RAYLO.

Sustainability Report 2023

Raylo Sustainability Report
Our mission to accelerate the move to a circular economy.

December 2023

> **"57 million tonnes of e-waste are generated each year, equivalent to discarding 1,140 laptops into landfill every single second."**

In Raylo's inaugural sustainability report from 18 months ago, I voiced a dire concern, stating that "we are on a trajectory toward a climate disaster, one that will reach an irreversible tipping point if humanity fails to take immediate action." My stance on this issue has remained steadfast; however, there is now cause for optimism as we witness promising developments by manufacturers within the consumer electronics industry, indicating that tangible actions are finally being initiated.

Nonetheless, the sobering reality persists: an estimated 57 million tonnes of e-waste are generated each year, equivalent to discarding 1,140 laptops into landfill every single second. Adding to this concern, the United Kingdom stands as one of the world's worst offenders, ranking second globally for e-waste per capita, with a staggering 23.9 kilograms[1] – roughly the weight of a double mattress. While reducing the environmental impact of manufacturing is undeniably vital, it is equally imperative that we enhance our approach to managing the entire lifecycle of electronic devices.

From a Raylo perspective, we remain committed to our vision for a circular economy for electronic devices. Our 'lease-and-reuse' model maximises the utilisation of devices, reducing idleness from multiple years ('hibernating in a drawer') down to just a few business days between happy consumer subscribers or users. This allows us to deliver the greatest return on the environmental investment of manufacturing the devices.

We have diligently strived to gain a deeper understanding of our customers' financial situations and preferences, enabling us to provide accessible low subscription pricing and heightened flexibility. This commitment is exemplified through the launch of our monthly rolling subscriptions, which can be cancelled at any time, ensuring that a wide range of consumers can benefit from our services without financial constraints.

The success of our approach has allowed us to grow 39x in the past 3 years. We have now circulated over 100,000 devices to consumers in the UK, through our Raylo.com store and a range of merchants using our Raylo Pay technology, slashing emissions and stopping tonnes of e-waste.
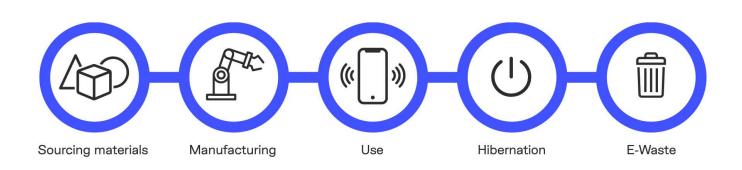
Karl,
Co-founder and CEO

1.   Circular Online. 2022, '*UK Generated 2nd Largest Amount of E-Waste as a Country in 2022*', Circular Online, Accessed November 2023, https://www.circularonline.co.uk/news/uk-generated-2nd-largest-amount-of-e-waste-as-a-country-in-2022/

The current consumption model is wasteful on multiple fronts

The way we produce and use electronic devices typically follows an inefficient linear economy. This kind of system is often branded 'take-make-dispose' – resources are taken from the earth to manufacture the electronic device, which is used for some time, and eventually ends up as obsolete electronic waste (e-waste). Recent studies show that only 17.4% of global e-waste is officially recycled, leaving the remainder destined for landfill.[2]

The final step has historically received the most attention – devices in landfill are often identified as the primary sustainability failure of the industry. Whilst indisputably e-waste and associated

e-pollution are serious issues, they are to an extent a symptom of the disease: the true problem to solve lies further upstream, in the consumption cycle - and more specifically the lack of use of devices during the consumption cycle. Here we find the root cause of the unnecessarily excessive CO_2 emissions – the key contributor to global warming and its disastrous implications.

