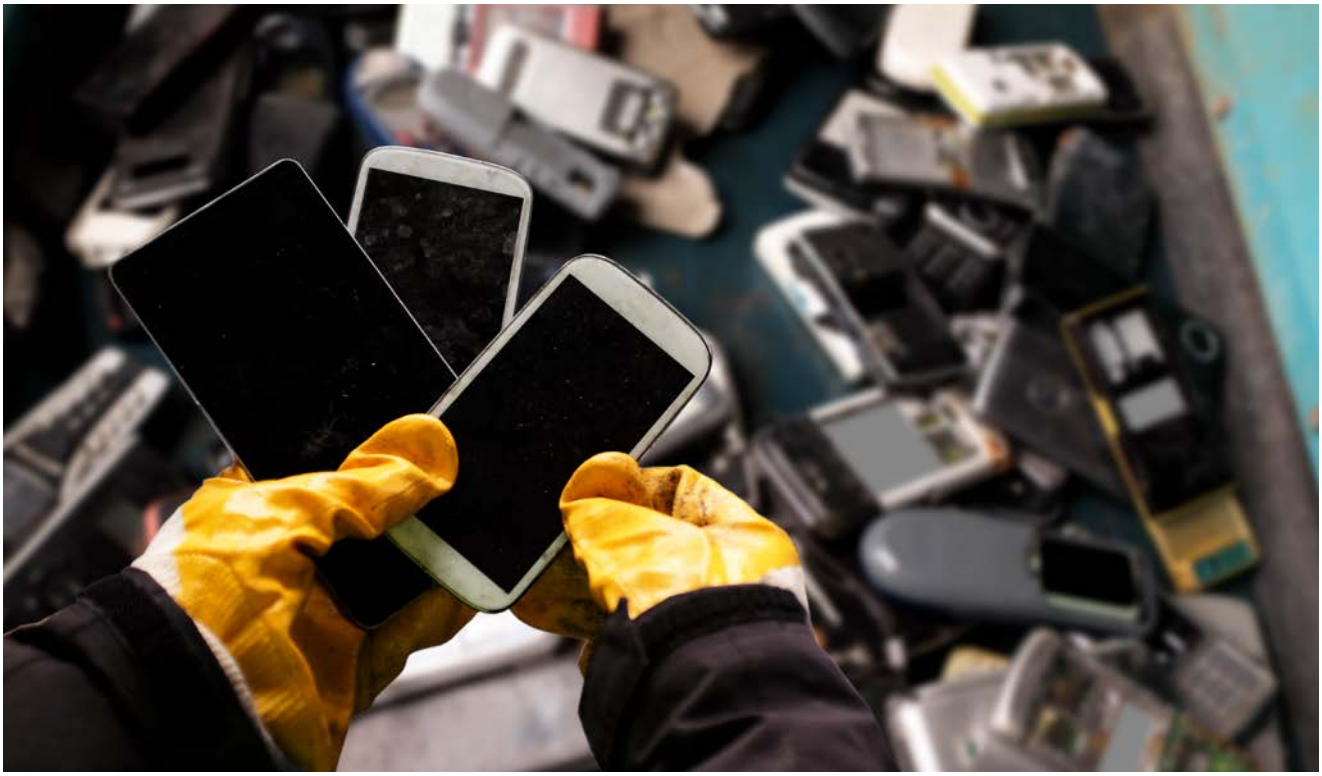
Source: Share of life cycle climate impacts based on GSMA analysis of Cordella et al. (2021), Eco Rating (2024), Ercan et al. (2016), Sánchez et al. (2024) and product environmental reports of mobile phones from Apple, Google and Samsung

The most recent UN Global E-waste Monitor estimated that only a fifth of small IT equipment (including mobile phones) was formally collected and recycled (Baldé et al., 2024). Although mobile phones represent only a fraction of the 62 billion kg of all e-waste generated in 2022, they contain valuable and hazardous materials that necessitate proper disposal and recycling. A major challenge is that e-waste is often shipped to low-income countries that lack adequate capacity and infrastructure to safely process it. The informal treatment of e-waste through open-air burning and acid baths exposes workers to harmful substances, causing irreversible health effects for workers, communities and the local environment.

In addition to addressing and mitigating its climate impacts, the mobile industry has an important role in addressing nature degradation and biodiversity loss across the life cycle of mobile phones. The new GSMA Nature Guidance for the Mobile Industry provides a structured approach to integrating nature considerations into business strategies, aligning with both regulatory frameworks like the Corporate Sustainability Reporting Directive (CSRD) and voluntary initiatives such as the Task Force on Nature-related Financial Disclosures (TNFD) (GSMA, 2025b).

> "The carbon emissions to manufacture mobile phones each year are considerable – in the range of 65 million tonnes (Mt) CO_2e"

While the environmental impacts of one phone may appear small, with nearly 1.5 billion new phones sold in 2024, the combined carbon emissions to manufacture mobile phones each year are considerable – in the range of 65 million tonnes (Mt) CO_2e (Malmodin et al., 2024), equivalent to the annual carbon emissions of Morocco or Romania. In addition, mobile phones contain a wide range of critical minerals, resulting in substantial material requirements to produce 1.5 billion new phones a year. For example, mobile phones currently account for around 10% of global cobalt demand (Cobalt Institute, 2024).



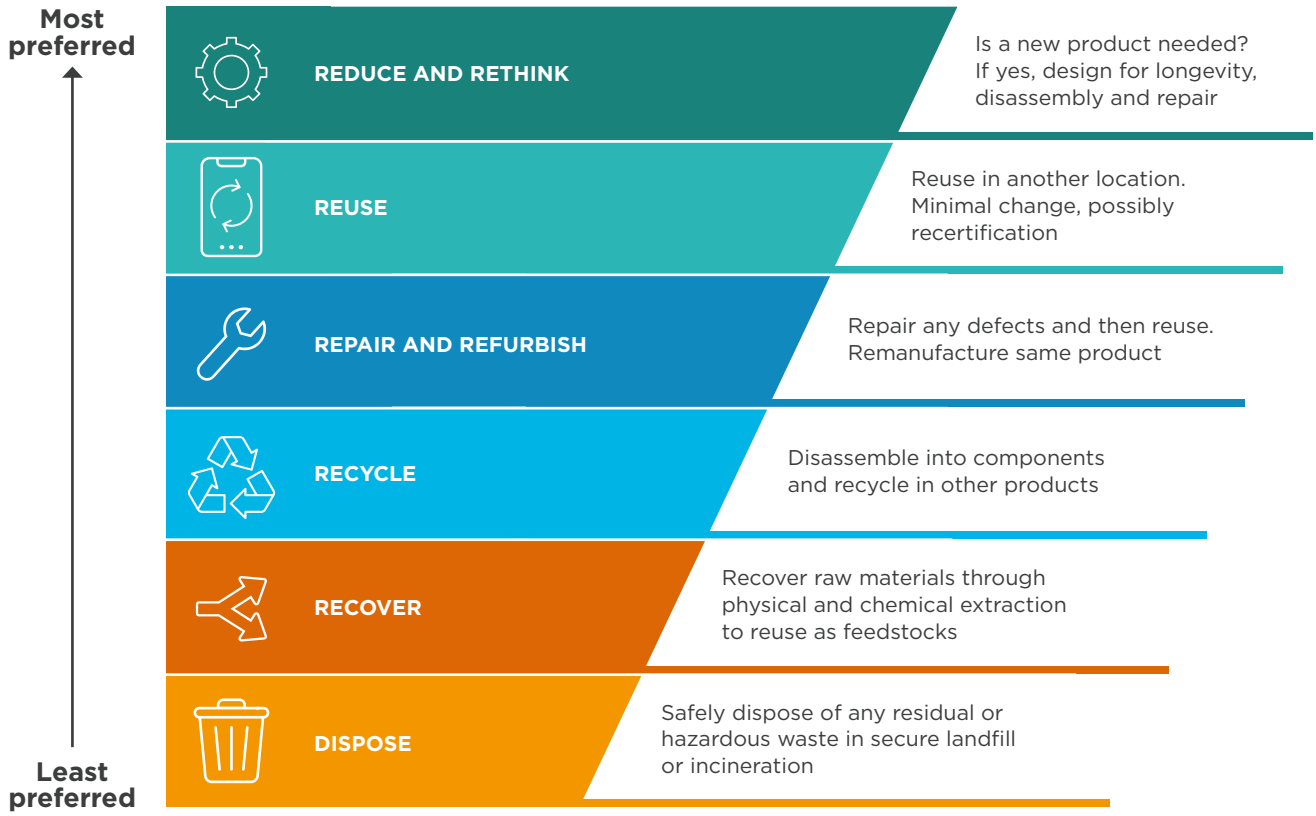
The need for greater circularity

In contrast to the traditional 'linear' (take-make-dispose) economy, a 'circular' economy promotes the reuse, repair, refurbishment and recycling of products to create a closed-loop system that reduces the consumption of finite resources. The waste and resource hierarchy provides a useful guide to help prioritise actions to transition towards a more circular economy (Figure 3). For example, reusing a mobile phone is preferred over recycling.

Since 70-90%[1] of the environmental impacts of a typical mobile phone come from manufacturing, increasing their circularity is critical in reducing the overall environmental impacts of mobile phones. The circularity of mobile phones can be increased in three main ways:

- **Reducing the environmental impacts of manufacturing** by using circular resources, such as recycled and recyclable materials and renewable energy.
- **Increasing the potential and actual lifespan of phones** by repairing and refurbishing existing phones, designing phones to be more durable and repairable, and providing adequate software and security support to match the potential physical lifespan of devices.
- **Ensuring no device ends up as waste** by recovering and recycling phones that have reached their actual end-of-life.

Figure 3 | Waste and resource hierachy



Source: Adapted from GSMA (2022), Strategy Paper for Circular Economy: Network equipment

1 Based on GSMA analysis of Cordella et al. (2021), Eco Rating (2024), Ercan et al. (2016), Sánchez et al. (2024) and product environmental reports of mobile phones from Apple, Google and Samsung.

Current business models

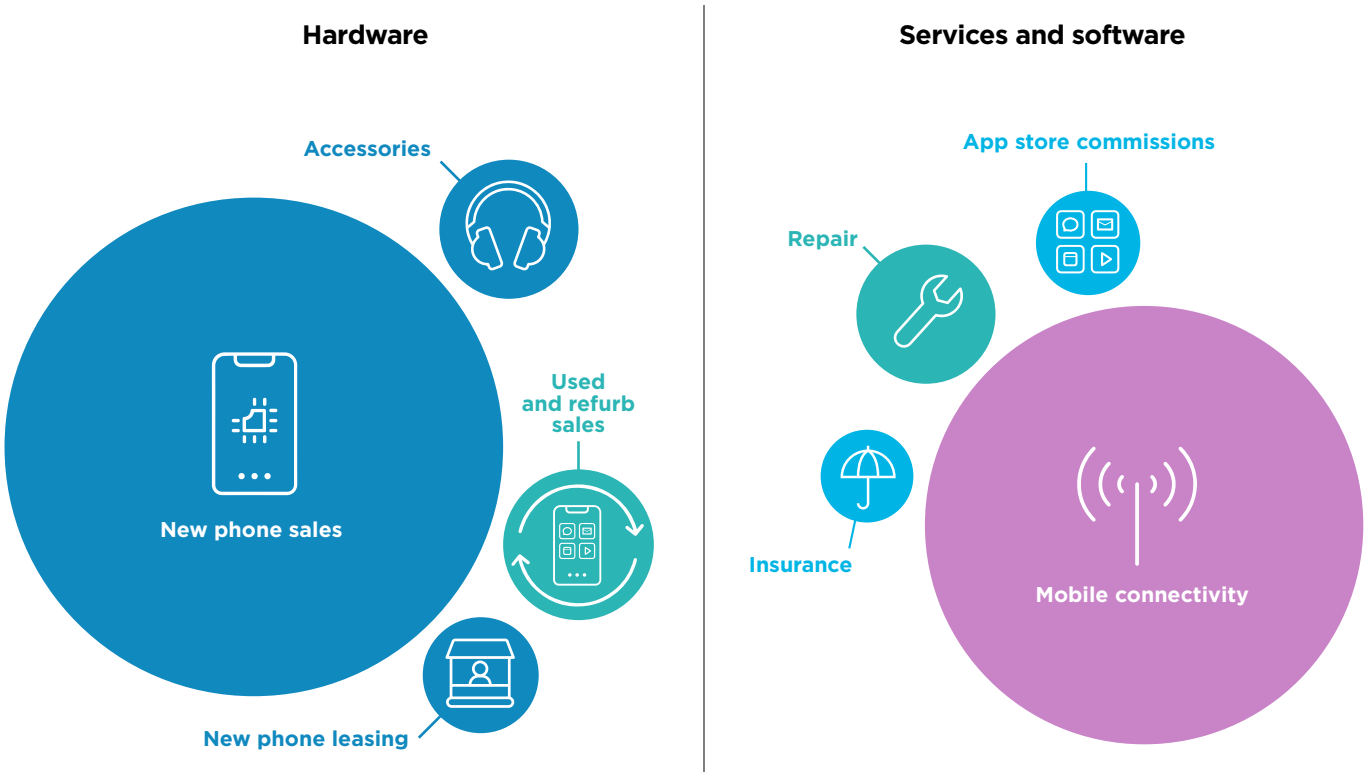
Mobile phone manufacturers derive revenue and profits from their device businesses through a variety of channels and business models. Manufacturers sell devices outright to consumers both directly or through mobile operators and other retailers, or through subscription models. Manufacturers also derive revenues from the sale of accessories, including earphones and cases. Apple and Google also derive significant revenue from commissions through app sales, subscriptions and in-app purchases.

While most manufacturers rely primarily on the sale of new devices, some manufacturers are developing more circular business models such as offering refurbished devices and repair services. Apple (49%) and Samsung (26%) accounted for three-quarters of the global refurbished phone market in 2022 (Counterpoint, 2023a).

Consumers and businesses buy or lease mobile phones directly from manufacturers, as well as mobile operators, retail stores, employers, peer-to-peer marketplaces or gifts from family or friends. Based on the GSMA consumer survey, around 40% of respondents globally purchased their current phone at a retail store, 24% from their mobile operator, 15% from the manufacturer and 12% received their phone from a family or friend.

There is considerable variation between countries, with a higher share of consumers in advanced economies acquiring their phones from their mobile operator (e.g. 69% in Japan, 47% in South Korea, 44% in the USA) and those in developing and emerging countries purchasing phones from retail stores and online marketplaces.

