The end of the upgrade?

How O2 is adapting to a more circular mobile market

green alliance...

Foreword

Ronan Dunne, chief executive, O2

At O2, we are proud of how we are helping people to live more sustainably with technology. We are delighted to have worked with Green Alliance, to further investigate the impacts of two of our customer propositions, O2 Recycle and Sim Only, both designed to keep devices in use for longer.

Our approach to the sustainability of our products is based on lifecycle thinking. For prospective consumers, we offer a sustainability guide providing credentials for a range of devices. This guide, *Eco rating*, also rewards manufacturers who have embraced design for recycling and longer life. This is an aspect on which we are pleased Green Alliance is calling for leadership.

At the point of sale, our 'Charger out the Box' initiative minimises excessive waste from unwanted chargers. And for the use phase of the lifecycle, O2 Refresh separates airtime and device payment, rewarding customers that extend their handset's life with significantly lower bills. For those that do decide to upgrade, O2 Recycle, studied in this report, is an easy way to give their old handset a new use.

Green Alliance highlights the importance of upstream impacts. We concur and seek to ensure we are doing the right thing in the background. Through combining value with sustainable innovations, we believe we can do better for everyone. So we are responding to the challenges set out by Green Alliance in this report. And, for us, there are two natural next steps on this agenda.

Further to our championing of the SIM-only, leasing and recycling markets, we want to do more to extend devices' useful life. So we are now focusing on mainstreaming refurbished devices, building on our online refurbished offerings, with the ultimate aim of taking them to the high street too.

We launched our first hand-me-down SIM proposition in 2011, which targeted family and friends, and rewarded both recipient and giver with £25 credit whenever they extended the life of a used device. We are currently exploring similar propositions.

We see these commitments as helping to meet a major change in customer preferences, toward longer lasting devices. We're proud to be helping to make more circular, greener electronics the norm.

Summary

The mobile market is stagnating. Upgrade cycles in developed countries have lengthened substantially, while growth in emerging economies is slowing and shifting to low cost, low margin devices. The industry's growth model, built on ever increasing sales of new devices, is reaching its limits. Much of this is due to the slowing pace of innovation in mobile phones over the past five years, with new devices taking much longer to become functionally obsolete.

But slower technology change and shifting consumer preferences need not be all bad, at least for companies willing to innovate. A new mobile market is beginning to emerge. This is based not on pushing faster upgrade cycles, but on capturing the value that exists in older devices. And it is this circular market that is poised to grow: resale is estimated to grow four to five times faster than the growth in the overall smartphone market in 2016.

This report looks at O2's experience. It is based on comprehensive analysis of the lifetimes of the mobile phones used by eight million of their customers, and provides new evidence that customers want to use phones for longer.

Through its Recycle programme O2 buys old phones from customers and prepares them for resale. The bulk of demand for the refurbished phones it sells is in Europe: in 2015, 72 per cent of the 420,000 devices sent in were resold here, with over 40 per cent sold in the UK alone. The programme has nearly doubled in size in the past four years. A sizeable market for second hand phones exists, even in the wealthy world.

O2's Sim Only programme is an existing business model which provides a mobile phone service without an incentive to purchase a new phone. This captures a market for customers who don't feel the need to upgrade rapidly. Our analysis shows that 74 per cent of customers on Sim Only have phones older than the UK average of 1.8 years. Moreover, many customers keep their phones for much longer: 43 per cent keep their phone for over three years, and one in five use their device for more than four years. Perhaps more significantly, the average age of a Sim Only device in 2015 was nearly half a year older than in 2012, demonstrating how quickly consumer preferences are shifting.

These changes are good news for the environment. Smart devices have a sizeable carbon footprint, and extending their lifetime can cut yearly emissions substantially. Ten thousand tonnes of CO_2 and 26 million litres of water have been saved through the O2 Recycle programme in the past four

years, while allowing O2 and their customers to capture value from used devices. This CO_2 saving is equivalent to 1.1 per cent of O2's UK emissions. Similarly customers on Sim Only deals produce nearly half the yearly emissions of their 24 month contract counterparts, while benefiting from cheaper monthly bills.

Schemes like these should be scaled up. Companies need to make it easier for people to sell their used phones than to leave them in a drawer. This report identifies how innovation in software, for example a trade-in app, or in business models, such as guaranteeing access to a spare phone, in case a new phone breaks, could work. Both options are technically feasible and economically sensible.

Governments should help these circular models to thrive. Many devices become prematurely obsolete because their software is not updateable, or because their screens or batteries are difficult to replace. This does not happen because companies cannot make better products or because consumers do not want longer lasting products. Instead, like energy efficiency, consumers rarely pay attention to durability, repair and upgradability at the point of purchase. Requiring manufacturers to meet standards to address these points would meet customer preferences for longer lasting devices, and would encourage the development of successful, and more circular, business models.