Stages in the smartphone linear economy

Sourcing materials   Manufacturing   Use   Hibernation   E-Waste

2.   Statista. 2023, '*Electronic Waste Worldwide - Statistics & Facts*', Statista, Accessed November 2023, https://www.statista.com/topics/3409/electronic-waste-worldwide/#top-icOverview

> **17.4% of global e-waste is officially recycled, leaving the remainder destined for landfill.**

The fact that a smartphone's use phase represents only 38% of its potential life means these great pieces of tech are chronically underutilised

> **In the UK alone, 527 million electrical devices are currently hoarded and unused in a 'hibernation' phase.**

Studies have uncovered that in the UK alone, 527 million electrical devices are currently hoarded and unused in a 'hibernation' phase[3].
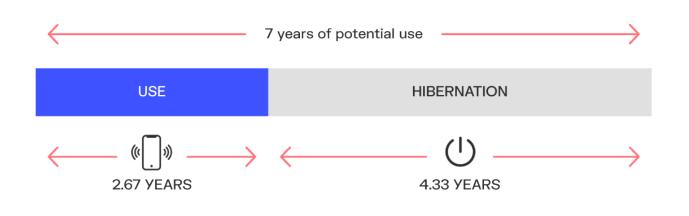
Let's get specific to bring this to life using a smartphone as an example.

The useful life of a smartphone can be defined as the period during which it is both functional and fit-for-purpose.

At Raylo we assume premium brands like Apple, Samsung and Google have a potential useful life of at least seven years.[4]

However, as we know all too well, consumer desire to embrace the latest smartphone technology results in upgrade demand on a more frequent cycle – on average every 2.67 years.[5] Whilst it is tempting to point the finger at consumer shopping habits, the more pressing issue is understanding what actually happens to the old smartphones made 'redundant' in this sequence of regular upgrades.

Smartphones use phase in a linear economy represents only 38% of its potential life

7 years of potential use

USE	HIBERNATION

2.67 YEARS — 4.33 YEARS

As we can see from the headline data point above, in the vast majority of cases, these smartphones enter a period of 'hibernation', unused and out of sight, gathering dust in a drawer rather than continuing as a useful device in another's hands.

The fact that a smartphone's use phase represents only 38% of its potential life means these great pieces of tech are chronically underutilised.

3. Material Focus. 2023, '*Only a Third of the UK Are Recycling Their Unwanted Electricals*', Material Focus, Accessed November 2023, https://www.materialfocus.org.uk/press-releases/only-a-third-of-the-uk-are-recycling-their-unwanted-electricals/

4. A conservative assumption given we see evidence of a robust market for refurbished iPhone 7, (including retailers such as giffgaff) as at October 2023. Initial launch September 2016

5. Statista. 2023, '*Average Smartphone Life*', Statista, Accessed November 2023, https://www.statista.com/statistics/619788/average-smartphone-life/

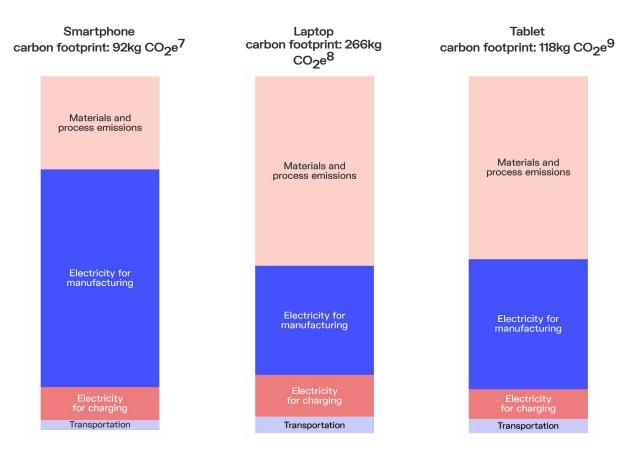# Why underutilisation is the biggest contributor to smartphone emissions

The connection between underutilisation and excessive carbon emissions might not at first be obvious. To appreciate the point we must consider the full spectrum of global demand – encompassing a diverse set of consumer preferences, and a wide range of affordability constraints.

As hundreds of millions of fully functional devices in hibernation have been excluded from global supply chains, the only way to satisfy the demand from the mid and lower end of the market is to manufacture new devices. This directly leads to millions of new devices being produced unnecessarily.

So what is the impact of this overproduction?

The climate impact is measured by CO_2e – carbon dioxide equivalent emissions, typically measured in kilograms or metric tons.