Figure 4 | Sources of revenues for mobile phones



Note: sizes of circles indicate the relative global market size

Source: GSMA analysis

Mobile network operators (MNOs) that provide phones to customers employ a variety of business models. Traditional linear models involve selling devices outright or bundling them with service contracts, where consumers purchase a new phone and often replace it after a few years.

Within an MNO, various teams contribute to the company's mobile phone strategy. More than 80% of operators responding to the GSMA operator survey indicated that their company's business strategy for mobile phones is led by customer-facing teams (e.g. device sales, strategy, marketing) with a third reporting that their corporate strategy and finance teams also play a leading role. Supplier-facing teams (e.g. procurement, supply chain, OEM relationship managers) as well as sustainability-related teams play a supporting role for most operators.

Many operators are starting to develop and scale more circular business models and approaches, such as offering refurbished products, repair services and leasing business models. These include:

Device repair services: Repair programmes operate as value added services for customers, emphasising sustainability and cost efficiency. The business model focuses on providing repair services either in-house or through partnerships with authorised service providers. This model can include in-warranty repairs, out-of-warranty repairs and refurbishment services.

Trade-in and buyback programmes: Trade-in programmes allow customers to return their old phones in exchange for credit towards new purchases or bill discounts. These programmes can be supported by partnerships with third-party trade-in companies and/or manufacturers.

Renewal/upgrade programmes: In a renewal/upgrade programme, customers periodically return their old devices in exchange for newer models. The returned devices are refurbished or recycled by the company.

Leasing programmes (including device as a service): In a typical leasing programme, the operator retains ownership of the products and leases them to customers for a specified period. At the end of the lease term, products are returned, refurbished and leased again or recycled.

Refurbishment programmes: Programmes that involve reselling refurbished devices and/or acquiring used mobile devices to refurbish them. In some cases, acquiring already refurbished devices for reselling purposes.

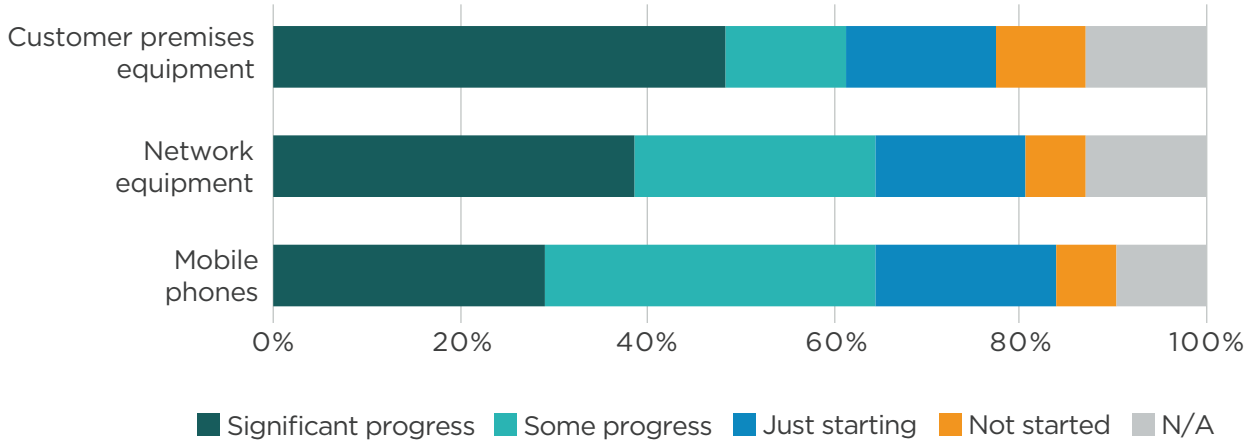
Electronic waste collection and management programmes: E-waste collection and management programmes are designed to manage the phone's end-of-life stage. These programmes typically involve the collection, recycling, refurbishment and disposal of e-waste, often in collaboration with manufacturers or recycling companies.

Of the 31 operators responding to the GSMA operator survey, more than 90% had at least one circular business model, with the most common being refurbished products (90%), e-waste collection and management programmes (87%) and trade-in and buyback programmes (84%).

However, the survey responses from operators also indicate that their progress on circularity for mobile phones is slower than progress in network equipment and customer premises equipment. Less than 30% of responding operators reported 'significant progress' on circularity related to mobile phones compared with nearly 40% for network equipment and 48% for customer premises equipment (Figure 5).

> "More than 90% of mobile network operators surveyed had at least one circular business model"

Figure 5 | Mobile operators' reported progress on circularity



Survey question: How do you think your company has progressed on circularity related to the following aspects (mobile phones; customer premises equipment, network equipment)?

Note: N/A includes operators who did not have related business operations or did not know

Source: GSMA Circularity Survey for Operators

03

Consumers and regulations: key drivers towards circularity

03 Consumers and regulations: key drivers towards circularity

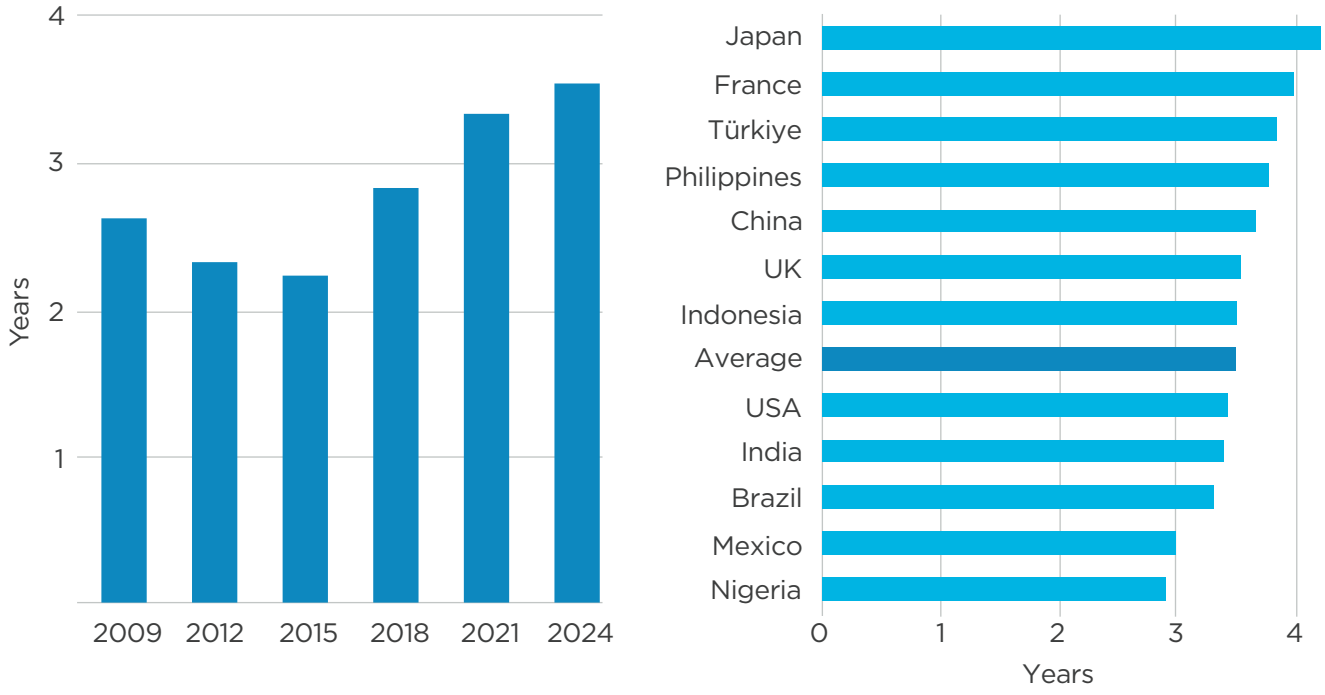
Evolving consumer preferences and behaviour

Consumer preferences and behaviours are increasingly shifting towards more circular phones as devices are being used for longer periods and there is a growing awareness and concern about the environmental impacts of electronic waste. Many consumers are now more open to purchasing used and refurbished devices, reflecting a significant change in attitudes. There is a rising demand for more repair services as consumers seek to extend the lifespan of their devices.

Devices are being replaced less often

Between 2009 and 2014, new smartphone sales grew at a compound annual rate of almost 50%. Innovation and features evolved rapidly over this period, with each generation with new features, better cameras and larger and higher-resolution screens. For example, the first iPhone to feature a front-facing camera was launched in 2010, while the first to feature optical

Figure 6 | Global average upgrade cycle of mobile phones, 2009-2024 (left) and current upgrade cycle by country (right)



Note: data on right chart is based on survey results of average lifespan of previous phone combined with expected lifespan of current phone

Source: Left chart based on GSMA analysis of mobile phone sales data, active mobile phone users and Knight (2023); right chart based on the GSMA Global Consumer Survey on Circularity (2024)

image stabilisation (OIS) was launched in 2014. Rapid year-on-year improvements and mainstream adoption of smartphones drove a faster upgrade cycle, which declined from 2.6 years in 2009 to 2.2 years by 2015 (Figure 6).

As smartphone adoption reached a plateau in advanced economies and the latest devices offered fewer noticeable improvements from the last generation, upgrade cycles have slowed to around 3.5 years over the past few years (Figure 6). Market research from Gartner shows that the global average replacement cycle increased by 10 months in 2023 to 4.2 years (Gartner Research, 2023). Analysis by IDC also shows that refresh rates for new phones in most developed markets have extended past 40 months (3.3 years) (IDC, 2024d).

Survey results in the USA and UK show similar trends of consumers replacing devices less often. A survey conducted in the USA showed that 32% of respondents in 2023 said they replaced their smartphone every five years or longer, up from less than 20% in 2022 (James, 2024). A 2022 Consumer Technology Association (CTA) survey found that US consumers expected smartphones to last 4.8 years on average, an increase of one year compared with a decade ago (CTA, 2023). A survey of UK consumers indicates they are also switching phones less often in recent years. In 2018, 48% of adults surveyed said they change or upgrade their mobile phone every two years or longer (Powell, 2023). In 2023, this share had increased to 62%.

> "Device-level data and analytics are needed to develop a complete understanding of the full lifespan of mobile phones and how these trends are evolving."

Analysis of the global GSMA survey shows significant variation across countries, with upgrade cycles in emerging and developing markets such as Nigeria and Mexico around a year shorter than those in advanced economies such as Japan and France (Figure 6, right), consistent with market trends from 2017 (Counterpoint, 2017). With many mobile phone users in developing countries giving their old devices to family or friends, upgrade cycles provide a limited view into the actual full lifespan of phones.

While consumer-level data can provide insights into upgrade cycles and trends at the user-level (i.e. how long a single user uses a device for), device-level data and analytics are needed to develop a complete understanding of the full lifespan of mobile phones and how these trends are evolving.

Growing awareness and the importance of sustainability in purchase decisions

According to the results of the global consumer survey, around 85% of consumers surveyed globally said sustainability is a 'very important' (49%) or 'important' (35%) factor in their next mobile phone purchase. Consumers considered sustainability (85%) to be a more important factor in purchase decisions than AI capabilities (67%) and visual appeal (73%), but slightly less important than battery life (96%), durability (94%) and data security (93%).

This proportion of consumers ranking sustainability as 'very important' was substantially higher for younger consumers (more than 55% for 18-34) compared with older consumers (around 35% for 55+). There was considerable variability across countries, with consumers in developing and emerging markets valuing sustainability factors most highly (Figure 7).

Case study – click to read
Orange – Engaging customers, employees and citizens on a more circular and sustainable digital future

Case study – click to read
Virgin Media O2 – Engaging Gen Z on e-waste

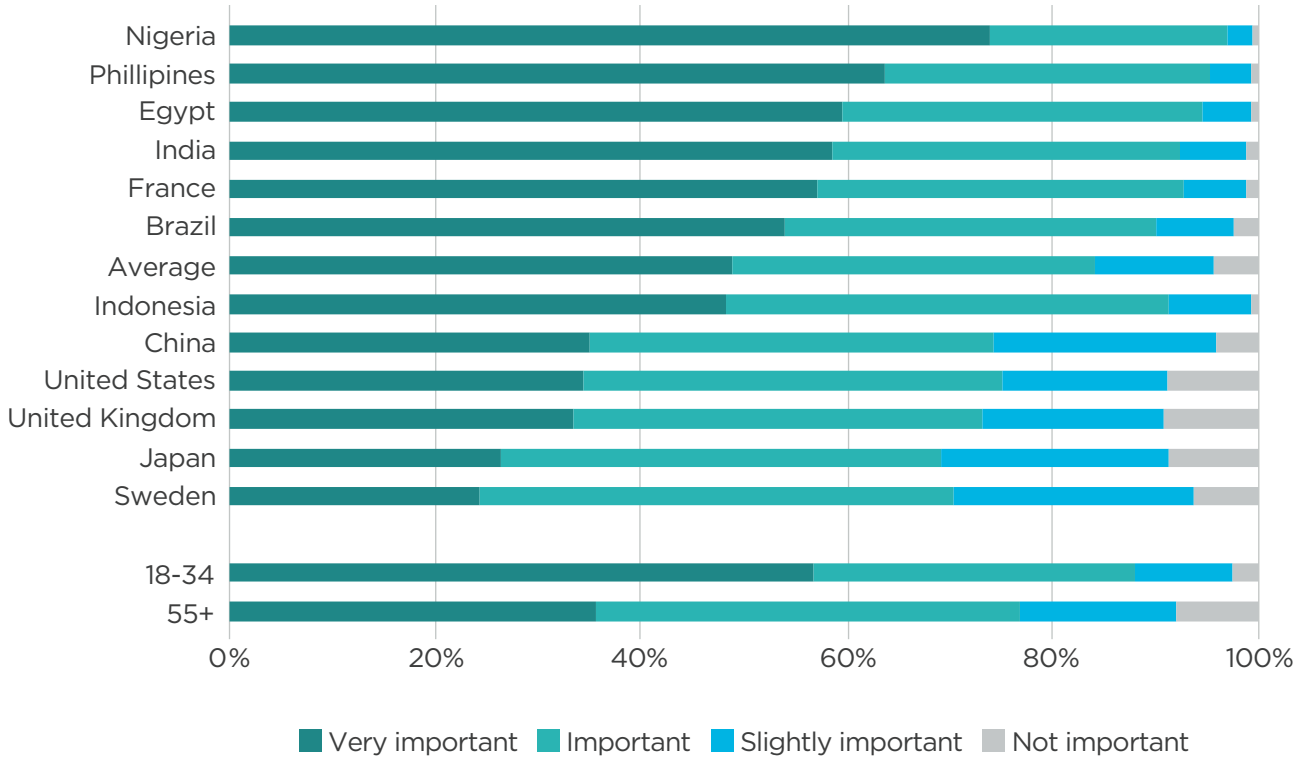
Consumers are willing to pay more for more environmentally friendly phones

Across the global sample, around 70% of consumers said they were willing to pay a premium for a more environmentally friendly mobile phone, including 30% of consumers willing to pay a premium of more than 10%.

