Sustainable EUC Device Strategy Report

Reducing carbon footprint, e-waste & energy consumption

Customer Example

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Sustainable End User Computing Device Strategy Report

Information and communications technology (ICT) generates 3% of global greenhouse gas (GHG) emissions. Research [1-9] shows that this carbon footprint can be reduced by an average of 30% by adopting responsible consumption strategies within organisations responsible for purchasing ICT equipment at scale. This study uses scientifically validated world leading calculation tools[10] to apply 6 sustainable ICT strategies to existing end user computing (EUC) operations at Customer Example. Each is designed to reduce on-going device carbon footprint, electricity consumption, utility and device procurement costs plus potential e-waste.

It is calculated that Customer Example can reduce EUC device annual carbon footprint by as much as 66%, electricity consumption by 56%, procurement and utility costs by 39%, and e-waste by 61%.

The avoided annual carbon footprint of 81,555 $kgCO_2e$ is equivalent to emissions caused by an average combustion engine car driving 480.2 thousand kilometres (km) or 12 times around Earth's equatorial circumference.

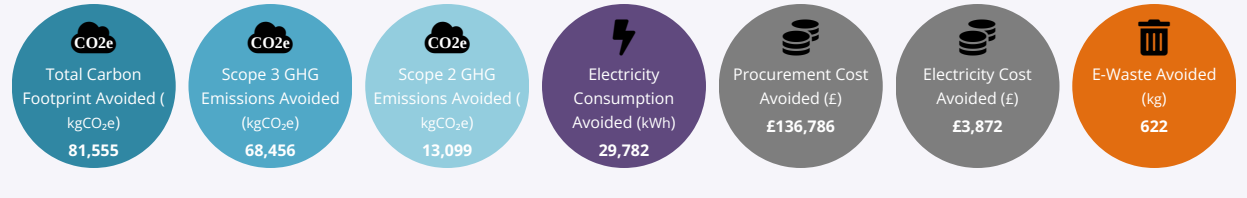
These excess annual GHG emissions will otherwise require 3,707 trees to remove the resulting ICT carbon footprint from the Earth's atmosphere via photosynthesis during every year of operation.

By extending replacement device procurement cycles and implementing low carbon footprint devices, there is an opportunity to avoid 68,456 $kgCO_2e$ of supply chain emissions each year and save £136,786 in annual device procurement costs.

By transitioning to energy efficient devices, 29,782 kWh of electricity consumption is avoided each year. This causes an annual reduction in scope 2 use-phase GHG emissions of 13,099 $kgCO_2e$. Additionally, at £0.06 per kWh, annual utility costs reduce by £3,872.

By extending device useful lifespans, end user computing potential annual hardware e-waste is reduced by 622kg.

Figure 1. Customer Example highest potential annual reductions to EUC carbon footprint (total, use-phase and supply chain), electricity use, utility and procurement costs plus e-waste



A scientific ICT carbon footprint report by sustainable ICT experts Px^3.

Research Lead

Dr Justin Sutton-Parker holds a PhD in computer science in the field of sustainable ICT and a MBA in sustainability. As Chief Scientist for Px^3 and a Research Fellow for the University of Warwick, Dr Sutton-Parker's findings advance and influence global ICT manufacturing, procurement and user behaviours designed to reduce the carbon footprint of ICT.

This activity supports the United Nations (UN) SDG 12 'responsible consumption and production' and ultimately SDG 13, 'climate action' via the diffusion of sustainable ICT. Many of the world's largest ICT manufacturers, eco-certification brands and governments use Dr Sutton-Parker's research to scientifically substantiate international sustainable ICT strategies. These include Acer, ASUS, Citrix, Google, IGEL, Microsoft, Qualcomm, TCO Development and the United Kingdom Government among others. Researching and developing the world's first ICT carbon footprint applications platform called Px^3, Dr Sutton-Parker is widely published in scientific journals and nominated for The Earth Shot Prize. A regular public speaker, Dr Sutton-Parker is also sustainable ICT editor for the world's leading ethics and sustainability magazine My Green Pod. Editions include the first dedicated sustainable ICT magazine series for the UN COP sessions.

