

Tackling the E-waste Crisis Through Circularity

Taking action for the environment has never been more important for businesses. ChromeOS can help your business accelerate its sustainability journey.

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In brief

- Business leaders are embracing sustainability with growing urgency. At the heart of this effort is an attempt to curb the growing crisis of electronic waste (e-waste).
- Business leaders can step up to the plate to tackle e-waste, starting with embedding circularity into workforce technology. For businesses that equip their workforce with devices such as laptops, one of the most important ways to reduce e-waste contribution through circularity is to prevent existing devices from entering landfills by extending their useful life.
- Google ChromeOS offers businesses an opportunity to reduce their e-waste contributions with a simple change to workforce technology. By allowing businesses to give their existing devices a new life and increasing the efficiency of devices in use, ChromeOS Flex can offer cost-savings of up to 96%, emissions reductions of 83%, and an e-waste reduction of 100% - all in the first year.
- Read on to learn more about the mounting sustainability challenges that businesses face, and how ChromeOS can help your business limit e-waste, reduce your carbon footprint, and drive cost savings.

Transitioning 10,000 devices to ChromeOS Flex can amount to savings of...

9.3M

fossil fuel miles'
worth of emissions

40

years' worth of
household power

167

couches' weight of
e-waste prevented



This report was developed with Accenture's support and 50+ primary and secondary sources to explore critical themes in sustainability that are increasingly at the heart of business decisions.



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**It's time for
business leaders to
face sustainability
head on**

It's time for business leaders to face sustainability head on

Sustainability is at the top of business leaders' agendas - and it should be.

“Climate change is the biggest challenge we face...and it's one that will affect all of us in deeply personal ways”¹

- Google CEO, Sundar Pichai, 2021

Heightened urgency from environmental challenges and increasing regulations are driving leaders to redefine business models with a new lens toward sustainability. According to research done by the United Nations in partnership with Accenture, **63%** of business leaders are launching new product and service offerings aimed at driving sustainability.²

Embedding sustainability into business models doesn't just drive environmental benefits - it's also been shown to impact the bottom line. Sustainable businesses perform better financially, with the EBITDA margin of top quartile companies reporting **21%** higher (+3.4 percentage points) than the bottom quartile.³

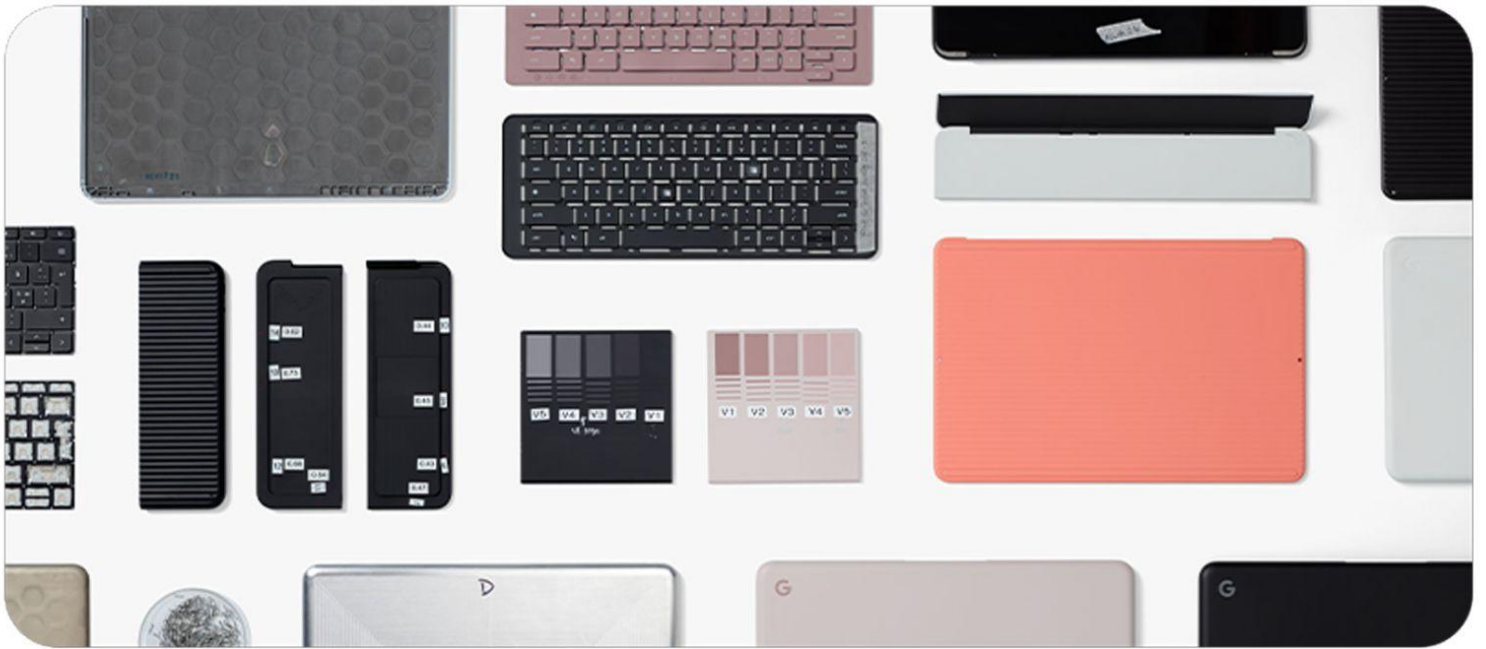
Feeling the sustainability buzz? You're not alone. This emphasis on sustainability has led **more than a third** of global business leaders to commit to net zero targets by 2050. However, despite articulating plans to shift to more sustainable business models and practices, leaders are still struggling when it comes to translating commitments into action. In fact, **93%** of leaders are facing significant barriers when it comes to implementing sustainable changes.²