The highest proportion of consumers surveyed willing to pay a premium of more than 10% was found in the two largest smartphone markets: India (49%) and China (44%). In India, 14% of respondents were willing to pay a premium of more than 20%.

> "Around 70% of consumers surveyed said they were willing to pay a premium for a more environmentally friendly mobile phone."

Figure 7 | Importance of sustainability in their next phone purchase decision



Survey question: Please think about the next mobile phone you will purchase. How important would the following factors be in your purchase decision?

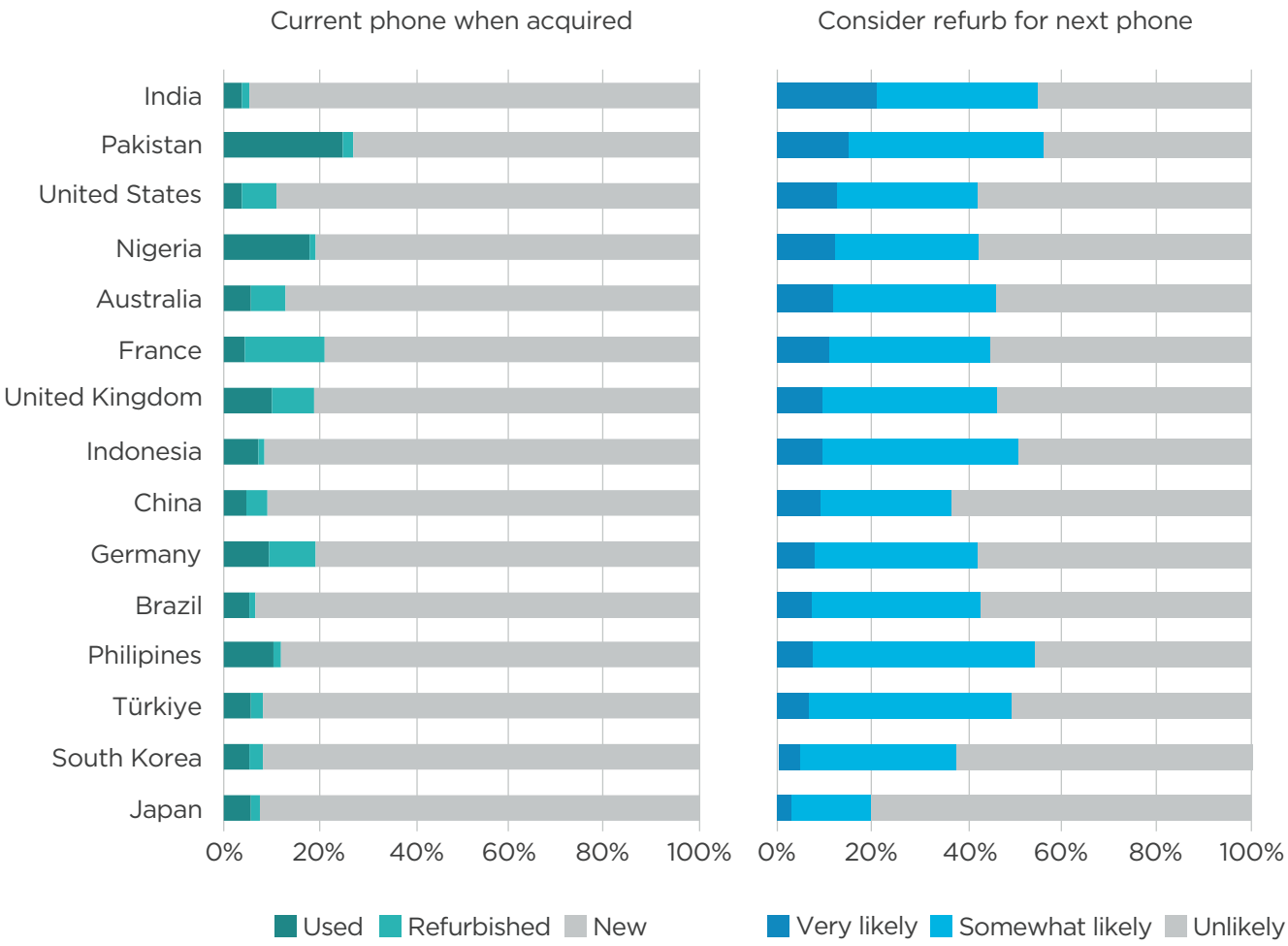
Source: GSMA Consumer Survey

Consumers are increasingly interested in buying used and refurbished devices

The survey results show that consumers are increasingly interested in buying used and refurbished phones. A tenth of consumers had acquired their current phone as a used device, compared with 4% refurbished and 86% new. A quarter of consumers surveyed in Pakistan had acquired their current phone in used condition, followed by all four countries surveyed in Sub-Saharan Africa: Ethiopia (19%), Madagascar (18.5%), Nigeria (18%) and South Africa (14%) (Figure 8, left).

France had by far the highest share of refurbished phones at 17%, followed by Germany (10%) and the UK (9%). Consumers showed higher levels of interest in refurbished phones than their recent purchase decisions, with around 10% of consumers surveyed as 'very likely' to consider refurbished for their next phone (Figure 8, right). Consumers in India showed the highest interest in refurbished, with more than 20% of consumers 'very likely' to consider refurbished for their next phone. Among advanced economies, consumers surveyed

Figure 8 | Condition of current phone when acquired (left) and likelihood of considering refurbished for their next phone (right)



Survey question: Left: Thinking about your current primary mobile phone, in what condition was the phone when you acquired it?
Right: Thinking of when you will replace your current mobile phone, how likely are you to consider buying a pre-owned refurbished phone?

Notes: "Unlikely" includes "Somewhat unlikely" and "Very unlikely".

Source: GSMA Consumer Survey

in the USA showed the highest interest with 13% 'very likely' to consider refurbished, 75% (5.4 percentage points) higher than the share of respondents who had purchased their current device refurbished.

Nearly half of consumers surveyed said that cost savings were a 'very important' benefit of buying refurbished, followed by 40% saying that they could buy a higher-end model than new due to the cost savings. When asked about the expected cost savings compared with new, nearly half of consumers surveyed expected savings of between 10-20% (21%) or 20-30% (26%).

> "Nearly half of consumers surveyed said that cost savings was a 'very important' benefit of buying refurbished."

Consumers' main concerns with refurbished devices were that the refurbished phone would break sooner than a new phone (49% 'very important'), its physical condition being worse than expected (46%), not being clean/hygienic (42%) and the warranty being shorter (38%).

Consumers want more durable and repairable phones

Consumers strongly value device longevity, with around 90% of consumers rating durability, guaranteed software and security updates for at least seven years, and easy and low-cost repair as important factors in their next purchase decision.

Poor battery life (33%), poor performance/ slowing down (27%) and physical damage (19%) were the top three reasons consumers had replaced their previous phone. Poor battery life was cited as by more than half of respondents in Japan (56%) while poor performance was cited as the top reason in China (44%) and South Korea (40%).

Just 17% of consumers replaced their previous phone because they wanted to buy the latest model, with the highest rates in Brazil (28%) and India (27%). Only 7% of those surveyed in Italy and France replaced their previous phone for this reason.

Consumers are experiencing barriers to repair

64% of consumers surveyed globally reported needing to have their current or previous phone repaired, of which half needed to fix a broken screen and one-third needed to replace the battery. In developing and emerging economies, 70-85% of consumers needed to repair their phones compared with below half in most advanced economies.

Of the consumers surveyed who needed to repair a phone, more than 60% proceeded to repair their phone (Figure 9, left). Of these, 63% had their phones repaired at a repair shop, 16% by their mobile operator, 14% by the phone manufacturer and 7% by themselves. In some advanced economies, mobile operators were important repair service providers (e.g. 39% in Japan, 26% in the USA).

Case study – click to read
Fairphone – Inspiring customers to keep their phone for longer

Despite needing repairs, more than a third of consumers did not end up repairing their phones, of which more than half continued to use them (Figure 9, left). The biggest barrier to repair was high repair costs (Figure 9, right).

Consumers are keeping many old devices

Many phones are seeing a second or third life, with more than 30% of consumers surveyed reporting giving their old phones to a family member or friend, and nearly 20% trading in or selling their used devices. Nearly one-third of consumers surveyed globally kept their previous phone as a backup after replacing it, including more than 40% of consumers in Italy (46%), Sweden (43%), Saudi Arabia (41%), Japan (41%) and China (41%).

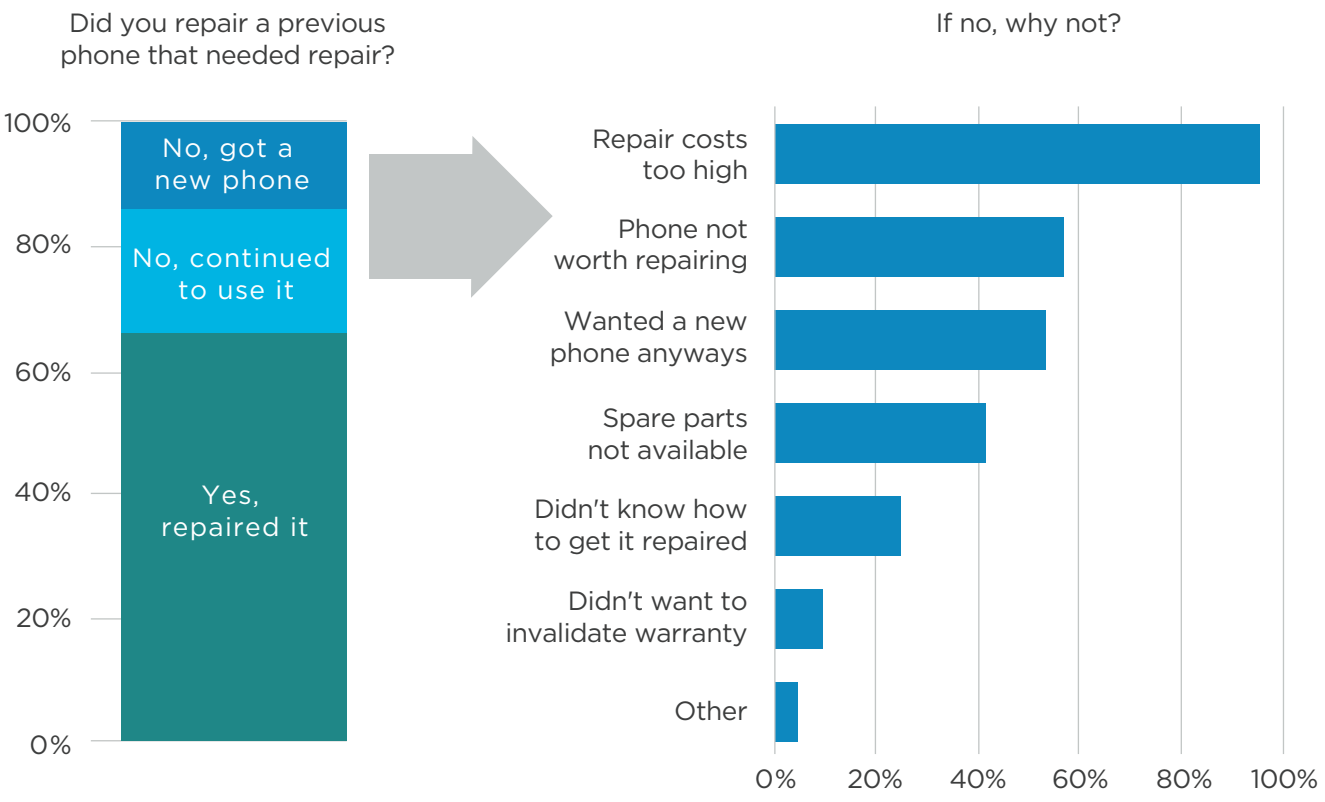
Three-quarters of consumers surveyed reported having at least one old handset sitting unused at home, while 20% had at least three phones at home. Based on these figures, there are likely around 10 billion dormant devices sitting idle worldwide.

> "Three-quarters of consumers surveyed reported having at least one old handset sitting unused at home."

A quarter of consumers choose to keep their phone because there is data that they want to keep and a further fifth of consumers held on to their old device because they don't know what to do with it. Data privacy was a particularly important concern for consumers in China (37%), Indonesia (30%) and Saudi Arabia (25%).

Consumers indicated that they would be encouraged to bring their phone in for reuse or recycling if they could get cash for it (42%), if their data would be deleted properly (42%) or if it was easy and convenient (34%).

Figure 9 | Share of respondents who repaired a previous phone (left) and reasons for not repairing it (right)



Survey question: Left: Did you have your phone repaired? Right: (If No) What were the main reasons you didn't repair your phone?

Source: GSMA Consumer Survey

Government regulations and policy

In addition to consumer trends, government regulations and policies are emerging as an important driver of circularity, with regulations on eco-design and right-to-repair emerging in Europe and North America. Other governments are actively considering regulations that could directly or indirectly support circularity.

Europe

In the **European Union**, a series of regulations aims to increase circularity through minimum eco-design requirements, labelling and right to repair. As part of the European Green Deal, the European Commission has adopted new regulations on eco-design requirements and energy labelling, which enter into force in June 2025.

The Commission Regulation (EU) 2023/1670 lays down eco-design requirements for mobile and cordless phones and tablets being placed on the European Union (EU) market (European Union, 2023b). The regulation covers eco-design requirements related to repair and reuse, durability, recycling and transparency.

On repair and reuse, manufacturers will be required to provide spare parts and repair information for specified components for at least seven years. In terms of durability, devices must survive 45 one-meter drops without reduced functionality, meet scratch resistance standards, offer protection from water splashes and dust particles and maintain a battery capacity of at least 80% after 800 charging cycles. Manufacturers will also be required to provide OS and security updates for five years after the end of the devices' placement in the market.