Methods

All current and potential ICT carbon footprint, electricity consumption, e-waste plus utility costs are generated using the unique Px^3 carbon footprint applications platform. Already used by organisations responsible for over 20 million computer users, the platform was researched, developed, tested and peer reviewed during PhD research conducted at the world leading University of Warwick Computer Science Faculty. Consequently, the platform is the only solution of its kind in the world to be validated by science and ensures the data produced is compliant with GHG accounting protocols and sustainable procurement legislation.

In this report, the existing end user computing estate is measured for carbon footprint, e-waste, electricity consumption and utility cost. This is achieved by adding user obfuscated computer asset data (e.g. device type, make, model and quantity into the Px^3 Calculate' application. Accessing the Px^3 database holding environmental and efficiency records for several thousands of computers dating back to 2009, scope 3 supply chain (production, distribution and end of life services) and scope 2 electricity consumed GHG emissions data is generated together with device annual electricity consumption values. The GHG emissions are reported in kilograms of carbon dioxide equivalent ($kgCO_2e$) as required by international GHG accounting protocol. Electricity is reported in kilowatt hours per year (kWh/y) as per international computer efficiency measurement standards. Scope 2 use-phase emissions are calculated using carbon conversion factors determined by the location in which the device is most regularly used. Commercial electricity costs are based upon the cost per kWh for the selected location. E-waste represents the weight of each and all devices owned by the organisation. This is reported in kg as per international policy and frameworks.

Key takeaway ideas suggesting sustainable ICT strategies are included throughout the report. This may include device lifespan extension or replacement with lowest carbon footprint devices when computers reach the end of their useful lives. These calculations in-depth can be conducted using the Px^3 Calculate' applications plus the Px^3 Compare, ChromeOS and Circular' web applications. Visit www.px3.org.uk to discover more.

Acknowledgements

Dr Sutton-Parker is a University of Warwick Research Fellow conducting sustainable ICT abatement research projects focusing on advancing global computer life cycle assessment (LCA) eco-certification, calculation accuracy that improve national and international sustainable ICT policies. For more details see www.drjustin.co.uk

Strategy 1: EUC Device Lifespan Extension (8 years)

The EUC device lifespan extension results show the feasible environmental and economic benefits available to your organisation by simply ensuring all devices are kept for a minimum of 8 years. 85% of an average device's carbon footprint is caused by supply chain GHG emissions. Therefore, keeping devices for longer periods reduces carbon footprint and procurement costs as replacement cycles become less frequent.

Table 1. Customer Example annual reductions generated by extending device lifespans to 8 years

Strategy	Lifespan (Years)	Devices	Annual Procurement Costs (£)	Annual Electricity Use (kWh)	Annual Electricity Cost (£)	Annual Scope 2 ($kgCO_2e$)	Annual Scope 3 ($kgCO_2e$)	Annual Carbon Footprint ($kgCO_2e$)	Annual E-Waste (kg)
Current	-	3031	£273,651	53,254	£5,469	23,432	100,464	123,896	1,020
Extend Life	8	3031	£171,032	53,254	£5,469	23,432	62,790	86,222	638
Reduction			£102,619	0	£0	0	37,674	37,674	382

Figure 2. Customer Example annual cost savings generated by extending device lifespans to 8 years