These barriers often arise from businesses' connection to their broader supply chain and ecosystem. In a survey of 1,000+ leading CEOs, “extending strategy throughout the supply chain”, or ensuring that partners and ecosystem players have the same sustainability mindset, was the **#1** barrier for CEOs of enterprises with revenue higher than \$25M.⁴

However, supply chain and partner struggles don't have to keep your business from meeting sustainability goals. While you may not have control over the actions of your ecosystem partners, you can choose to engage with companies like Google that match your business's dedication to sustainability. And there's no better time to start than now.

This paper will help you make progress on your sustainability ambitions by outlining not only the environmental benefits but also the cost savings that can be achieved through ChromeOS Flex.





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The growing e-waste crisis & how circularity can help

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One of the easiest ways to get started with sustainability is to evaluate, and mitigate, your business's contribution to the growing e-waste crisis. The scale of the global e-waste crisis is staggering, with **61.3 Million Tons (Mt)** of e-waste to be discarded by the end of 2023. If no action is taken, e-waste is projected to rise **22%** to 74.7 Mt by 2030, making it the world's fastest-growing waste stream.⁵

What is e-waste? E-waste refers to old, end-of-life or prematurely discarded electrical and electronic equipment that is not recycled, reused, or repurposed. It can encompass anything from broken refrigerators that end up in a landfill to prematurely discarded laptops, thrown out with household waste to make room for the latest model. By weight, laptops and similar devices account for more than **10%** (6.7 Mt) of global e-waste. And this is no small number. In the US alone, **41M** computers end up in landfills each year. And many of these devices didn't need to become e-waste in the first place; every year, devices are prematurely thrown away that could have otherwise remained in use if software updates were supported or repair was readily available.⁵



DID YOU KNOW?

The amount of e-waste generated in 2023 (61.3 Million Tons) is equivalent to the weight of

168 Empire State buildings.⁵



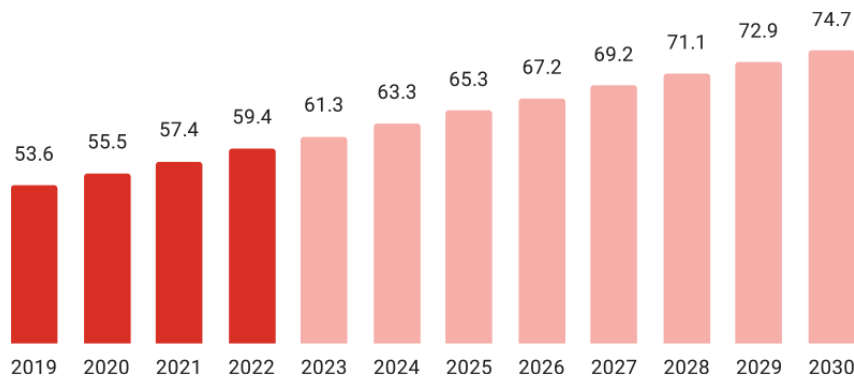
DID YOU KNOW?