Manufacturers will also be required to provide dismantling information (steps, tools and technologies) for 15 years. Finally, vendors will be required to provide publicly available information online on scarce mineral use, indicative recyclability score, percentage of recycled content in the product, IP rating and battery endurance.

The Commission Delegated Regulation (EU) 2023/1669 requires energy labelling of smartphones and slate tablets (European Union, 2023a). The energy labels will include an energy efficiency rating, along with ratings for drop protection and repairability, battery endurance capacity and ingress protection (IP) rating.

The Directive on common rules promoting the repair of goods (2024/1799) entered into force in July 2024, requiring Member States to transpose it into national rules and apply it from 31 July 2026 (European Commission, 2024). It aims to ensure consumers easier, faster and more transparent access to the repair of home appliances and consumer electronics, including smartphones.

The Corporate Sustainability Reporting Directive (CSRD) is also expected to drive more circular practices by increasing transparency and accountability across the value chain. Companies are required to report on their environmental, social and governance performance, including on circular economy. By assessing and reporting on the environmental and social risks associated with their operations (including linear models), companies may be incentivised to adopt more circular business models to reduce risks and attract responsible investors.

In 2021, **France** became the first European country to implement a legally binding repairability index, with a new set of criteria for manufacturers of electronics and home appliances, including smartphones (ITU, 2021). Under the law, manufacturers must disclose how 'repairable' their products are on a scale of one to 10, based on a range of criteria including the availability of spare parts and ease of disassembly. In 2023, **Belgium** became the second European country to introduce a reparability index (Khattabi, 2023).

North America

In the **United States of America**, Right to Repair legislation has recently passed in several states. In 2023, New York, Minnesota and California signed laws that require that spare parts, documentation and tools for the maintenance, diagnosis and repair of electronic devices are accessible to the public (Pozo Arcos, 2024). In 2024, Oregon and Colorado also passed strong Right to Repair laws covering mobile phones (PIRG, 2024a; Terry, 2024). According to the Public Interest Research Group (PIRG), 30 states are actively considering Right to Repair bills (PIRG, 2024b).

In **Canada**, recent changes to Canada's Copyright Act – which previously restricted repairs due to copyright restrictions on software and code – will make it easier for people and independent repair technicians to repair electronic devices, including smartphones (CBC News, 2024). In 2023, Quebec became the first province to enact Right to Repair legislation, passing Bill 29 amending the Consumer Protection Act (Bennett Jones, 2023). The law aims to protect consumers from planned obsolescence and promote the durability, repairability and maintenance of goods (National Assembly of Québec, 2023).

Other regions

Brazil's National Policy for Solid Waste (2010) requires that manufacturers, importers, distributors and resellers of electronics products and their parts must create and implement a reverse logistic system allowing consumers to return the electronics rather than using public garbage disposal services (International Trade Administration, 2022).

India's Ministry of Consumer Affairs proposed to introduce a right to repair law in 2022, setting up a committee to develop a right to repair framework, which includes mobile phones (Singh, 2022). The Department of Consumer Affairs hosted a national workshop on the Right to Repair Framework for the mobile and electronic sectors in August 2024, encouraging the need for a repairability index for products to improve consumer access to warranty and repair options and promote sustainable product design (India Ministry of Consumer Affairs, Food and Public Distribution, 2024).

In **Taiwan**, the Ministry of Environment provided guidance in 2023 to mobile phone and computer manufacturers to pilot the implementation of a 'Repairability Index' (Taiwan Ministry of Environment, 2023).

04

Business case for circularity

04 Business case for circularity

Challenges and risks of linear models

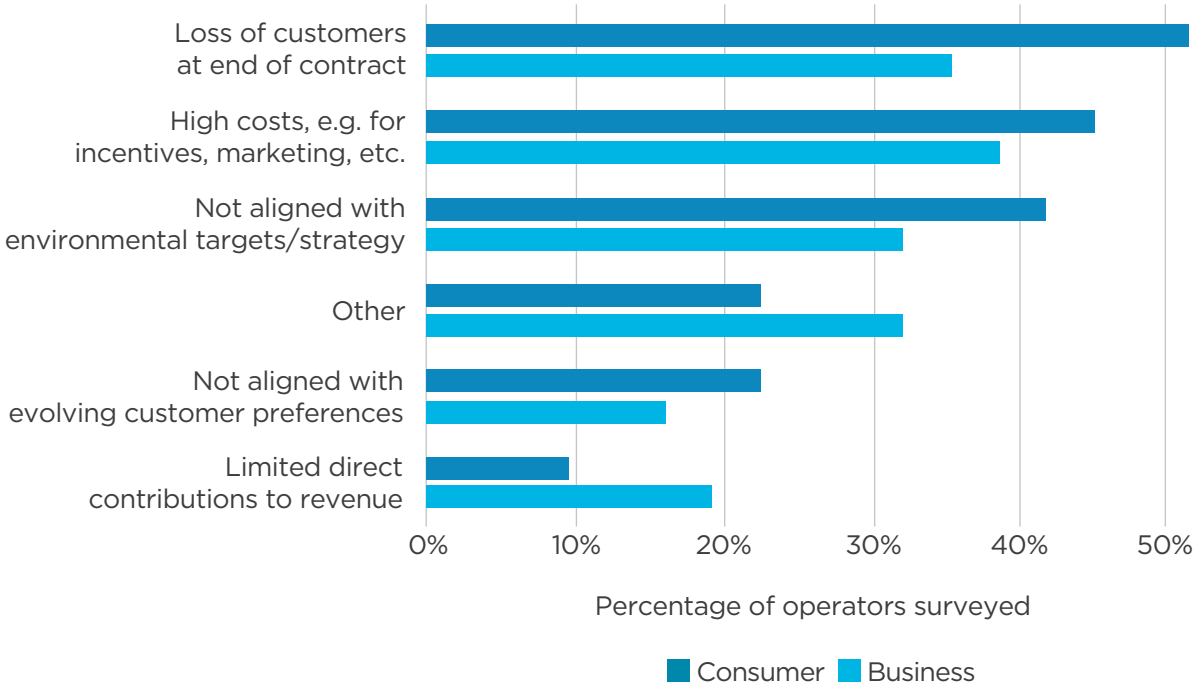
Linear business models incentivise manufacturers and retailers to pursue short-term economic gains through continuous production and sales of new devices. However, this model comes with significant and growing environmental impacts and raises costs for consumers who are encouraged to frequently replace their devices.

There are also key drawbacks and risks in linear business models. For manufacturers, linear models could reduce customer satisfaction and loyalty if devices are not as long-lasting or high-performing as customers expect.

> "For manufacturers, linear models could reduce customer satisfaction and loyalty if devices are not as long-lasting or high-performing as customers expect."

For mobile operators, the risks of their current – mostly linear – business models include the loss of customers at the end of contracts, high costs for incentives and marketing and the lack of alignment with company environmental targets and strategy (Figure 10).

Figure 10 | Drawbacks and risks of current business models for mobile operators



Survey question: What are the main drawbacks and risks of your current strategy and business model? Select all that apply.

Source: GSMA Circularity Survey for Operators

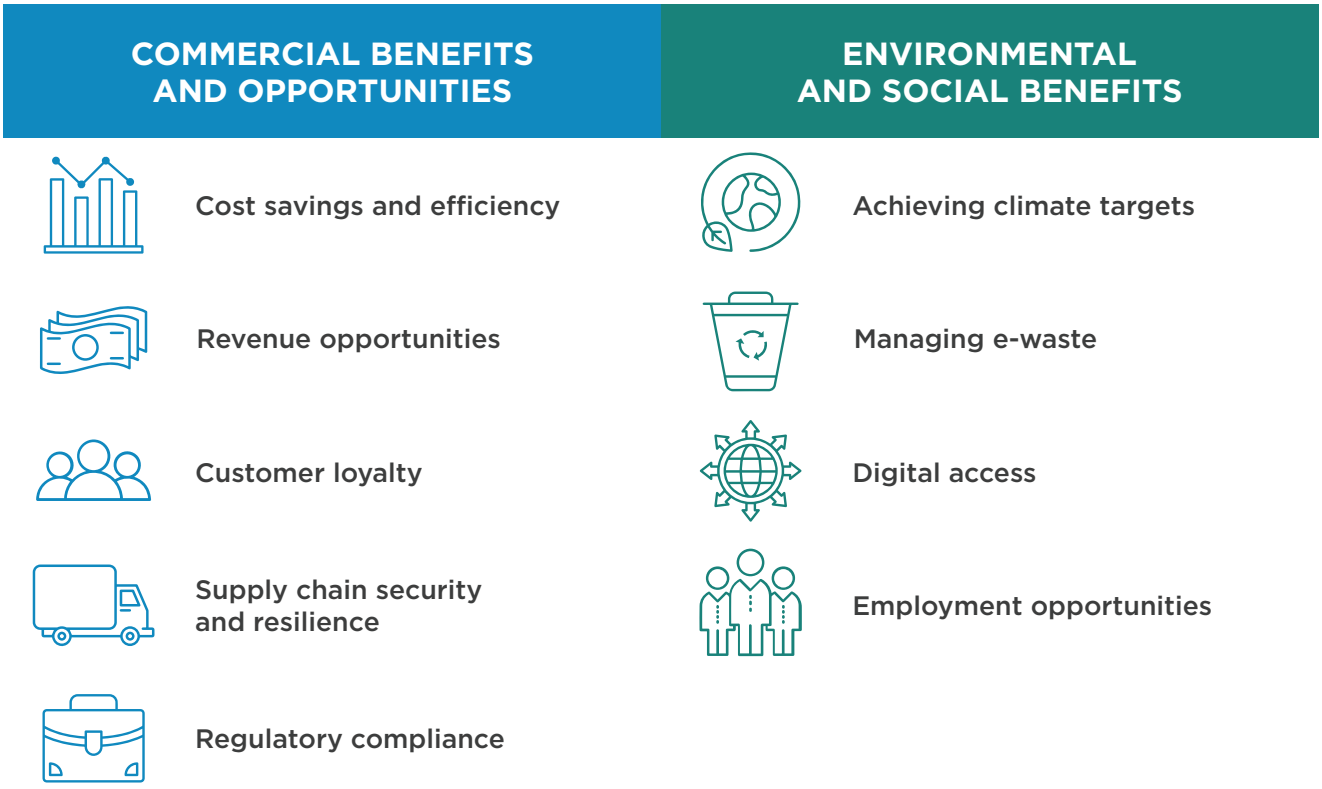
The business case for circularity

In addition to growing consumer interest and emerging regulations that could accelerate the transition to circularity, the business case for circularity is becoming increasingly compelling. From a commercial perspective, circular business models can open up alternative revenue streams through repair services and refurbished devices, while also enhancing customer loyalty and brand reputation (Figure 11). More circular approaches and products can also enhance supply chain security and resilience.

Circularity is a critical lever for mobile operators and manufacturers to achieve their climate targets by addressing Scope 3 emissions associated with mobile phone production and use. Refurbished devices could be part of the solution in bridging the usage gap.

> "A strong business case requires circular business models to make sense financially, advance environmental goals, enhance brand image and customer loyalty and meet customer needs."

Figure 11 | Benefits and opportunities of circularity



Commercial benefits and opportunities

There are numerous commercial benefits and opportunities of circularity for both mobile phone manufacturers and mobile operators, such as cost savings, revenue opportunities, customer loyalty and supply chain resilience.

Cost savings and efficiency

Increasing circularity can help reduce costs by increasing resource efficiency. For example, increasing energy efficiency and the use of renewable energy can reduce costs from manufacturing. Solar and wind are already the cheapest forms of electricity generation in most countries today and their costs continue to decline rapidly (IRENA, 2024). Long-term renewable energy power purchase agreements (PPAs) can also protect companies against rapid increases in electricity prices.

Improving material efficiency and using recycled materials can reduce demand for minerals, reducing costs and mitigating price volatility, while also minimising waste generation and disposal costs.

Revenue opportunities

While the global trend towards longer replacement cycles and fewer new users is slowing revenue growth for manufacturers and retailers relying on linear business models, transitioning towards circular business models can help offset these reductions by increasing and diversifying revenues from the growing market for circular products and services.

> “The global used and refurbished smartphone market is projected to grow by more than 10% annually to 2027.”

The global used and refurbished smartphone market is projected to grow by more than 10% annually to 2027, reaching $110 billion by 2027 (IDC, 2024d). Although there is a lack of robust data on the size of the global mobile phone repair market, most analysts project near-term annual growth rates of 5-10% per year (Business Research Insights, 2024; Grand View Research, 2024; Spider Technologies, 2017; UnivDatos, 2021).

Circular business models such as device-as-a-service can generate stable and recurring revenue while also retaining ownership of products and better controlling product lifecycle.

Customer loyalty

Customer satisfaction is one of the most important drivers of customer loyalty, including for mobile phones (Jo and Park, 2024). For phone manufacturers, consistently producing high-quality and long-lasting products is key to enhancing customer satisfaction (iFixit, 2023). By providing quality products and repair services, scaling up circular business models could be an effective way for companies to ensure financial sustainability while consumer demand shifts toward longer product lifetimes (Vanhamäki, 2022). Loyal and satisfied customers are more likely to recommend their device or service provider to friends and family.

Offering repair services also offers additional opportunities to provide a positive customer experience and foster closer relationships with existing customers, enhancing their loyalty to a manufacturer or service provider. Embracing circularity also demonstrates a commitment to sustainability which resonates with environmentally conscious consumers and enhances brand image and reputation. Early adopters of circular business models can gain a competitive edge by establishing themselves as sustainability leaders and attracting environmentally conscious customers and investors.

Supply chain security and resilience

Mobile phones require a range of critical minerals, many of which are concentrated in only a few countries. For example, more than 95% of cobalt today is mined in just three countries: the Democratic Republic of the Congo (DRC), Indonesia and Russia (IEA, 2024a). China dominates mineral processing, accounting for more than 90% of refined production of rare earth elements and graphite.

By increasing the lifespan of devices through repair and refurbishment, phone manufacturers and their suppliers – particularly those operating in countries with limited mineral resources – can reduce their dependence on critical minerals and the need to extract and process new raw materials. This not only mitigates the environmental impacts associated with mining and processing, but also minimises the geopolitical and economic risks linked to the supply of critical minerals, especially in times of high price volatility. Driven by supply chain disruptions from COVID-19 and Russia's invasion of Ukraine, the price of rare earth elements and battery metals between January 2020 and March 2022 more than tripled (IEA, 2024a). The price of lithium alone increased sevenfold between January 2021 and March 2022 (T.-Y. Kim, 2022).