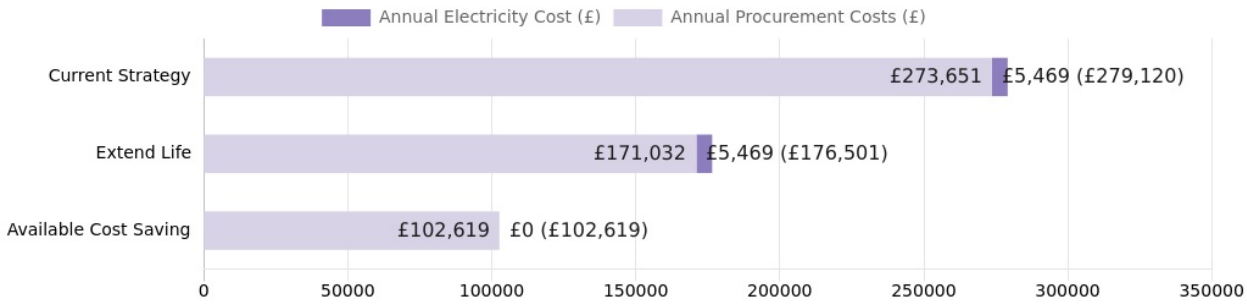
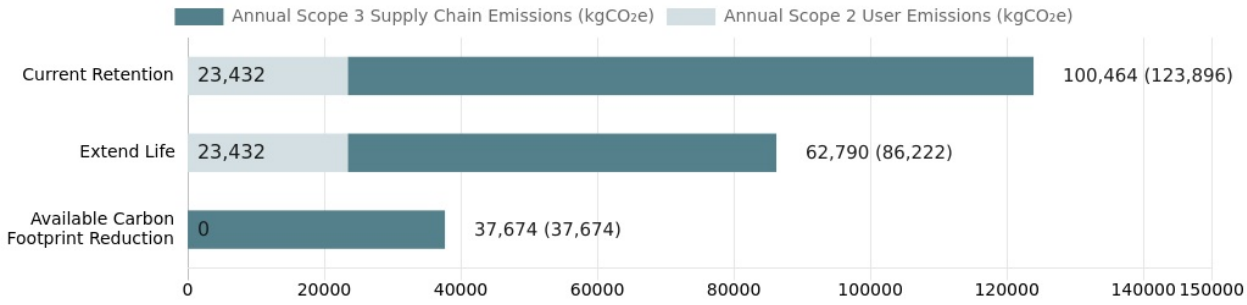


Figure 3. Customer Example annual GHG emissions avoided by extending device lifespans to 8 years



Strategy 2: EUC Device Lifespan Extension (8 years) with ChromeOS

ChromeOS Flex enables upgrading of Windows and MacOS devices to become similar to Chromebooks and Chromeboxes. Research shows that ChromeOS Flex reduces existing device electricity consumption and therefore scope 2 emissions. Consequently, when used for EUC device lifespan extension strategies, electricity focused carbon footprint and utility costs will be lower than illustrated by Strategy 1.

Table 2. Customer Example annual reductions generated by extending device lifespans to 8 years with ChromeOS Flex

Strategy	Lifespan (Years)	Devices	Annual Procurement Costs (£)	Annual Electricity Use (kWh)	Annual Electricity Cost (£)	Annual Scope 2 ($kgCO_2e$)	Annual Scope 3 ($kgCO_2e$)	Annual Carbon Footprint ($kgCO_2e$)	Annual E-Waste (kg)
Current	-	3031	£273,651	53,254	£5,469	23,432	100,464	123,896	1,020
ChromeOS Flex	8	3031	£171,032	47,478	£4,876	20,890	62,790	83,680	638
Reduction			£102,619	5,776	£593	2,542	37,674	40,216	382

Figure 4. Customer Example annual cost savings generated by extending device lifespans to 8 years with ChromeOS Flex