In the US alone, more than

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E-waste Generated Globally (Mt) - Global E-waste Monitor, 2019²



E-waste generation is predicted to grow by

+22%

by 2030 (74.7 Mt)

Figure 1: E-waste generated globally since 2019

Overconsumption, inadequate disposal infrastructure, and lax enforcement are all drivers of the escalating problem of e-waste. In the US, the average number of devices per household surged to 25 in 2021, up nearly **130%** from just 11 devices in 2019. Despite global e-waste regulations covering **71%** of the world's population, only **17.4%** of would-be e-waste was properly recycled worldwide in 2019. Through the responsible management of enterprise devices, businesses can play their part in increasing the percentage of e-waste recycled and taking other steps to mitigate the crisis.^{5,6}



DID YOU KNOW?

Around 20%

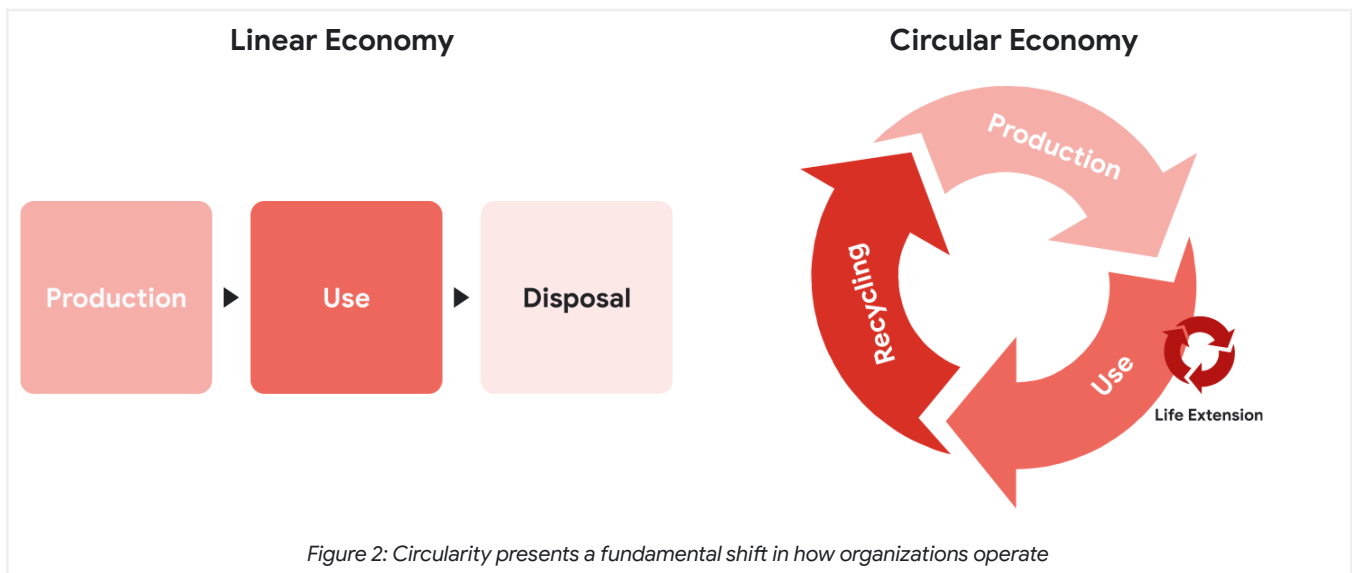
of e-waste from high-income countries (e.g., the US) is exported to low-income countries in regions such as Africa and Southeast Asia, where

over 90%

of it is informally processed through dangerous methods such as open-dumping, burning, leaching, and melting, posing a grave environmental and health concern.⁵

As the problem grows, one thing is clear: circularity will be one of the most critical tools in the battle against e-waste

Circularity is a full-scale mindset shift that requires a pivot from a linear 'take-make-waste' approach to a restorative process that reduces waste. Circularity is an economic model, regenerative by design, that aims to keep products and materials in the economy for as long as possible, maximizing their useful life while minimizing the extraction of new raw materials and the generation of waste. Put simply, instead of producing more and more stuff that is destined to end up in a landfill, circularity focuses on prioritizing products that are meant to last and keeping them in use as long as possible.