Recycled mobile phones can also be an important source of critical minerals. One tonne of waste mobile phones contains around 90 times more gold (125g) than a typical tonne of gold ore mined today (1.42g) (GSMA, 2023). The estimated 10 billion dormant phones that exist today contain around 100,000 tonnes of copper, seven million ounces of gold, and one million ounces of palladium – collectively worth around $20 billion based on current market prices.

"The estimated 10 billion dormant phones that exist today contain around 100,000 tonnes of copper, seven million ounces of gold, and one million ounces of palladium – collectively worth around $20 billion based on current market prices."

Regulatory compliance

Implementing circular practices helps companies meet evolving environmental regulations and extended producer responsibility (EPR) schemes, mitigating potential legal and financial risks (Circular Electronics Partnership, 2024b; WBCSD, 2024).

Environmental and social benefits

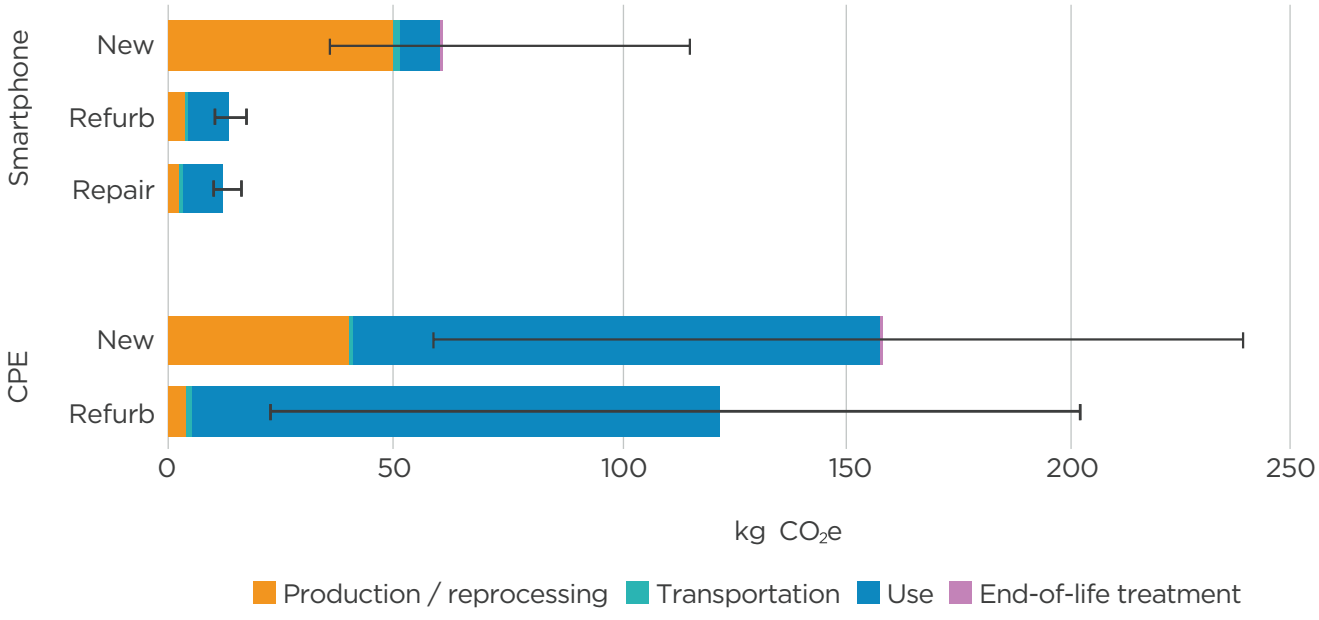
Achieving climate targets

As of December 2024, 74 mobile network operators – representing around half of mobile connections and two-thirds of revenues – have set or committed to near-term science-based targets. Several phone manufacturers have also set or committed to near-term science-based targets: Apple (set), Fairphone (set), Google/Alphabet (committed), HMD (set), Motorola/Lenovo (set), Oppo (committed) and ZTE (set). Others have yet to commit to comprehensive science-based targets.

Achieving near-term science-based targets and net zero targets will require operators and manufacturers to address Scope 3 value chain emissions. Scope 3 emissions represent the vast majority of the carbon footprint of most mobile operators and phone manufacturers (GSMA, 2024b). Most of the same Scope 3 emissions associated with mobile phones are accounted for by both operators and manufacturers, such as upstream emissions from production and downstream emissions from mobile phone charging and use.

Circularity is a critical lever to reduce upstream Scope 3 emissions for both operators and manufacturers. Materials and manufacturing account for around 70-90% of the life cycle emissions of a typical smartphone. This means that longer device lifespans can deliver substantial emission reductions and savings. For example, using a device for five years instead of three reduces its annual carbon footprint by around 30%, even when factoring in a battery replacement (Sánchez et al., 2024). The environmental footprint of refurbishing a phone is about 90% lower than manufacturing a new phone. Across its full life cycle, repaired and refurbished phones typically have around 80-90% lower carbon emissions than new phones (Figure 12). The GSMA has developed new guidance to help operators align on methods and approaches to calculate the carbon savings of repair and refurbishment (Box 1).

Figure 12 | Typical life cycle carbon emissions of new, refurbished and repaired mobile phones and customer premises equipment



Notes: For simplicity and ease of comparison, all smartphones assume three-year lifespans and CPE assume five-year lifespans. In reality, refurbished and repaired models are likely to have shorter lifespans (and therefore smaller use-phase emissions, but requiring more frequent replacement). Error bars indicate approximate range of typical emissions, depending on product and country of use (grid carbon intensity).

Source: GSMA (2025), Carbon Savings of Circularity

Box 1: Quantifying the carbon savings of repair and refurbishment

The GSMA recently published new industry guidance to help telecommunication operators quantify the carbon savings of circularity initiatives for mobile phones, customer premises equipment and active network equipment (GSMA, 2025a).

The guidance outlines two main accounting approaches to quantifying the carbon savings of circularity: inventory accounting and project-based accounting.

Inventory accounting quantifies actual greenhouse gas (GHG) emissions associated with an organisation's activities, allocating them across Scope 1, 2 and 3 categories. Due to a relatively lower carbon impact within the production stage of their lifecycle, refurbished products typically have lower attributed embodied emissions per unit compared to newly manufactured products. This lower emissions burden can be reflected accordingly within the inventory calculations, ideally via a specific product- or supplier-level method.

Project-based accounting, also known as consequential accounting or intervention accounting, estimates the impacts or changes in GHG emissions resulting from specific projects, actions or interventions relative to a counterfactual baseline scenario. Circular products can be considered to partially or fully substitute newly manufactured products, with a counterfactual product being selected to represent the most likely product chosen in the absence of the circular option. In this case, the estimated difference in emissions between the two scenarios ('circular' and 'counterfactual' scenarios) can be quantified (often referred to as 'avoided emissions'). Standards require any project-based accounting claims to be reported as a separate disclosure outside of the emissions inventory.

Typically, savings of up to 80% or more per unit can be achieved by sourcing refurbished products instead of newly manufactured products. However, the size of the saving is dependent on a number of factors, such as the assumed lifespan of the repaired or refurbished product and the significance of use-phase emissions in the overall lifecycle.

The guidance is supported by an accompanying modelling tool which allows operators to enter their own custom baselines and scenarios and to model the carbon impacts of refurbishment initiatives for specific products. For more information, refer to the new GSMA guidance: Quantifying the Carbon Savings of Circularity (GSMA, 2025a).

Case study – click to read
HONOR – Circularity initiatives and carbon savings

Case study – click to read
BT Group – Refurbing routers reap environmental benefits

Managing e-waste

According to the UN Global E-waste Monitor, a record 62 million tonnes (Mt) of e-waste was produced in 2022, up more than 80% from 2010 (Baldé et al., 2024). Since 2010, e-waste generation has outpaced formal recycling of e-waste by a factor of five and less than one-quarter (22%) was formally recycled in an environmentally friendly manner.

E-waste volumes are projected to continue to increase rapidly, reaching more than 80 Mt by 2030. Circularity initiatives that extend the useful lifespan of devices can play a crucial role in managing this surge, decreasing the volume of waste generated.

The UN estimates that e-waste generates annual external costs of $78 billion to both people and the environment (Baldé et al., 2024). These costs stem from lead and mercury emissions, plastic leakages and contributions to global warming, particularly when hazardous substances are not managed properly. BCG estimates that the USA alone loses $10 billion across all unrecycled e-waste products per year (BCG, 2023).

Case study – click to read

Vodacom – Circularity and E-Waste Initiatives: tackling environmental challenges in Africa

Case study – click to read

Globe – E-Waste zero programme in the Philippines

Bridging the digital divide and expanding the local repair economy

Circularity initiatives offer significant social benefits globally and locally. Nearly 40% of the global population – more than three billion people – live within mobile broadband coverage and are not using it (GSMA, 2024c). For the unconnected in low- and middle-income countries, device affordability and digital skills and literacy are the main barriers to mobile internet adoption. In these countries, entry-level internet-enabled phones can cost nearly a fifth of the average monthly income.

The GSMA estimates that there are around 10 billion dormant phones around the world, many of which have the potential to be refurbished and reused. Many consumers surveyed by the GSMA – including a fifth of consumers in Africa and Southeast Asia – indicated that they would be encouraged to bring back their old phones for reuse or recycling if they knew it would help someone get connected. There is significant potential to explore how the recovery and refurbishment of dormant phones could help connect people who cannot afford new phones.

Increasing circularity can have many local benefits as well, including creating employment opportunities in device collection, repair, refurbishment and recycling and contributing to wider economic benefits for communities. Additionally, by extending the lifespan of devices, repair services can reduce the volume of e-waste sent to local landfills and reduce the costs to manage e-waste as well as the local environmental and health impacts of informal e-waste processing.

Case study – click to read

Virgin Media O2 – Community Calling: smartphone redistribution programme

Managing the transition

While circular products and services offer new revenue opportunities, it is important to also acknowledge that longer device lifespans could reduce the overall revenues derived from linear models that rely on the frequent replacement of devices.

Companies along the value chain will need to manage the near-term benefits and risks of both linear and circular models, while also laying the foundation to reap the benefits of the transition to a circular economy for mobile phones. Strategies that can help to manage the transition include:

- **Starting small and scaling gradually:** Companies can start their circularity transitions with pilot projects or focus on specific products or customers (e.g. B2B) to gain experience, test feasibility and learn from experience before large-scale implementation.
- **Building internal capabilities and culture:** Successfully transitioning to a circular economy requires developing internal capabilities as well as fostering a culture of sustainability and circularity throughout the organisation.
- **Collaborating with partners:** Many circularity challenges cannot be solved by one part of the value chain, requiring companies to develop partnerships across the value chain to share knowledge and contribute to solutions.

Manufacturers, operators and other retailers that are slow to transition to more circular business models may see the benefits of circular models realised by existing competitors or even new companies that are focused on circular models.

Companies that focus primarily on circular models, such as refurbishment companies and device-as-a-service companies, are already seeing rapid growth and investment. For example, Back Market, one of the largest online marketplaces for refurbished phones and electronics, saw a 45% growth in revenue in 2023 to €320 million (Butler, 2024). The French startup has already raised $1 billion to date, with its most recent funding round in 2022 placing it at a $5.7 billion valuation (Dillet, 2024). Another French refurbishment company, Recommerce Group, reported revenues of €150 million in 2023, with an annual growth of 30% (Recommerce Group, 2024).

Everphone, a Berlin-based Device-as-a-Service platform for corporate smartphones and tablets, increased its revenue to more than €80 million in 2023, up from €19 million in 2021 (Everphone, 2024). The company announced that it raised €270 million in financing led by Citigroup and KfW.

Case study – click to read

Everphone – Reduce, reuse, refurbish – "device as a service" to use fewer phones for a longer time

Examples from other sectors

Other companies in the **information and communication technology** (ICT) sector are developing circular business models. For example, Dell offers a 'PCs as a Service' to its business customers (B2B), which helps boost the recovery of devices at the optimum time for refurbishment and reuse (Circular Electronics Partnership, 2024b).

Other sectors and industries, such as automotive, fashion, furniture and consumer electronics are also responding to the growing demand for used products, greater recycling and remanufacturing by adapting their business models and strategies (Table 3).

The **automotive sector** has a long history with circular business models, with a strong used market (outpacing new car sales by at least two in most markets), repair and maintenance services from OEMs and third parties, and leasing models. Car sharing services can also improve the use of vehicles, reducing the need to manufacture as many cars.

The **fashion industry** has seen paradoxical trends in sustainability in recent years, with the rapid growth of both low-end fast fashion as well as growing consumer demand for second-hand, high-end fashion. Driven by strong demand, the global fashion resale market is projected to double to $3.5 billion by 2027 (Wicker, 2024). The online clothing rental market, worth more than $6 billion in 2023, has more than doubled since 2016, driven by demand from Gen Z and millennials (Biondi, 2024). However, both resale and rental companies are facing challenges in translating revenue growth into profitability – primarily due to the oversupply of clothing from the rise of ultra-fast, ultra-cheap fashion brands.

The Ellen MacArthur Foundation estimates that circular business models for the fashion industry could be worth $700 billion by 2030, making up nearly a quarter of the global fashion market (Ellen MacArthur Foundation, 2021c). Leading clothing brands such as Patagonia are pursuing more circular business models.

In the **furniture industry**, IKEA has announced a range of initiatives to transition to a more circular value chain. This includes applying circular design principles, using renewable and recycled materials and working to prolong the life of products through repair, takeback and resale. Other companies are developing platforms for second-hand furniture as well as subscription models for office furniture.

In the **energy** sector, circularity is a key strategy to meet the growing mineral requirements of expanding grids and clean energy. Circular approaches such as repurposing EV batteries for stationary storage and recovering critical minerals through recycling will become increasingly important to meet growing demand (Dunn, 2024; IEA, 2024b).