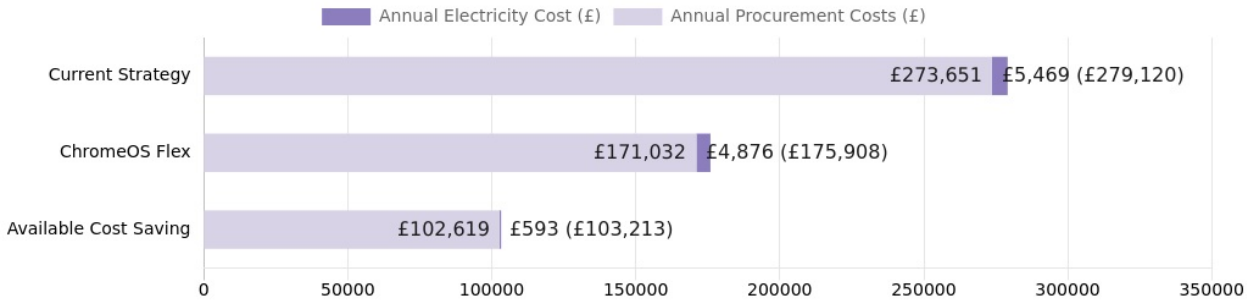
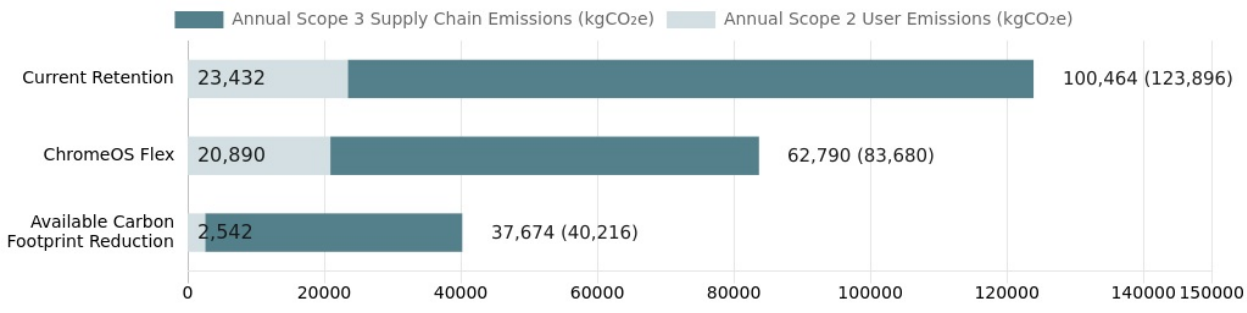


Figure 5. Customer Example annual GHG emissions avoided by extending device lifespans to 8 years with ChromeOS Flex



Strategy 3: Low Carbon Footprint Devices

Including carbon footprint as an EUC device selection criterion reduces carbon footprint and costs. The results below show the reductions available by transforming your current devices to the lowest carbon footprint version of each device type. In this example, device types (e.g. desktops and notebooks) and operating system types (e.g. Windows) are maintained to show an exact like for like alternative.

Table 3. Customer Example annual reductions generated by selecting low carbon footprint devices

Strategy	Lifespan (Years)	Devices	Annual Procurement Costs (£)	Annual Electricity Use (kWh)	Annual Electricity Cost (£)	Annual Scope 2 ($kgCO_2e$)	Annual Scope 3 ($kgCO_2e$)	Annual Carbon Footprint ($kgCO_2e$)	Annual E-Waste (kg)
Current	-	3031	£273,651	53,254	£5,469	23,432	100,464	123,896	1,020
Low Carbon	8	3031	£172,908	37,839	£3,886	16,675	31,380	48,055	487
Reduction			£100,743	15,415	£1,583	6,757	69,084	75,841	533

Figure 6. Customer Example annual cost savings generated by selecting low carbon footprint devices

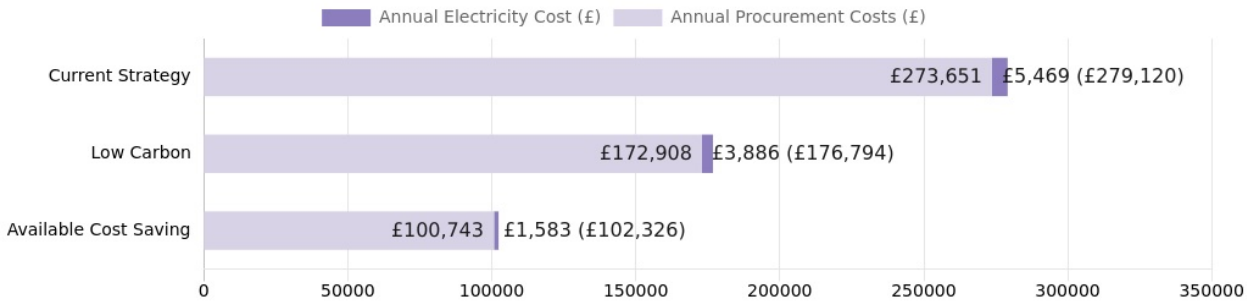
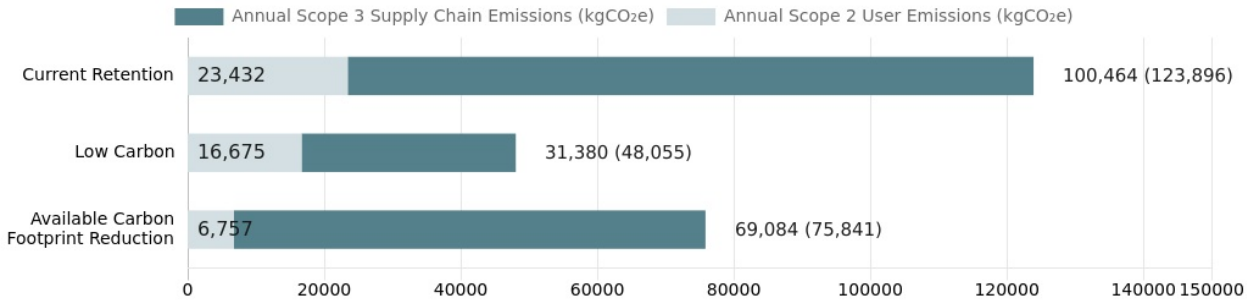