The benefits of circularity are multifold. From a purely environmental perspective, **80%** of the annual volume of plastics in our oceans can be mitigated through circularity. It might be counterintuitive, but nearly a fifth of e-waste is plastic. Societally, the adoption of circular business models is projected to result in the development of **6M** new jobs by 2030. Finally, the economic benefits should not be ignored. Circularity presents a **\$4.5 trillion** global opportunity by 2030 through models including sharing platforms, products-as-a-service, product life extension, circular supply chains, and recovery and recycling infrastructure. This amounts to an opportunity larger than the GDP of Germany, the 4th largest economy.^{7,8}





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**How Google can
help your business
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How Google can help your business reduce e-waste through circularity

The concept of circularity sounds great, but how can you move from idea to execution with your business’s workforce technology? No matter where you are on your sustainability journey, ChromeOS Flex can make a difference - leveraging ChromeOS Flex is a simple, easy-to-implement change that will allow you to make progress toward sustainability goals without significant changes to company operations.

One of the easiest ways to prevent e-waste from heading to landfills too soon is to ensure you are making the most of the devices you already own. The goal for any existing technology in your workforce should be to extend its useful life as much as possible.

ChromeOS Flex is a cloud-first, easy-to-manage, and fast operating system for PCs and Macs that will allow you to accomplish that goal. You may find that aging hardware in your workforce’s technology fleet is often rendered unusable from software bloat or security vulnerabilities, leading it to be discarded with still-functioning hardware. Your software may be struggling, but your hardware might still have plenty of life in it. This is where ChromeOS Flex comes in. Instead of sending devices to a landfill as they age, ChromeOS Flex will allow you to breathe extended life into your workforce’s devices with the following benefits:



Ongoing support for updates at faster speed

Devices don’t slow down over time and won’t get impacted by lack of support for software updates. Background updates reduce device downtime and improve productivity.



Proactive, innovative security

Rather than a firewall, blocked executables and sandboxing technology eliminate the need for antivirus software, ensuring your employee’s devices are safe from growing cybersecurity threats.



Fast deployment & easy management

ChromeOS Flex can be rapidly deployed via USB or through your company network, and Chrome Enterprise Upgrade makes it easy to manage apps and policies across your workforce.

Besides convenience, implementing ChromeOS Flex can have a significant impact on your bottom line and your business’s progress toward sustainability goals. First off, transitioning to ChromeOS Flex gives your aging, tired devices a new lease on life and reduces the need to buy new devices. Not only is this beneficial for the environment by reducing (1) harmful CO₂ emissions and (2) the release of toxic chemicals from e-waste, but it also provides savings where it matters most for your business – on your bottom line. Switching to ChromeOS Flex can offer cost-savings of up to **96%** (inclusive of avoided new device spend, subscription cost savings, and energy cost savings) as well as emissions reductions of **83%** (resulting from avoided lifecycle emissions of purchasing a new device and running a more efficient OS) and e-waste reductions of **100%** (from limiting new device purchases) in Year 1 alone. The cherry on top? Devices that run ChromeOS Flex are **19%** more energy efficient on average than other devices, slashing energy use, cutting costs, and supporting sustainability goals!¹⁰

ChromeOS Flex Total Savings⁹

Size of Business	Cost Savings (\$)	Emissions Savings (kgCO ₂ e)	Energy Use Savings (kWh)	E-waste Savings (lbs)
< 100 employees	\$2K - \$200K	380 - 40K	43 - 4K	5 - 500
101 - 500 employees	\$200K - \$800K	40K - 190K	4K - 20K	500 - 3K
500 - 1,000 employees	\$800K - \$2M	190K - 400K	20K - 45K	3K - 5K
1,001 - 25,000 employees	\$2M - \$45M	400K - 10M	45K - 1M	5K - 125K
25,001 - 50,000 employees	\$45 - \$80M	10M - 20M	1M - 2M	125K - 250K
50,001 - 75,000 employees	\$80M - \$125M	20M - 30M	2M - 3M	250K - 400K
75,001 - 100,000 employees	\$125M - \$200M	30M - 40M	3M - 4M	400K - 500K