Table 3 | Examples of circular business models from other sectors

Sector	Type of circular model	Example
ICT	Device-as-a-service	Dell's 'PC as a Service' offers its business (B2B) customers PCs, software, support and asset return services for a single monthly fee (Circular Electronics Partnership, 2024b). Customers benefit from more predictable budgets, reduced IT effort to manage computing needs and streamlined processes.
Automotive	Rental	Zipcar operates a car-sharing service that allows members to rent vehicles by the hour or day. Members pay an annual fee for access to the fleet and are then charged hourly or daily rates for usage. This model reduces the need for individual car ownership.
Fashion	Trade-in, repair, refurbishment and resale	Patagonia's 'Worn Wear' programme encourages customers to buy used Patagonia products, trade in their old items and repair rather than replace damaged gear (Patagonia, 2024). Through this programme, customers can bring their used Patagonia clothing and gear to participating stores or mail them in. The items are then inspected and, if they meet quality standards, they are cleaned, repaired and resold as 'Worn Wear' items.
	Rental (B2C)	Nuuly operates a clothing rental subscription service that allows customers to rent six items per month from a curated collection of brands. Subscribers pay a monthly fee for access to the rental pool and the company handles the cleaning and maintenance of the clothing (Nuuly, 2024).
	Rental (P2P)	By Rotation operates as a peer-to-peer fashion rental platform where users can rent and lend their clothes directly to each other. This model allows for a more sustainable and affordable way to access fashion, reducing the need for fast fashion and extending the lifespan of clothing items (Ellen MacArthur Foundation, 2021b).
	Second-hand platforms	Vinted and Vestiaire Collective are two examples of peer-to-peer online marketplaces where users can buy, sell and swap second-hand clothing and other items. Vestiaire Collective specialises in luxury and designer fashion and provides authentication services (Ellen MacArthur Foundation, 2021a).
Furniture	Repair, takeback, refurbishment and resale	IKEA's 'Buy-back and Resell' service resulted in more than 400,000 items seeing a second life in FY23 (IKEA, 2024). They also reported providing more than 20 million spare assembly parts to help customers prolong the life of products.
	Subscription	NORNORM is a subscription-based furnishing service that enables businesses to move from single-use office furniture to a circular model. As well as improving flexibility and cost efficiency for landlords and business owners, customers can reduce their environmental impact by moving to a circular model that extends the lifecycle of office furniture by three times (NORMNORM, 2022).
Consumer electronics and medical	Subscription access to products	Philips has set a goal to generate 25% of its revenue from products, services and solutions that contribute to circularity by 2025 (Philips, 2024). The company is exploring circular business models – such as offering subscription access to products – opening up new opportunities for growth and cost savings.

Source: GSMA analysis.

05

Scaling circular products and business models

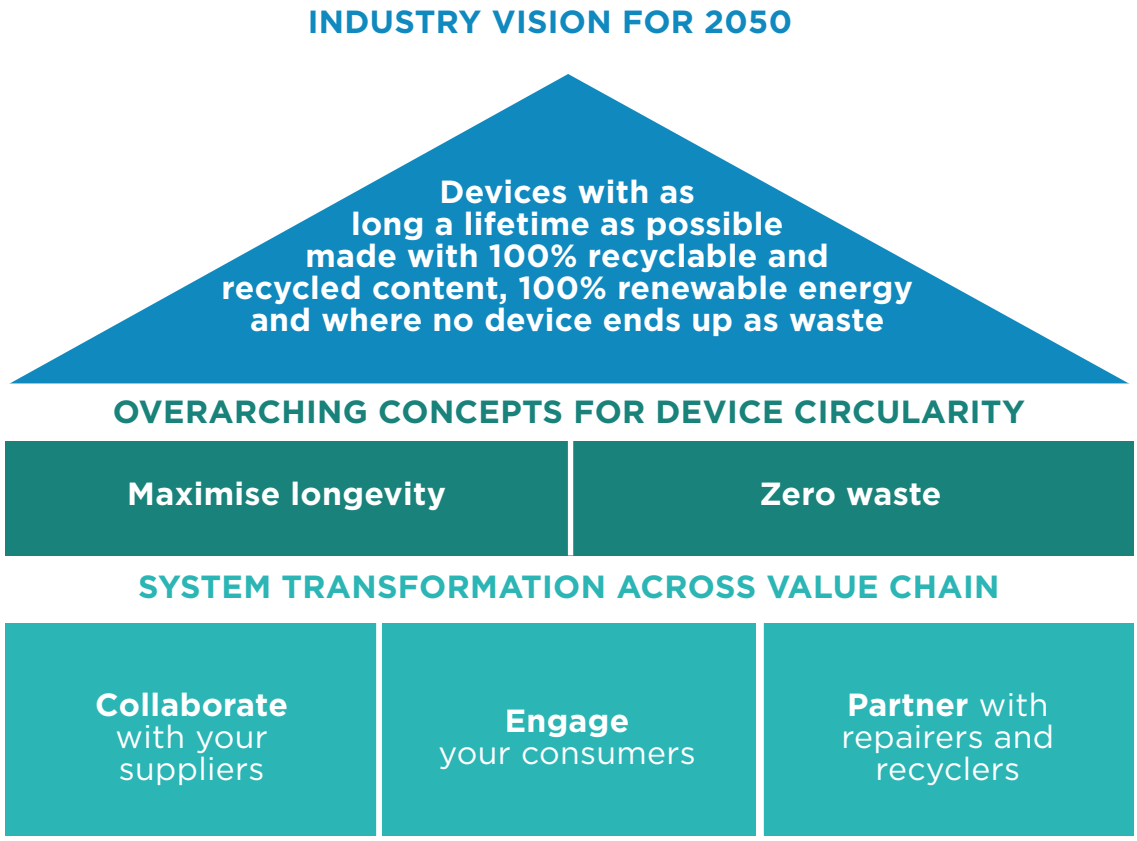
05 Scaling circular products and business models

Industry vision for a circular economy

In 2022, the GSMA and mobile operators defined a long-term (2050) industry vision for a more circular economy for mobile devices: "Devices with as long a lifetime as possible, made with 100% recyclable and recycled content, 100% renewable energy and where no device ends up as waste".

The vision is underpinned by two foundational concepts for circularity: 'maximised longevity' and 'zero waste'. A variety of circular business models and strategies can contribute to the industry vision, including eco-design, repair services, refurbishment, takeback and leasing (Watson et al., 2017). As circularity is not achieved in isolation, the solutions entail collaboration with stakeholders across the value chain.

Figure 13 | Mobile industry vision for circularity



Source: GSMA (2022), Strategy Paper for Circular Economy: Mobile devices.

Manufacturing more circular phones

Achieving the industry vision for circularity requires considerable efforts from mobile phone manufacturers who play a central role in supporting and designing for device longevity and reducing the environmental impacts of materials and manufacturing.

Supporting longevity through repair and software support

Manufacturers can support longer device lifespans by offering repair services and convenient access to cost-effective genuine parts.

Longer software and security support are important ways to support device longevity. Several manufacturers have extended guaranteed software and security updates in recent years. Samsung announced their flagship Galaxy S25 will receive OS and security updates for seven years. Google announced their Pixel 8 and later phones will also get updates for seven years, while Fairphone has guaranteed eight years of software support and a five-year warranty on their Fairphone 5. Other manufacturers' flagship phones typically guarantee three or four years of software updates and a further year of security updates.

While Apple does not guarantee updates for a specified length of time, the oldest phone supported by the current iOS 18 is the iPhone XS and XR released in 2018 – equating to seven years of OS and security updates.

Eco-design to maximise longevity and minimise environmental impacts

Eco-design considers environmental aspects in product design and development to maximise the longevity and minimise the environmental impacts of a product. Key strategies of eco-design for mobile phones include designing devices that have more durable screens, are easily repairable (including through modularity) and offer high water and dust resistance. For example, the Fairphone 5's modular design received a 10/10 from iFixit while achieving an IP55 rating for weatherproofing.

Case study – click to read
Fairphone – Designed for circularity and built to last

Case study – click to read
Samsung – Strengthening circularity of Galaxy devices

Eco Rating conducted a detailed analysis comparing devices assessed in January 2022 and April 2024 (Eco Rating, 2024). The analysis showed improvement in durability (battery life, charge connector lifetime), percentage of recycled material in packaging and ease of battery disassembly, but regression in the use of hazardous and restricted substances section.

Case study – click to read
Eco Rating – Helping consumers make more sustainable choices when buying phones

On life cycle impacts, the analysis showed positive progress overall, with significant reductions in the weight of accessories (-55%) and gold (-29%) and tantalum (-25%) content, as well as air transport (-20%). However, average internal storage increased 42%, along with increased electricity used for assembly (+24%) and cobalt content (+37%) – linked to increasing average battery capacity.

Case study – click to read

Deutsche Telekom – T-Phone generation 2 as a lighthouse in emission reduction

Case study – click to read

HONOR – Embedding circular economy across the full life cycle

Case study – click to read

Cisco - A holistic approach to circularity: embedding circularity into product design

Greening manufacturing and supply chains

Mobile phone manufacturers have three main levers to reduce the environmental impacts of manufacturing: energy efficiency, clean energy and recycled materials.

Manufacturing mobile phones and their components is highly energy and carbon intensive. Improving energy efficiency – particularly for integrated circuit production – can reduce energy use and carbon emissions. Using clean energy across materials extraction and production processes can also reduce carbon emissions. For example, Apple has worked with more than 300 suppliers (representing 95% of Apple's direct manufacturing spend) who have committed to using 100% clean energy for their Apple production by 2030. These suppliers have collectively procured 16.5GW of renewable capacity, generating more than 25TWh of clean energy in 2023 (Apple, 2024b). More than 30% of manufacturing electricity to produce the iPhone 16 came from clean energy (Apple, 2024a).

Several phone manufacturers are setting recycled content targets and increasing the use of recycled materials in their products. In setting their recycled content targets, Apple conducted detailed analysis to determine which materials to prioritise (Apple, 2019). The analysis considers a wide variety of criteria related to supply, environmental and social impacts, including geographic production concentration, current recycling rates, substitutability, life cycle impacts, recyclability and child and forced labour. Fairphone has also conducted detailed analysis in their Fair Materials Roadmap 2030 to prioritise key materials for recycled content and fair mining practices (Fairphone, 2024). Manufacturers are advancing quickly on recycled aluminium, cobalt, copper, gold, lithium and rare earth elements.

Case study – click to read

Apple – Decarbonising the value chain

Case study – click to read

Motorola Mobility – Renewable energy and power efficiency at their largest smartphone manufacturing centre

Key barriers and potential solutions

While there are many benefits of implementing eco-design, supporting longevity and greening the production of mobile phones, manufacturers face a variety of barriers in initiating more circular business practices and models. These include:

- **Financial and economic barriers,** including high up-front investment costs (for product redesign, reverse logistics, new technologies for material recovery), uncertainty of investment returns and profitability, and pressure from senior leadership and investors to prioritise short-term gains.
- **Operational and logistical barriers,** including challenges in developing robust reverse logistics networks and infrastructure and challenges in tracking materials for responsible sourcing and end-of-life management.
- **Organisational barriers** such as a lack of knowledge or skills to advance circularity, resistance to change, siloed thinking and a lack of incentives.
- **Consumer and market barriers,** including consumer preference for new products, low awareness of circular options and their benefits, as well as negative perceptions of circular options such as a lack of trust in quality.
- **Policy and regulatory barriers,** including inconsistent and fragmented regulations across jurisdictions (hindering scale for manufacturers operating globally) and a lack of incentives for circular products (Circular Electronics Partnership, 2024a; World Economic Forum, 2024).

Many of these barriers are also shared by mobile operators, as discussed below.

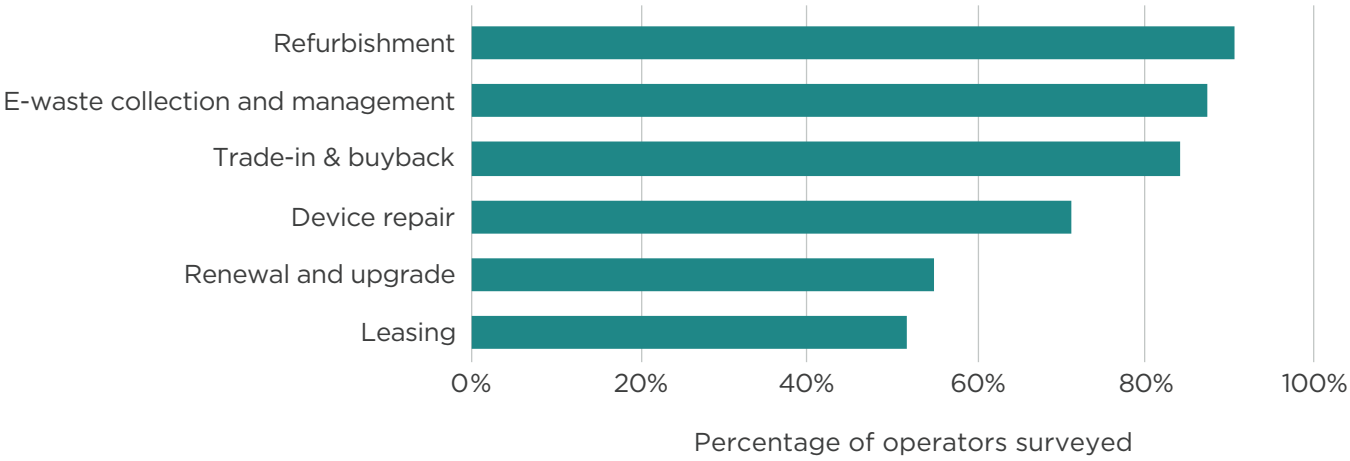
Circular business models for mobile operators

Many operators are moving towards more circular business models

Mobile operators are increasingly adopting a range of circular business models. More than 90% of operators surveyed have at least one circular business model, with the highest share having a refurbishment programme (90%) or e-waste collection and management programme (87%) (Figure 14).

Around 70% of operators responding offered repair services to prolong the life of devices. Just over half of operators also reported having renewal/upgrade or leasing programmes. Mobile operators who have yet to develop circular business models cite a range of barriers (Table 4, following page). For nearly all circular business models, more than half of operators without these models cited a "lack of a strong business case/financial motive" and "limited internal capacity and resources" as the main barriers to developing circular business models. A lack of customer interest was cited as an important barrier for refurbishment and leasing programmes.

Figure 14 | Operators with circular business models



Survey question: Does your company currently have any of the following circularity initiatives or programmes for mobile phones? Select all that apply.
Notes: Leasing includes device-as-a-service.