To measure a device's carbon footprint we can assess CO_2e across the various components of its lifecycle, from production to end of life. Very helpfully, Apple undertakes detailed analysis on all their products through their Environmental Responsibility Report, so we will use these as the basis of our analysis going forward.[6]

Smartphone
carbon footprint: 92kg CO_2e[7]

Materials and process emissions

Electricity for manufacturing

Electricity for charging

Transportation

Laptop
carbon footprint: 266kg CO_2e[8]

Materials and process emissions

Electricity for manufacturing

Electricity for charging

Transportation

Tablet
carbon footprint: 118kg CO_2e[9]

Materials and process emissions

Electricity for manufacturing

Electricity for charging

Transportation

> **"Millions of new devices are being produced unnecessarily."**

Given the production phase contributes to the vast majority of a smartphone's carbon footprint, it's clear that mass overproduction poses the biggest climate challenge and the problem originates in today's consumption model.

In Apple's September 2023 event it revealed its "first-ever carbon-neutral product" with the Watch Series 9, this being the first step to its commitment to make every one of their devices carbon-neutral by 2030.[10]

This step forward, and commitment to leap forward in the next 6 years, from the second largest smartphone manufacturer in the world[11], in how it considers and manages the environmental impact of its operations is to be heralded - Apple shipped almost 225 million smartphones in 2022.

However, it's crucial to acknowledge that millions of tons of carbon have already been emitted in the manufacturing of the devices currently either in use or destined for abandonment in drawers or in landfill. While we are still six years away from

Apple's commitment to producing carbon-neutral devices, even then, it won't be acceptable to simply hibernate a device and replace it with a "carbon-neutral" one. Not only could someone continue to happily use derive significant utility from the device that is in hibernation, but it's also important to note that "carbon-neutral" doesn't equate to "zero carbon". Achieving carbon neutrality typically involves offsetting emissions through the purchase of carbon offsets rather than entirely eliminating carbon emissions.

There are further negative secondary effects to consider regarding manufacturing new carbon neutral devices, but the bottom line is that the materials used in the production of new devices are finite and must be sourced from somewhere, diverting them from their potential use in essential products.

So, given underutilisation is driving over-production and production is the largest driver of carbon emissions in the electronic device lifecycle, how can we most effectively address this underutilisation?

6. We consider the baseline emissions from Apple's report for our calculations, as the majority of smartphones are not created leveraging clean electricity, and as considered above the use of clean electricity has cost consequences that have impact in a free-market economy. Furthermore, the creation of solar/wind farms comes at a significant carbon emission cost that should be considered in any calculation regarding emission reductions

7. Apple Inc. 2023, '*iPhone 15 Pro and iPhone 15 Pro Max Environmental Report*', Apple, viewed Accessed November 2023, https://www.apple.com/environment/pdf/products/iphone/iPhone_15_Pro_and_iPhone_15_Pro_Max_Sept2023.pdf

8. Apple Inc. 2023, '*MacBook Air 15-inch Environmental Report*', Apple, viewed Accessed November 2023, https://www.apple.com/my/environment/pdf/products/notebooks/MacBook_Air_15-inch_PER_June2023.pdf

9. Apple Inc. 2022, '*iPad Environmental Report*', Apple, Accessed November 2023, https://www.apple.com/environment/pdf/products/ipad/iPad_PER_Oct2022.pdf

10. Apple Inc. 2023, '*Apple Unveils Its First Carbon-Neutral Products*', Apple Newsroom, Accessed November 2023, https://www.apple.com/uk/newsroom/2023/09/apple-unveils-its-first-carbon-neutral-products/

11. Counterpoint Research. 2023, '*Global Smartphone Market Share*', Counterpoint Research, Accessed November 2023, https://www.counterpointresearch.com/insights/global-smartphone-share/#:~:text=Apple%20dominated%20the%20smartphone%20market,revenue%20and%20operating%20profit%20share

Current attempts to tackle underutilisation are failing to have a meaningful impact

> **"Sadly all too often, the most convenient action for the consumer is to put their old smartphone in a drawer and forget about it."**

We recognise that some progress has been made in recent years to invigorate the market for refurbished devices. These efforts have been applied to both sides of the equation: the supply side (encouraging consumers to trade-in old phones when upgrading) and the demand side (promoting the merits of buying refurbished smartphones).