Note: Savings assume 1 device per employee

ChromeOS Flex vs. Purchasing a New Device: Cost, Emissions & E-waste Comparison

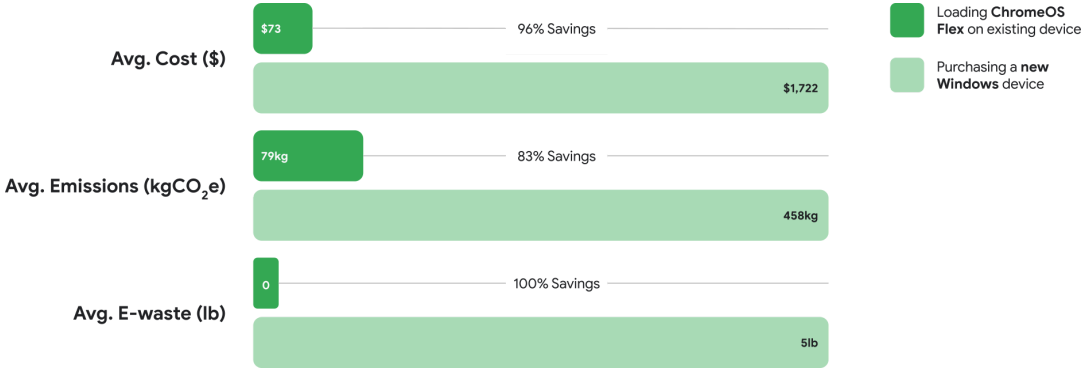


Figure 3: Comparison of cost, emissions, and e-waste between loading ChromeOS Flex on an existing device and purchasing a new device



What do these savings consist of?

As **ChromeOS Flex** can delay the need to purchase a new device and runs more efficiently (by up to 19%) significant cost and environmental savings can be realized^{9,10}:



Cost

Avoided purchase of new devices, energy savings from increased efficiency, subscription cost savings



Emissions

Avoided emissions from production of a new device, reduced emissions from increased efficiency



E-waste

Avoided e-waste generation from giving devices a second life



Energy Use

Reduced energy use from increased efficiency



DID YOU KNOW?

In the first year, **transitioning 10,000 devices to ChromeOS Flex** instead of buying new devices⁹:

- Reduces CO2 emissions equivalent to **9.3M fossil fuel car miles**
- Cuts as much e-waste as the weight of **167 couches**
- Saves enough energy to **power the average American household for 40 years**



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How to get started

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It's important to act now to rethink your enterprise technology strategy in light of the growing e-waste crisis. And it doesn't take a big leap – ChromeOS Flex allows you to make mindful changes to your workforce's technology strategy that have a major impact.

To get started with ChromeOS Flex today, you should be thinking through 4 main steps:

01

Evaluate your current enterprise tech stack and opportunities to embed circularity in your workforce's technology

How many new laptops are you retiring each year that could be revitalized with the use of ChromeOS Flex?

02

Contact a Chrome Enterprise representative to discuss options for your business

- a. Understand how ChromeOS Flex could be beneficial for your business.
- b. Try it out for yourself! All you need is a USB drive to install ChromeOS Flex on your device, or simply boot and run from the USB to try it out before deciding to install it on your device.
- c. Discuss next steps for installation and management across your workforce, as applicable.

03

Determine socialization and change management for your workforce

How can you socialize the environmental savings (e.g., emissions) with your workforce and customers as you drive these changes?

04

Continue to think ahead to both future hardware investments as well as ultimate device end-of-life

- a. Considerations for circularity begin when devices are initially purchased. When purchasing additional hardware for your workforce, prioritize devices that are durable and easy to repair to keep your hardware functioning for as long as possible.
- b. When devices reach their end of life due to hardware constraints and require disposal, ensure your enterprise is taking the steps to properly dispose of, recycle and reuse e-waste. E-waste cannot be disposed of in regular waste bins, so a plan must be made according to local protocols and regulations to ensure toxic waste and hazardous byproducts aren't leached into the environment. For more information on e-waste disposal and region-specific resources, check out [Google's recycling program](#) and [recycling resources by region](#).



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