Figure 7. Customer Example annual GHG emissions avoided by selecting low carbon footprint devices



Strategy 4: Low Carbon Footprint ChromeOS Devices

Research shows that ChromeOS devices consume less energy than comparable Windows devices. The results below show the reductions available by transforming your current devices to the lowest carbon footprint ChromeOS version of each device type. In this example, the ChromeOS version of each device type (e.g. Chromebooks replace notebooks) is selected to show the influence.

Table 4. Customer Example annual reductions generated by selecting low carbon footprint ChromeOS devices

Strategy	Lifespan (Years)	Devices	Annual Procurement Costs (£)	Annual Electricity Use (kWh)	Annual Electricity Cost (£)	Annual Scope 2 ($kgCO_2e$)	Annual Scope 3 ($kgCO_2e$)	Annual Carbon Footprint ($kgCO_2e$)	Annual E-Waste (kg)
Current	-	3031	£273,651	53,254	£5,469	23,432	100,464	123,896	1,020
Low Carbon ChromeOS	8	3031	£172,908	28,058	£2,882	12,353	35,119	47,472	523
Reduction			£100,743	25,196	£2,587	11,079	65,345	76,424	497

Figure 8. Customer Example annual cost savings generated by selecting low carbon footprint ChromeOS devices

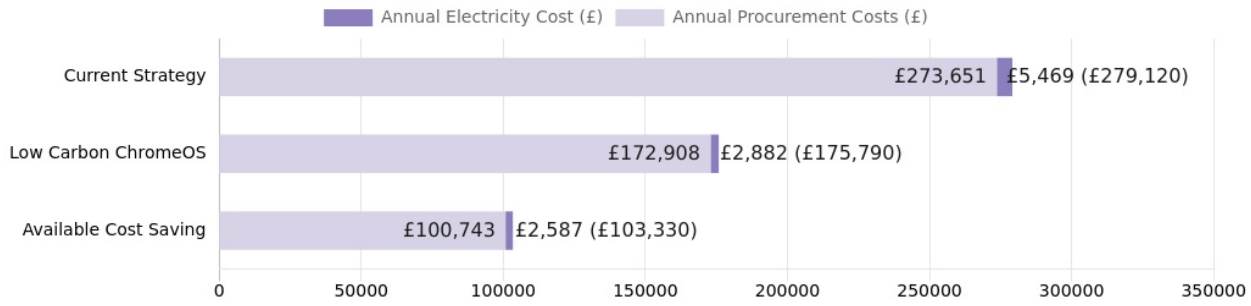
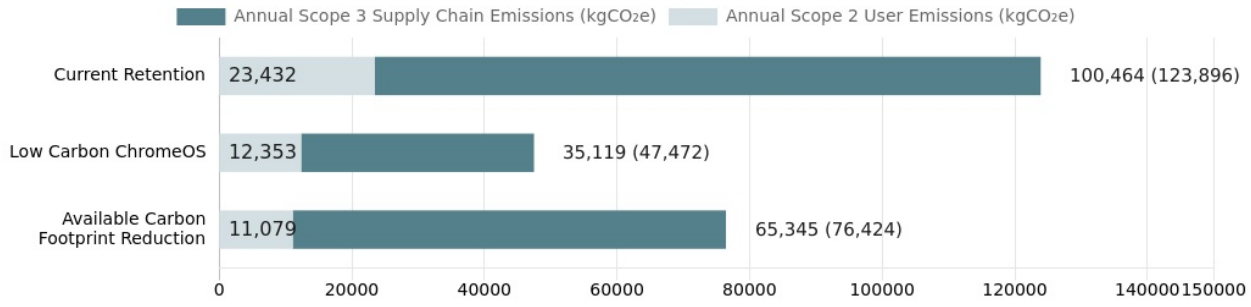