The market for refurbished devices is growing rapidly. A 2023 study by Vodafone UK found that the cost of new devices, as well as the environmental impact of manufacture, is driving increased consideration for refurbs - with 47% of respondents stating that brand-new items are too expensive and the same proportion stating buying refurbished is more eco-friendly. Whilst smartphones are the most in demand, 26% of respondents would buy refurb laptops and 21% would buy refurb tablets.[12]

However, major barriers to upscaling these initiatives lie on the supply-side. Consumer trade-in programmes unfortunately remain cumbersome, complicated and a poor customer experience. Sadly all too often, the most convenient action for the consumer is to put their old device in a drawer and forget about it.

The core issues will persist as long as consumers continue to actually *own* devices. Rather than try to tweak a broken system, we at Raylo are building a whole new system.
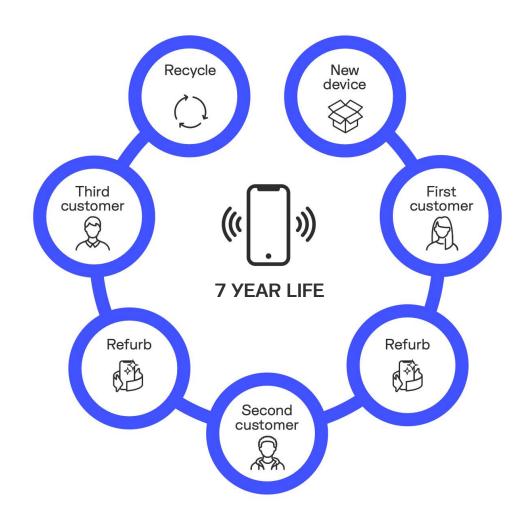
12. Vodafone UK. 2023, '*Refurb on the Rise: Expanded Range of Refurb Phones with EVO*', Vodafone UK News Centre, Accessed November 2023, https://www.vodafone.co.uk/newscentre/press-release/refurb-on-the-rise-expanded-range-refurb-phones-evo/

The real solution – instilling a circular economy at the point of purchase

We imagined a system that could (i) prevent great devices from languishing in drawers, (ii) maximise device utilisation by directly satisfying a full range of consumer preferences and affordability constraints, and (iii) ultimately address the e-waste issue when a device reaches obsolescence.

So we redesigned the consumption model into a fully functioning circular ecosystem. Raylo customers choose between leasing a brand new or refurbished device on a monthly rolling (cancel anytime) or fixed term lease. When customers want to upgrade to a newer model, the device is returned to Raylo for refurbishment and reuse by another Raylo customer. Our devices live a long and fulfilled life, never abandoned in a drawer, before being sustainably recycled by Raylo when the time comes.

The environmental benefits are enhanced if we retrieve and re-lease our devices as quickly as possible. So one critical factor in executing our circular model is a slick and seamless upgrade experience for our customers, and an efficient reverse logistics process for the returned device. We work towards an average time of five business days to process, refurbish and put a device back into service with a new Raylo customer. A fundamental change to access and ownership.

"Our smartphones live a long and fulfilled life, never abandoned in a drawer."

Circular Economy

7 YEAR LIFE

Recycle · New device · First customer · Refurb · Second customer · Refurb · Third customer

What are the CO$_2$e savings of a circular ecosystem?

For every refurbished device we ship, we prevent a new one from being unnecessarily manufactured – the potential reduction in climate impact is staggering.

Let's consider a simple economy with 3 consumers in it. In a linear world, each consumer will use 3 new smartphones over an 8 year period - upgrading once every 2.67 years (as we detailed above). This would require 9 new smartphones to be manufactured during that period.

In a perfectly circular economy, this would reduce to only 3 new smartphones being manufactured during this period - as devices would be refurbished and passed on to a new user every 2.67 years, as we look to describe below:

	Year 0	Year 2.67	Year 5.33
Consumer A	New smartphone	Upgrades to new	Upgrades to new
Consumer B	2.67yo smartphone	Upgrades to A's smartphone	Upgrades to A's
Consumer C	5.33yo smartphone	Upgrades to B's smartphone	Upgrades to B's

Clearly this 'perfectly circular economy' reduces emissions by almost two thirds - as only one third of the manufacturing takes place, and so only one third of the manufacturing associated emissions occur.