Source: GSMA Circularity Survey for Operators

Case study – click to read
Orange – "Re" initiative

Case study – click to read
Telefónica – MARA: a 360 approach to circularity

Case study – click to read
Proximus – Use, Reuse, Recycle

Case study – click to read
América Móvil – Circular economy initiatives

Table 4 | Barriers to developing circular business models

Circular business model (% operators without this model)	Lack of a strong business case	Limited internal capacity and resources	Limited customer interest	Lack of action/ collaboration from key stakeholders	Limited regulatory pressure
Device repair (29%)	●	●	○	○	○
Trade-in and buyback (16%)	○	○			
Renewal and upgrade (45%)	●	●	○		
Refurbishment (10%)	●	●	●		○
Leasing (48%)	●		●		
E-waste collection and management (13%)	●	●		○	○

Notes: ● = barrier for >50% of operators without this model; ○ = barrier for 25-50% of operators without this model.

Source: GSMA Circularity Survey for Operators

More could be done to further scale up circular business models

Operators were also asked about the extent to which circular business models could be further scaled up – in other words, how much more could be done to reach their full potential.

More than three-quarters of operators with refurbishment programmes said 'a lot more' could be done to reach their full potential (Figure 15). More than half of responding operators felt that 'a lot more' could be done to scale up trade-in and buyback, device repair, e-waste and leasing programmes. Operators generally felt that renewal and upgrade programmes had the least potential to scale up further.

Mobile operators face a variety of barriers in scaling up circular business models, including limited consumer awareness of circular programmes and their benefits, high costs and lack of standardisation.

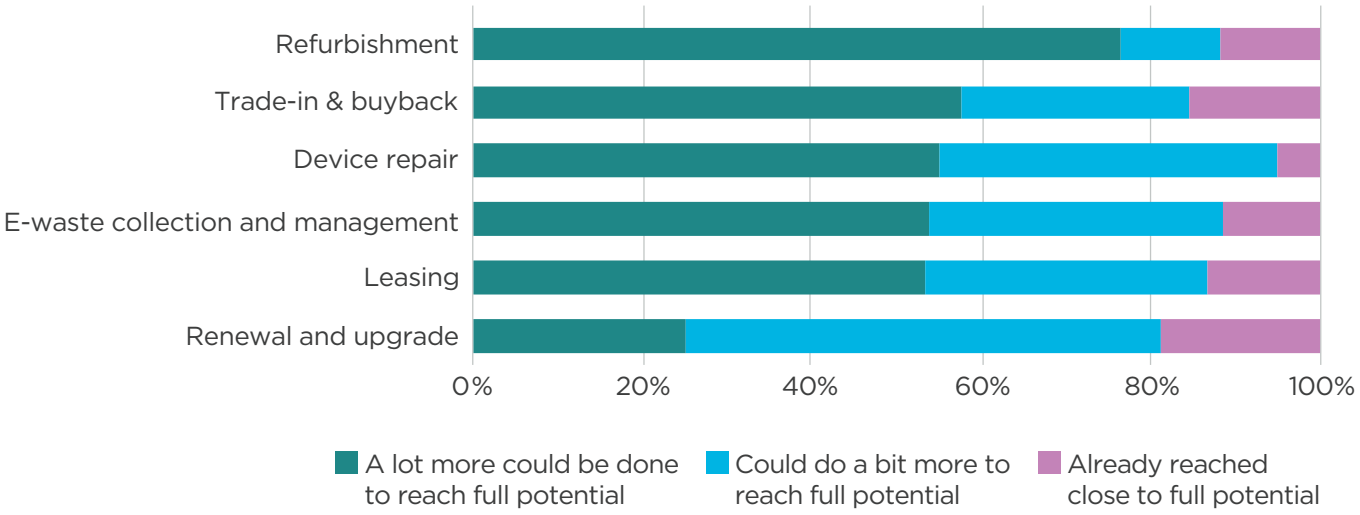
Case study – click to read
Virgin Media O2 – Circular economy as a key pillar of its Better Connections Plan

Operators identified a range of potential solutions to address these barriers. One of the most important solutions related to engaging customers to increase their awareness and acceptance of circular options, such as communicating the quality, reliability and benefits of refurbished products and offering incentives and warranties to promote circular options. Convenient systems that also ensure customer confidence in data security are key to encouraging customers to bring back old devices for reuse and recycling.

The following sections provide a deep-dive into each of the circular business models for mobile operators, highlighting their benefits, key barriers hindering their scale-up and potential solutions to overcome the barriers.

Case study – click to read
Vodafone – Device Circularity: how Vodafone is building and scaling up circularity programmes for its customers

Figure 15 | Potential to scale up circular business models



Source: GSMA Circularity Survey for Operators

Device repair programmes

71% of mobile operators surveyed had a device repair programme. Operators are seeing several important benefits, including improved customer satisfaction and loyalty ('very important' for 67% of operators), lower overall cost of device ownership for customers (62%), improved brand image (i.e. positioning the company as a sustainability leader) (57%) and environmental benefits (including reduction in e-waste) (57%).

More than half of operators felt that 'a lot more could be done' to reach the full potential of device repair programmes. Operators cited a range of barriers to scaling up, as well as potential solutions to overcome them (Table 5).

"Device repair programmes are bringing important benefits to operators, including improved customer satisfaction and loyalty. Lowering costs, engaging OEMs on spare parts and equipment and raising customer awareness are key solutions to scale up repair programmes."

Case study – click to read
BT Group – Repair over replace

Table 5 | Device repair: barriers and potential solutions

Key barriers to scaling up	Potential solutions
High cost of repair to customers: the lack of a significant price difference compared with a new phone sold with subsidies. **Technological complexity:** the increasing complexity of mobile devices can require specialised skills and equipment that may not be readily available. **Repair restrictions and limited access to OEM parts:** OEMs may impose restrictions on who can perform repairs; difficulty in obtaining genuine OEM parts for repairs.	**Reduce costs of repair**, including lower costs for spare parts and lobbying for the removal of VAT on repairs. **Engage OEMs and regulators** to facilitate access to genuine spare parts at reasonable costs as well as information, training and equipment. **Raise customer awareness** on the availability and benefits of repair services and encourage repair over replacement.

Notes: Key barriers cited as 'significant' or 'very significant' by at least 60% of responding operators.

Source: GSMA Circularity Survey for Operators

Trade-in and buyback programmes

84% of mobile operators surveyed had a trade-in and buyback programme. The most important benefits that operators are seeing are greater customer retention and loyalty ('very important' for 69%), lowering environmental footprint by extending the lifespan of devices and collecting e-waste (69%) and gaining a competitive edge by offering sustainable and cost-effective options (54%). Trade-in and buyback programmes are an important source of used devices that can be refurbished and support social programmes to bridge the digital divide.

The biggest barriers to scaling up trade-in and buyback programmes relate to consumer awareness and incentives. Improving consumer communication and making it easier for consumers to participate are key solutions (Table 6).

> "Trade-in and buyback programmes are helping operators increase customer retention and loyalty while also extending device lifespans to reduce environmental impacts. Improving consumer communication and making it easier for consumers to participate are key to further scaling up."

Case study – click to read
Telstra – eCycle programme: Takeback, Reuse, Refurb and Recycling

Case study – click to read
HONOR – Trade-in and refurbished programme

Table 6 | Trade-in and buyback: barriers and potential solutions

Key barriers to scaling up	Potential solutions
Cost and budget: insufficient financial incentives for customers compared with other options (e.g. selling in an online marketplace)	**Improve consumer communication,** marketing and awareness of environmental benefits, including through strategic cooperation and partnerships with key stakeholders.
Market penetration: limited consumer awareness and participation in trade-in programmes.	**Simplify the process for customers** and offer flexibility in how customers can participate and develop processes to ensure customer confidence in data security.
	Provide attractive incentives for customers, including guaranteeing residual value.

Notes: Key barriers cited as 'significant' or 'very significant' by at least 60% of responding operators.

Source: GSMA Circularity Survey for Operators

Renewal and upgrade programmes

55% of mobile operators surveyed had a renewal and upgrade programme, the second lowest share among the circular business models. The most important benefits that operators are seeing are greater customer retention by driving repeat purchases and customer loyalty by offering attractive upgrade options ('very important' for 88%) and increasing the collection of devices with high potential for refurbishment and resale (50%).

Like trade-in and buyback programmes, the biggest barriers relate to consumer awareness and incentives. Improving consumer communication and making it convenient for consumers to participate are key solutions (Table 7).

Case study – click to read

Kingfisher – Katalyst Circular Operating Platform: Unlocking new forms of value for customers, carriers and the environment

Table 7 | Renewal and upgrade programmes: barriers and potential solutions

Key barriers to scaling up	Potential solutions
Customer education: informing customers about the benefits and availability of upgrade programmes. **Changing customer behaviour:** customers may want to continue using existing devices.	**Inform customers** about the availability and benefits of upgrade programmes. **Streamline processes** to make it as convenient as possible for customers. **Provide competitive pricing and incentives** for customers, including assurance on data protection.

Notes: Key barriers cited as 'significant' or 'very significant' by at least 60% of responding operators.

Source: GSMA Circularity Survey for Operators

Refurbishment programmes

90% of operators surveyed had a refurbishment programme, the highest share among the circular business models. Two-thirds of operators indicated that environmental benefits – including reducing carbon emissions, critical minerals use and electronic waste by extending the lifespan of devices – were a 'very important' benefit of refurbishment programmes. More than half of operators also noted that they saw the benefits of providing customers with more affordable device options, creating new revenue streams from refurbished device sales and responding to increasing customer demand for refurbished devices.

Nearly 80% of operators felt that 'a lot more could be done' to reach the full potential of refurbishment programmes – by far the highest share among circular business models. However, operators face a variety of barriers in scaling up, including limited consumer awareness, lack of cost savings and lack of refurbished device options. Enhancing customer awareness and acceptance and increasing the supply and availability of refurbished models were mentioned as key solutions (Table 8).

"90% of operators surveyed sell refurbished devices, which are helping to reduce environmental impacts, create new revenue streams and provide customers with more affordable device options."

Case study – click to read

Vodacom – 'Good as New' devices programme raising awareness in Africa

Table 8 | Refurbishment programmes: barriers and potential solutions

Key barriers to scaling up	Potential solutions
Awareness and acceptance: limited consumer awareness and convincing customers of the value and reliability of refurbished devices. **Lack of cost savings:** too small price difference compared to the acquisition of new phones sold with subsidies. **Lack of refurbished device availability:** securing a consistent supply of used devices from qualified suppliers can be challenging. **Proprietary technology and parts:** OEMs often use proprietary components and technology that makes it difficult for third parties to repair and refurbish devices.	**Enhance customer acceptance of refurbished devices** by communicating the quality and reliability of refurbished products (supported by warranties and certifications) and the environmental benefits and cost savings of refurbishment. **Raise customer awareness** with marketing efforts including collaborations with manufacturers and refurbishers. **Increase supply and availability of refurbished models** by scaling up buyback programmes and changing incentive schemes for sales representatives to support refurb sales. **Engage OEMs and refurbishers** to ensure access to repair information, spare parts and equipment for refurbishment.

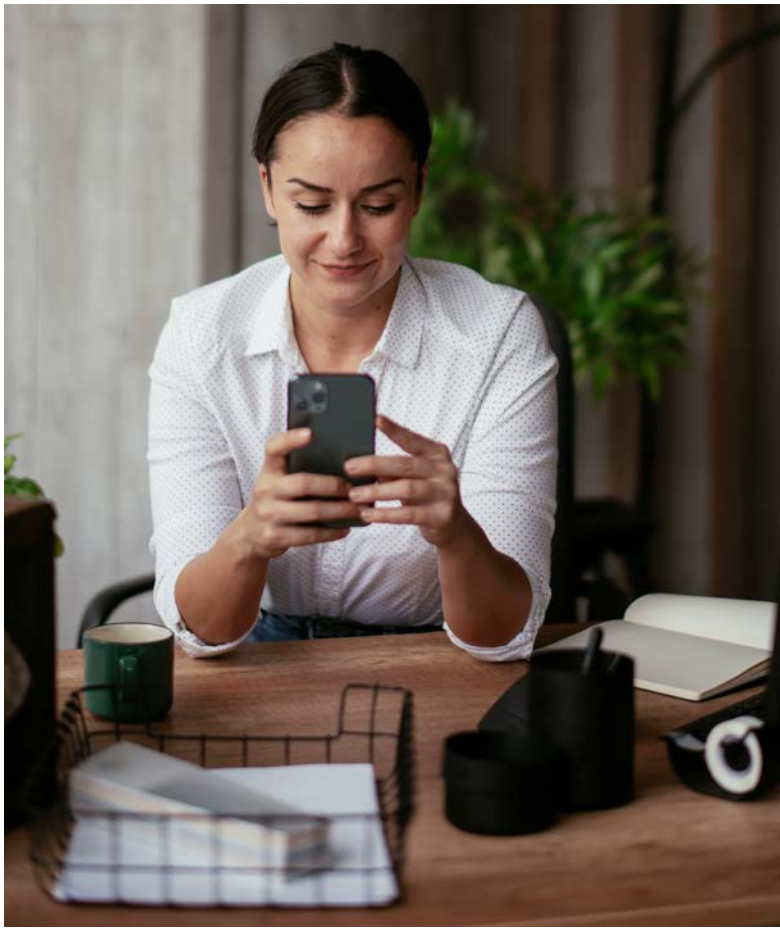
Notes: Key barriers cited as 'significant' or 'very significant' by at least 60% of responding operators.

Source: GSMA Circularity Survey for Operators

Leasing programmes

Despite the considerable benefits, only 52% of mobile operators surveyed had a renewal and upgrade programme, the lowest share among the circular business models. The most important benefits that operators are already seeing are creating a steady revenue stream and fostering long-term customer relationships and retention ('very important' for 60%), environmental benefits (60%) and increasing the collection of devices with high potential for refurbishment and resale (57%).

Changing consumer mindsets and logistical complexity were cited as key barriers. Like other business models, engaging and informing customers – particularly business customers – as well as engaging manufacturers and refurbishers were seen as key solutions to scaling up (Table 9).



Case study – click to read
Tele2 – Device as a Service for business customers

Table 9 | Leasing programmes: barriers and potential solutions

Key barriers to scaling up	Potential solutions
Consumer mindset: changing consumer preference from ownership to usage can be challenging. **Logistics complexity:** requires efficient systems for product returns, refurbishment and redistribution.	**Engage and inform customers** to raise awareness of leasing programmes and highlight the financial and environmental benefits. **Optimise product offerings** and pricing through a diverse product range. **Engage manufacturers, refurbishers and logistics providers** to develop efficient processes and systems.

Notes: Key barriers cited as 'significant' or 'very significant' by at least 60% of responding operators.