Figure 9. Customer Example annual GHG emissions avoided by selecting low carbon footprint ChromeOS device



Strategy 5: 100% Mobile Computing

Research shows that static devices, such as desktop and monitor combinations, are on average 145% higher in carbon footprint than mobile equivalents, such as notebooks. The results below show the reductions available by transforming your current devices to a 100% mobile computing strategy. In this example, desktop format and AIO computers become notebooks, while your existing notebooks and tablets remain as they are.

Table 5. Customer Example annual reductions generated by a 100% mobile computing strategy

Strategy	Lifespan (Years)	Devices	Annual Procurement Costs (£)	Annual Electricity Use (kWh)	Annual Electricity Cost (£)	Annual Scope 2 ($kgCO_2e$)	Annual Scope 3 ($kgCO_2e$)	Annual Carbon Footprint ($kgCO_2e$)	Annual E-Waste (kg)
Current	-	3031	£273,651	53,254	£5,469	23,432	100,464	123,896	1,020
Mobile	8	2936	£165,590	35,406	£3,636	15,616	28,954	44,570	388
Reduction			£108,061	17,848	£1,833	7,816	71,510	79,326	632

Figure 10. Customer Example annual cost savings generated by a 100% mobile computing strategy

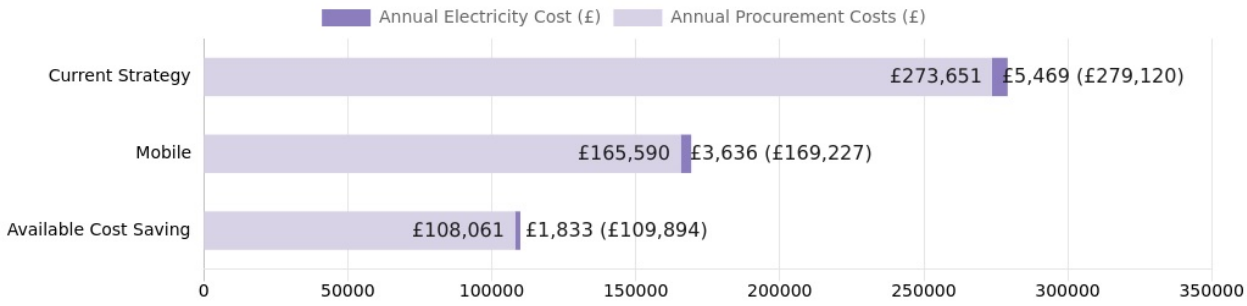
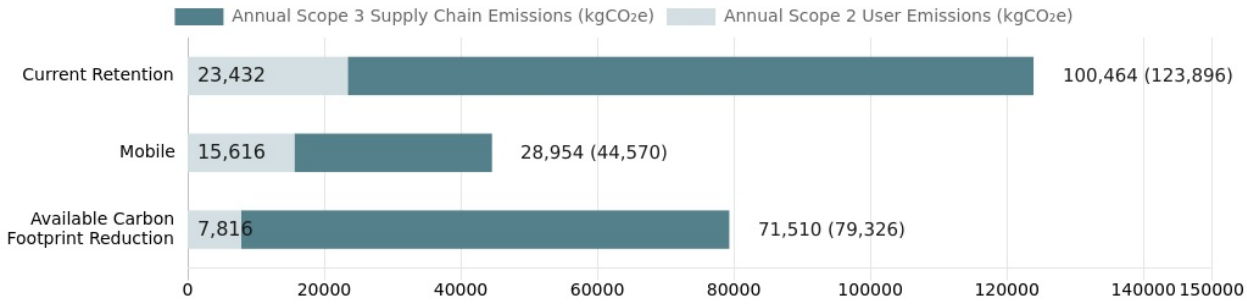