Whilst a perfectly circular economy is an idealised vision, Raylo is making strides towards this. Our analysis below demonstrates that Raylo's ecosystem, comprised of customers enjoying both refurbished and new smartphones who upgrade every 2.67 years (as evidenced above), reduces emissions by 56% vs. a traditional linear economy with the same consumer behaviours over the long term. This translates to an average consumer saving over 1.65kg of CO$_2$e every month, adding up to almost 200kg of CO$_2$e reduced every 10 years.
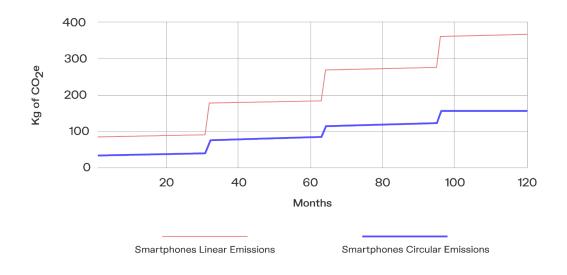
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13.   uSwitch. 2023, '*Mobile Phone Usage Statistics*', uSwitch, Accessed November 2023, https://www.uswitch.com/mobiles/studies/mobile-statistics/

14.   NimbleFins. 2023, '*Average CO2 Emissions for a Car in the UK*', NimbleFins, Accessed November 2023, https://www.nimblefins.co.uk/average-co2-emissions-car-uk#nogo

15.   Calculation considers the same consumer behaviours of upgrading devices every 32 months, and each device type having a useful life of 7 years.
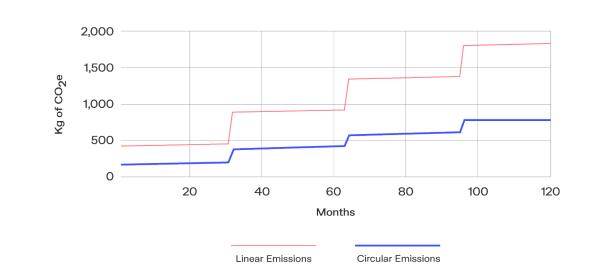
Smartphone CO_2e per smartphone user (Kg)

Smartphones Linear Emissions   Smartphones Circular Emissions

With 71.8 million active mobile phones in the UK[13], if we all moved to a circular ecosystem the savings would be an impressive 1.43 million tonnes of CO_2 per annum. That's the equivalent of taking over 1 million new cars off the UK's roads.[14]

If we broaden this, to consider consumers having a smartphone, tablet and laptop the impact is over 5x greater - with emission reduction of over 8.6kg in CO_2e per month![15]

Total CO_2e for a consumer with a smartphone, tablet and laptop (Kg)

Linear Emissions   Circular Emissions

A scalable win-win

"A complete transformation of the way we consume our tech."

As we alluded to earlier, too often the responsibility and costs of sustainability are placed directly on end consumers - and ultimately this approach will lead to very unsatisfactory suboptimal outcomes. Businesses are best placed to own the problem and we believe consumers should not be faced with an either/or trade-off when making purchasing decisions which involve sustainability issues.

Raylo's 'lease-and-reuse' model provides customers with seamless flexible access to the best tech at the lowest monthly prices, and in turn the planet benefits from a significantly reduced carbon footprint as fewer devices are produced. The mutually beneficial nature of the Raylo model is key to unlocking scalable adoption, and ultimately *a complete transformation of the way we consume our tech*.

Thank you

Thank you for taking the time to read about Raylo's sustainability mission.

We are committed to using our business as a force for good and continually strive for ways to improve our practices to ensure we positively contribute to our world around us. We remain in the early stages of our journey and will continue to challenge ourselves to do a lot more. If you have any thoughts, feedback or questions, please get in touch at: help@raylo.com.

Appendix

Our impact methodology

To demonstrate the impact of Raylo's circular ecosystem we have conducted a product life cycle assessment on an iPhone 15 Pro 128GB, iPad (10th Gen) and MacBook Air (2023).