Source: GSMA Circularity Survey for Operators

Electronic waste collection and management programmes

87% of operators surveyed had an e-waste collection and management programme, the second most prevalent circular business model among the surveyed operators. More than 70% of operators noted that compliance with regulations and reducing environmental impacts were 'very important' benefits. 58% felt that their e-waste collection and management program enhanced their brand image, strengthening the company's reputation as an environmentally responsible company.

Operators cited three main challenges with e-waste collection and management programmes: low consumer participation, high cost and limited access to technology. Deeper engagement with customers, the value chain and governments are seen as key solutions to overcoming these challenges (Table 10).

Table 10 | E-waste collection and management programmes: barriers and potential solutions

Key barriers to scaling up	Potential solutions
Low consumer participation: low consumer awareness and participation in e-waste collection programmes. **High cost:** high costs associated with setting up and maintaining collection and recycling infrastructure. **Limited access to technology:** limited access to advanced recycling technologies that can efficiently process e-waste.	**Enhance customer engagement and incentives,** including information campaigns with other stakeholders to increase awareness and provide discounts or rewards to motivate participation. **Optimise collection and recycling processes and systems,** including expanding the network of collection centres, offering mail-in options, and investing in new systems and processes. **Develop and scale shared solutions, increase government support and incentives, and develop advanced recycling technologies** by engaging the mobile phone value chain, recyclers, other e-waste generating sectors, and governments.

Notes: Key barriers cited as 'significant' or 'very significant' by at least 60% of responding operators.

Source: GSMA Circularity Survey for Operators

Case study – click to read
Bell Canada – Mobile phone collection and recovery

Case study – click to read
Deutsche Telekom – Mobile phone collection centre

Case study – click to read
NTT DOCOMO – Mobile phone recycling

Case study – click to read
KDDI – Advancing VISION 2030 with safe, secure and specialised mobile phone recycling

Case study – click to read
Samsung – Engaging customers in used phone collection

Case study – click to read
Safaricom – Partnerships to manage e-waste

Adapting lessons from other business units

Many mobile operators also provide fixed network services to customers. In many cases, operators lease customer premises equipment (CPE) to customers, retaining ownership and ensuring high takeback rates. Many operators have achieved takeback rates of more than 90% for CPE and high rates of refurbishment. Given the high rates of takeback, some CPE manufacturers assume their equipment will be refurbished, incorporating design considerations to make it easier to refurbish and recycle their equipment through modular design and material selection (Sagemcom, 2024).

While there are inherent differences in how consumers perceive and interact with mobile phones and CPE, operators can consider how different approaches to circularity in their fixed businesses can be adapted to boost takeback and circularity of their mobile businesses.

Case study – click to read

Deutsche Telekom – CPE leasing programme

Another important share of mobile operators' Scope 3 emissions is from the manufacturing emissions associated with network equipment. Mobile operators are also making significant strides in advancing the circularity of their network equipment. By focusing on the refurbishment and reuse of network infrastructure, they are working to reduce manufacturing emissions and extend the lifecycle of their technology assets. The GSMA Strategy Paper for Circular Economy: Network equipment analyses how network equipment can evolve towards a circular business model through collaboration with stakeholders throughout the value chain (GSMA, 2022b).

A key initiative supporting the circularity of network equipment is the GSMA Equipment Marketplace (Box 2). Launched in February 2024, this platform enables operators to source and resell pre-owned network equipment efficiently. Through this marketplace, operators can manage their equipment more effectively, ensuring that decommissioned items are either reused or recycled, contributing to their environmental and financial goals.

Box 2: GSMA Equipment Marketplace

The GSMA Equipment Marketplace, launched in February 2024, is the first global digital platform to source, resell, reuse and recycle pre-owned network equipment – bringing together buyers and sellers from the telecommunication ecosystem.

The cloud-based platform, powered by Shields, provides a global view of assets and equipment, including real-time visibility of the stock. Users can search for the required individual assets, view the results on a simple and intuitive interface, identify the most efficient and cost-effective source for the products needed and submit an order. Additionally, users can sell decommissioned equipment to a global buyer base or have it recycled responsibly.

All products offered for sale through the marketplace are refurbished and tested with a two-year warranty. Experience and customer feedback show the warranty return rate and out-of-the-box failure rate is 0.4% vs 2% for new equipment – the equipment has already been stress tested on a live network.

The platform was beta tested with Vodafone Group and more than 40 companies have signed up as of December 2024, with CommScope being the most recent to join. The platform hosts more than four million parts and benefits 1,500 users across operator, manufacturer, agent and vendor partners. Users are leveraging the quality, speed and efficiency of the platform to help companies across the value chain reach their financial and environmental targets. The platform enables operators across the globe at different stages of technology evolution to source and deploy refurbished equipment in a cost-effective and environmentally efficient way.

Learn more about the GSMA Equipment Marketplace.

Tracking progress on circularity: targets and indicators

Circularity targets

In addition to science-based climate targets, many mobile operators have also set circularity targets. These range from high-level ambitions at the company level to more specific targets on zero waste to landfill, increasing takeback rates for phones or CPE or growing specific circular business lines.

In June 2023 the GSMA announced that leading operators had committed to two new targets to reduce the environmental impact of mobile phones by boosting their circularity through reuse, repair and recycling. The two targets aim to increase the takeback of mobile phones and prevent them from being sent to landfills or incineration:

- By 2030, the number of used mobile devices collected through operator take-back schemes should amount to at least 20% of the number of new mobile devices distributed directly to customers.
- By 2030, 100% of used mobile devices collected through operator take-back schemes will be repaired, reused or transferred to controlled recycling organisations.

As of January 2025, 16 operators[2] have signed up to the new targets, representing one billion mobile connections.

Indicators

Tracking progress towards a circular economy for mobile phones requires robust data collection, standardised metrics and transparent reporting.

The GSMA has worked with operators to develop the ESG Metrics for Mobile featuring 10 industry-specific KPIs to report on ESG (GSMA, 2024a). The metrics include standardised metrics on the circular economy, covering mobile devices, CPE, network equipment and e-waste. For mobile phones, the indicators aim to track progress towards the 2030 circularity targets:

- Used mobile devices collected through operator take-back schemes in the reporting period as a percentage of new mobile devices distributed directly to customers in the reporting period (%).
- Percentage of used mobile devices collected through operator take-back schemes in the reporting period that were repaired, reused or recycled i.e. diverted from landfill or incineration (%).
- Percentage of refurbished, repaired or used mobile devices distributed to customers for reuse in the reporting period, as a share of all mobile devices distributed directly to customers in the reporting period (%).

While these indicators are a good starting point for mobile operators, tracking progress towards a more circular economy holistically across the value chain requires consideration for a wider set of indicators and metrics, considering the use of recycled and renewable resources, product lifespans, repair and refurbishment rates, recycling rates and revenues from circular products and services. The Circular Transition Indicators (CTI), developed by the World Business Council for Sustainable Development (WBCSD), offer a comprehensive and flexible framework for measuring circular performance (WBCSD, 2024).


Case study – click to read
Deutsche Telekom – Telekom Circularity Score


Case study – click to read
Orange – Circularity indicators and targets

2 As of December 2024: BT Group, Deutsche Telekom, Globe Telekom, GO Malta, Iliad, KDDI, NOS, NTT Docomo, Orange, Proximus, Safaricom, Singtel, SoftBank, Tele2, Telefónica and Telenor.

06

Opportunities for collaboration

06 Opportunities for collaboration

Phone manufacturers, network operators, refurbishers, recyclers, users and governments all play important roles across the mobile phone life cycle and value chain, but no single stakeholder can achieve circularity alone.

While mobile operators are making progress in developing and scaling circular business models, responses to the operator survey indicated specific areas in which operators are seeking closer collaboration with manufacturers and other stakeholders, including:

- Joint marketing and education initiatives on circular services and products, takeback and e-waste management;
- Working with manufacturers on customer incentives, including extended warranties and special pricing;
- Authorised service provider agreements with manufacturers on repair;
- Collaboration on national takeback schemes with other operators, manufacturers and governments.

Advancing circularity requires partnership and collaboration across the value chain to help overcome barriers – many of which are shared. Table 11 highlights potential priority areas for collaboration to advance circularity of mobile phones and how different stakeholders across the value chain – and governments – can play important roles.

Case study – click to read
MobileMuster – Collaboration to advance circularity and mobile phone recycling

Table 11 | Key collaboration opportunities to advance the circularity of mobile phones

Priority area	Potential collaboration opportunities	Role of key stakeholders	
		Leading role	Supporting and enabling role
Designing for circularity	Cross-value chain collaboration for circular product design and development to enhance repairability, refurbishment and recycling. Establishing industry-wide standards and design principles on modularity, repairability and disassembly.	Manufacturers and suppliers	Operators and retailers Repairers, refurbishers, recyclers Governments
Sourcing recycled materials	Collaboration between manufacturers, operators and recycling companies on sourcing and processing a stable supply of recycled materials, including boosting takeback. Manufacturers could work with recyclers on eco-design to more easily and effectively recover valuable materials at end-of-life by considering these at the design stage. Manufacturers, recyclers, and governments could collaborate on digital product passports and developing advanced recycling technologies. passports and developing advanced recycling technologies.	Manufacturers and suppliers Repairers, refurbishers, recyclers	Operators and retailers Governments
Facilitate access to easy and cost-effective repair services	Partnerships between manufacturers, mobile operators and repair companies to facilitate access to repair information, spare parts, skills, diagnostic tools and equipment to facilitate repair services.	Manufacturers and suppliers Repairers, refurbishers, recyclers	Governments Operators and retailers
Raise consumer awareness and confidence in circular products and services	Joint marketing and communication campaigns to help raise consumer awareness about the availability and benefits of circular options and services, responsible consumption behaviours and proper disposal and recycling practices. Partnerships between manufacturers, operators and refurbishers to increase refurbished offerings and incentivise them through discounts, warranties and assurances of quality. Implement rigorous testing, cleaning and data protection procedures to ensure the quality and safety of refurbished products, building consumer trust and confidence.	Manufacturers and suppliers Operators and retailers	Governments Repairers, refurbishers, recyclers
Increase takeback of devices	Manufacturers, operators and other retailers can work together to set up convenient take-back schemes for consumers to bring back old devices.	Operators and retailers	Governments Manufacturers and suppliers Repairers, refurbishers, recyclers
Implementing and advocating for enabling policies	Governments should engage companies across the value chain to develop and implement enabling policies that incentivise circularity, including Extended Producer Responsibility (EPR) schemes, 'right to repair' legislation, eco-design requirements and financial incentives for circular practices.	Governments	Manufacturers and suppliers Operators and retailers Repairers, refurbishers, recyclers

Source: GSMA analysis based on GSMA Circularity Survey for Operators and Circular Electronics Partnership (2024a); WBCSD (2024) World Economic Forum (2024)

Appendix A: Consumer survey

Methodology

The global consumer survey collected data in September and October 2024 from mobile phone users in 26 countries. Each country had a minimum of 400 valid completions, with representative samples for age, gender and household income.

Overview of questionnaire

The survey covered questions on how consumers use, repair and dispose of their mobile phones, including:

- **Demographic questions:** age, gender, household income, urban/rural.
- **Current mobile phone:** network provider, contract type, brand/model, acquisition source, condition when acquired, date of acquisition.
- **Previous mobile phone:** what did you do with it, reason for replacement, lifespan, number of old phones at home, reasons for keeping old phones, factors to bring back old phones.
- **Next mobile phone:** when you plan to purchase, reasons for replacing the current phone, the importance of different factors in the purchase decision, the importance of sustainability features, willingness to pay premium for environmentally friendly phone.
- **Refurbished phones:** likelihood of considering refurbished for next purchase, the importance of benefits, expected savings vs. new, the importance of concerns.
- **Repairing phones:** have you had a need to repair a phone, did you have it repaired, who did the repair, reasons for not repairing.

Data availability

The data is available publicly through a data dashboard:

https://www.gsmaintelligence.com/research/pbi-report?pbiReportId=d404e572-e253-4f56-9092-c150caa72212&pbiGroupId=d38c0dd1-d140-4c17-b11c-bf72efb44528&reportId=63247

Americas	Asia Pacific	Europe and Eurasia	Middle East and North Africa	Sub-Saharan Africa
Brazil	Australia	Azerbaijan	Egypt	Ethiopia
Mexico	China	France	Saudi Arabia	Kenya
United States of America	India	Germany	Türkiye	Madagascar
	Indonesia	Italy		Nigeria
	Japan	Poland		South Africa
	Pakistan	Sweden		
	Philippines	United Kingdom		
	South Korea			

Appendix B: Operator survey

Methodology

The global operator survey collected responses from mobile network operators in August and September 2024. Thirty-one operator groups across all major global regions responded to the survey. Europe was the most highly represented (23 companies operating in the region), followed by Asia Pacific (including Greater China) (10), North America (six), Latin America and the Caribbean (four), Middle East and North Africa (four), Sub-Saharan Africa (four) and Eurasia (two). Collectively, the 31 operator groups represent 2.4 billion mobile connections or around 28% of global mobile connections.

Overview of questionnaire

The survey covered questions on:

- **Current strategy and business models for mobile phones:** whether the operator sells or leases mobile phones to consumers (B2C) and/or business customers (B2B); how different internal teams/functions contribute to the company's mobile phone business strategy; benefits and drawbacks of current strategy and business models.
- **Overall strategy on circularity:** how circular economy is defined; whether the company has a circularity vision, strategy and/or targets; current level of progress on circularity related to network equipment, customer premises equipment (CPE) and mobile phones.
- **Current initiatives on circularity of mobile phones:** whether the operator already has any circular business models; for each type of circularity initiative currently implemented, the importance of different benefits; the extent to which circular initiatives can be scaled up further; the importance of different barriers preventing scale-up; the role of collaboration with key stakeholders to improve and scale-up circularity initiatives; barriers to initiating and developing circularity initiatives; circularity initiatives related to CPE.
- **Transforming business models:** what a fundamental transformation to circular business models for mobile phones could look like; the main barriers hindering a transformation to circular business models; the roles of different stakeholders in overcoming key barriers.
- **Engaging key stakeholders:** whether the operator had engaged various stakeholders on circularity (e.g. device manufacturers, customers, refurbishers, governments); the type of engagement and progress made so far; for each stakeholder type not yet engaged, the main reasons for not engaging; the importance of device manufacturers in enhancing operators' circularity initiatives.

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