Figure 11. Customer Example annual GHG emissions avoided by a 100% mobile computing strategy



Strategy 6: 100% Mobile Computing with ChromeOS

Research shows that static devices, such as desktop and monitor combinations, are on average 230% higher in carbon footprint than Chromebooks. The results below show the reductions available by transforming your current devices to a 100% mobile computing strategy with ChromeOS. In this example, desktop format and AIO computers plus notebooks become Chromebooks, while your existing tablets remain as they are.

Table 6. Customer Example annual reductions generated by a 100% mobile ChromeOS computing strategy

Strategy	Lifespan (Years)	Devices	Annual Procurement Costs (£)	Annual Electricity Use (kWh)	Annual Electricity Cost (£)	Annual Scope 2 ($kgCO_2e$)	Annual Scope 3 ($kgCO_2e$)	Annual Carbon Footprint ($kgCO_2e$)	Annual E-Waste (kg)
Current	-	3031	£273,651	53,254	£5,469	23,432	100,464	123,896	1,020
Mobile ChromeOS	8	2936	£165,590	23,472	£2,410	10,333	32,008	42,341	398
Reduction			£108,061	29,782	£3,059	13,099	68,456	81,555	622

Figure 12. Customer Example annual cost savings generated by a 100% mobile ChromeOS computing strategy

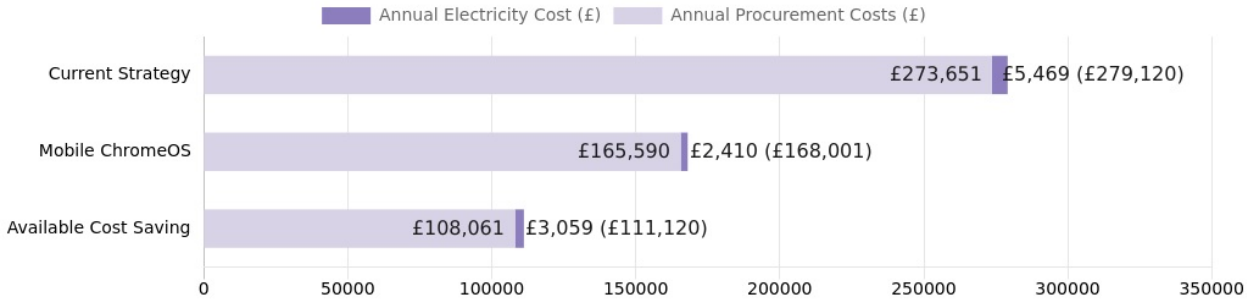
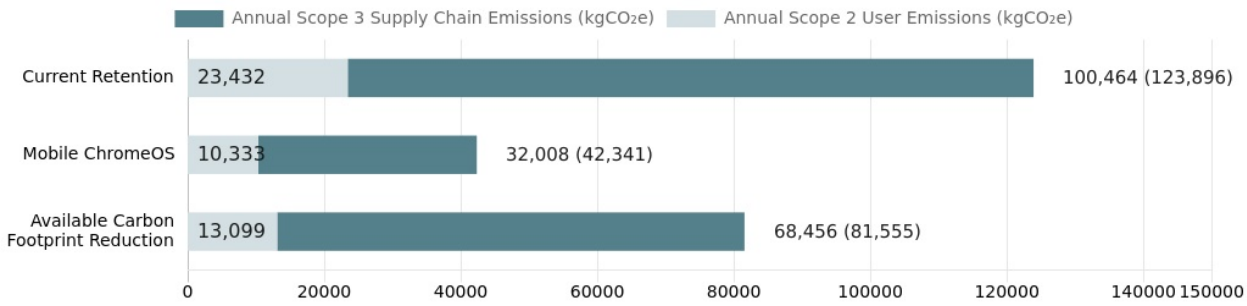


Figure 13. Customer Example annual GHG emissions avoided by a 100% mobile ChromeOS computing strategy



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