A life cycle assessment is a cradle-to-grave or cradle-to-cradle analysis technique to assess environmental impacts associated with all the stages of a product's life, from raw material extraction through materials processing, manufacture, distribution, use and end of life.

Apple's Product Environment Report provides the foundation of our methodology. Apple assumes a use period (or upgrade cycle) of 36 months for iPhones and iPads and 48 months for MacBooks. Estimated emissions are calculated in accordance with guidelines and requirements as specified by ISO 14040 and ISO 14044.[16]

We translate Apple's data into a simple two-state world: a linear economy and a circular ecosystem. We do this through using a ratio of the expected 'actively used life' of a device (32 months / 2.67 years) and the 'useful life' of a device (7 years) - as detailed in the report above - and applying this ratio to the Total 'fixed' emissions above. We then accrue the 'use per month' emissions detailed every month.

Table 1:

Device	iPhone 15 Pro 128GB	iPad	MacBook Air
	Benchmark Emissions (kg CO₂e)		
Production	79.46	101.44	228.47
Transport	1.98	5.76	5.56
Recover/Refurb	0.66	0.72	1.39
Total 'fixed' emissions	82.10	107.92	235.42

Apple's calc period	36 months	36 months	48 months
Use	9.9	10.08	30.58
Use per month	0.28	0.28	0.64

16. Apple Inc. 2022, '*iPad Environmental Report*', Apple, Accessed November 2023, https://www.apple.com/environment/pdf/products/ipad/iPad_PER_Oct2022.pdf
Apple Inc. 2023, '*MacBook Air 15-inch Environmental Report*', Apple, Accessed November 2023, https://www.apple.com/my/environment/pdf/products/notebooks/MacBook_Air_15-inch_PER_June2023.pdf
Apple Inc. 2023, '*iPhone 15 Pro and iPhone 15 Pro Max Environmental Report*', Apple, Accessed November 2023, https://www.apple.com/environment/pdf/products/iphone/iPhone_15_Pro_and_iPhone_15_Pro_Max_Sept2023.pdf

Appendix

Linear economy assumptions:

- **Production emissions** – taken from Apple's Product Environment Report

- **Transport emissions** – taken from Apple's Product Environment Report

- **Use emissions** – 32 months[17] upgrade cycle, and a linear extrapolation of Apple's Product Environment Report (36 months upgrade cycle)

- **Refurbishment emissions are zero** – no smartphones are refurbished

- **Recovery emissions are zero** – all old smartphones hibernate in drawers

This means that every 32 months, a linear economy generates the following CO2e per consumer:

Smartphones:
79.46kg production + 1.98kg transport + (0.28*32)kg usage = 90.4kg

Tablets:
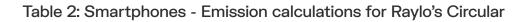101.44kg production + 5.76kg transport + (0.28*32)kg usage = 116.16kg

Laptops:
228.47kg production + 5.56kg transport + (0.64*32) kg usage = 254.51kg

Forecasting this forward to a 10 year time cycle, requires 4 production events (in month 0, 32, 64 and 96) - which leads to emissions over a 10 year period totalling:
Smartphones: 358.76kg
Tablets: 462.40kg
Laptops: 1,012.57kg

Raylo circular ecosystem assumptions:

- Devices are used for their full useful life of 7 years, rather than just the first 32 months. This is done by the devices being returned by the consumer after 32 months, the device being refurbished and then used by another consumer. As there are 84 months in 7 years, this means a factor of 32/84 can be used for the proportion of new devices in use, with 52/84 as the proportion of refurbished devices in use, at any given time.

- Production emissions – taken from Apple's Product Environment Report for the new smartphones. Zero emissions for refurbished smartphones

- Transport emissions – taken from Apple's Product Environment Report for the new smartphones (likely being shipped from China). Zero for refurbished smartphones, couriered within the UK only[18]

- Use emissions – 24 months upgrade cycle, and a linear extrapolation of Apple's Product Environment Report (36 months upgrade cycle)

- Refurbishment emissions – are taken to be equivalent to Apple's documented 'Recovery' emissions for each time the device is refurbished

- Recovery emissions – taken from Apple's Product Environment Report and applied only to two-times refurbished smartphones

Table 2: Smartphones - Emission calculations for Raylo's Circular

Device	New Smartphone	Refurb Smartphone	Weighted Average
Length of use (months)	32	52	
	Benchmark Emissions (kg CO_2e)		
Production	79.46	0	30.27
Transport	1.98	0	0.75
Total 'fixed' emissions	82.10	0	31.02
Use per month	0.28	0.28	0.28
Recover/Refurb per event	0.66	0.66	0.66

17.   Statista. 2023, '*Average Smartphone Life*', Statista, Accessed November 2023, https://www.statista.com/statistics/619788/average-smartphone-life/

18.   Raylo's courier partner is DPD, https://www.dpd.co.uk/pdf/DPD_-_Delivering%20a%20zero%20emission%20future.pdf

Appendix

Table 3: Tablets - Emission calculations for Raylo's Circular Ecosystem

Device	New Tablet	Refurb Tablet	Weighted Average
Length of use (months)	32	52	
	Benchmark Emissions (kg CO_2e)		
Production	101.44	0	38.64
Transport	5.75	0	2.19
Total 'fixed' emissions	107.20	0	40.83

Use per month	0.28	0.28	0.28
Recover/Refurb per event	0.72	0.72	0.72

Table 4: Laptops - Emission calculations for Raylo's Circular Ecosystem

Device	New Laptop	Refurb Laptop	Weighted Average
Length of use (months)	32	52	
	Benchmark Emissions (kg CO$_2$e)		
Production	228.47	0	87.04
Transport	5.56	0	2.12
Total 'fixed' emissions	234.03	0	89.16
Use per month	0.64	0.64	0.64
Recover/Refurb per event	1.39	1.39	1.39

This means that every 32 months, a circular economy generates the following average CO2e per consumer:
Smartphones:
30.27kg production + 0.75kg transport + (0.28*32)kg usage + 0.66kg refurb = 40.64kg

Tablets:
38.64kg production + 2.19kg transport + (0.28*32)kg usage + 0.72kg refurb = 50.51kg

Laptops:
87.04kg production + 2.12kg transport + (0.64*32)kg usage + 1.39kg refurb = 111.03kg

Forecasting this forward to a 10 year time cycle, requires 4 'production' events (in month 0, 32, 64 and 96) - which leads to emissions over a 10 year period totalling:
Smartphones: 159.08kg
Tablets: 199.11kg
Laptops: 437.24kg

Appendix

The broader factors we also consider

To become a truly sustainable business, we have to do more than implement our circular model. As our customer base grows, so will our carbon footprint. We are taking steps now to ensure we minimise the climate impact of our operations from the outset. Specifically, we have implemented measures across the following key aspects of our operations:

- Transport
- Packaging
- Phone accessories

Transport

We are proud to work with DPD, a carbon-neutral business making considerable leaps in reducing the carbon footprint of its deliveries. DPD has added more electric vehicles to its fleet than any other delivery provider in the UK. The majority of our London-based customers will have had their phones delivered by electric vehicles.

Packaging

We minimise packaging where possible and exclusively use 100% recycled materials.

Phone accessories

Every Raylo phone comes with a free screen protector and phone case to help our customers keep the phone in good condition for the next customer. Our phone cases are 100% compostable. Going one step further than biodegradable, compostable materials break down into non-toxic components and have the potential to add nutrients back into the ground. Replacing plastic with compostable materials can have a huge impact. For every 10 Raylo smartphone customers, 1kg of plastic is kept out of the waste stream.

Looking to the future

Our sustainability journey doesn't stop here. As we grow, we will continually review our footprint and look for ways to reduce it. From the companies we partner with to the way we power our offices, we will apply carbon-cutting principles to every aspect of the way Raylo operates. Here are some ways we are currently reducing our footprint further:

Raylo is working exclusively with R2 certified recyclers for end of life processing to eliminate E-waste

Increase deliveries made via electric vehicles

Move to offices powered by renewable energy + work with suppliers who are powered by 100% renewable energy

To improve our packaging we are working to eliminate plastics and increase recyclable content

Increase affiliate partnerships with eco friendly products e.g. eco coffee cups to promote circulairty

Shipping accounts for 3% of total CO_2e. To optimise we will ship by ocean rather than air freight

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