Transition is occurring in the mobile market

In less than ten years, smartphones have become ubiquitous, and have created a multitude of new ways for their owners to interact with the world. The industry has boomed, initially through business use and early adopters, then broader penetration of western markets and later the wave of budget models sweeping through emerging markets. But now, after seven years of sustained double digit growth, the market seems to be maturing. Sales growth is falling, with the markets for first time buyers and replacements both slowing.[1]

There are fewer first time buyers, even in emerging markets

High smartphone ownership rates in the west mean most sales to new users are in emerging markets. Global smartphone ownership has doubled in three years, from one billion in 2012 to nearly two billion by the end of 2015, bolstered by the availability of cheaper phones.[2,3] But some emerging markets are now also reaching saturation. According to Nielsen, China reached 73 per cent smartphone penetration in 2015, with the market now primarily driven by upgrades.[4]

Upgrades are slowing in the wealthy world

In saturated markets, sales are crucially dependent on the rate people replace their phones. But, while early smartphones offered great leaps in functionality from their predecessors, today's models advance only incrementally, if at all. This is one factor driving the increase in upgrade cycles, which have grown from 18 to 22 months in the US to match the average in the UK.[5] Commentators are drawing parallels to the PC market, which flatlined when "the hardware simply got too good, and people didn't need to upgrade as frequently."[6]

Resale is booming

But more is afoot in the mobile market. While some people are simply keeping their devices longer, there is also a trend towards buying and selling second hand. This means that even a more frequent upgrade cycle cannot guarantee growth in

new device sales. In China, although the upgrade cycle decreased from 29 months in 2011 to 18 months in 2015, a major driver of this is the emerging upcycling industry, where multiple startups are competing to provide low cost second hand phones, cannibalising sales of new budget devices.[7]

To date, the global resale market has been constrained by supply rather than demand.[8] This is not because there are not enough second hand phones out there, but because too few of them are reaching consumers. Instead, most end up sitting unused: it is estimated that between 28 and 125 million phones are languishing in drawers across the UK, and only 20 per cent of people sell their used phones.[9] Deloitte has concluded that, in 2016, globally, the growth rate of the used smartphone market will be as much as four to five times higher than that of the overall smartphone market.[10]

This is a very different world for smartphone manufacturers, retailers and carriers. A combination of slowing innovation, emerging market saturation and a growing resale market threatens to destroy companies who align their revenues solely with sales of new devices. But opportunities abound for those who embrace the new order.

Industry leaders are inventing new business models

Savvy companies are seeing diverging consumer preferences as an opportunity rather than a threat, and are diversifying their businesses to decouple revenue from the sale of new devices. These companies are serving people who are happy to keep their old phone longer or use a second hand device instead of buying new. The initial growth in this market has come from startups, such as reseller Gazelle.

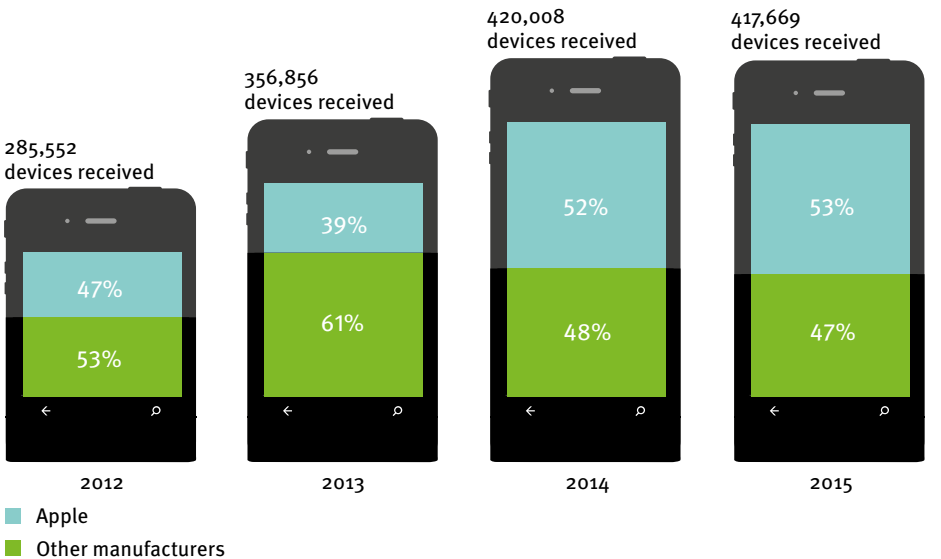
This analysis focuses on network operator O2, which is experimenting with business models that keep devices in use for longer. Green Alliance has analysed data from two of O2's programmes, O2 Recycle and Sim Only, to see how viable these models are in practice. We found that they are popular with customers, and have significant growth potential, as well as environmental benefits.

People want to buy and sell old phones

The O2 Recycle programme is one of a number of growing smartphone resale schemes offering customers money for their old phones. This encourages the reuse of older, working phones, that would otherwise be abandoned. The scheme is open to everyone, not just O2 customers, and has grown in popularity since it started in 2012.

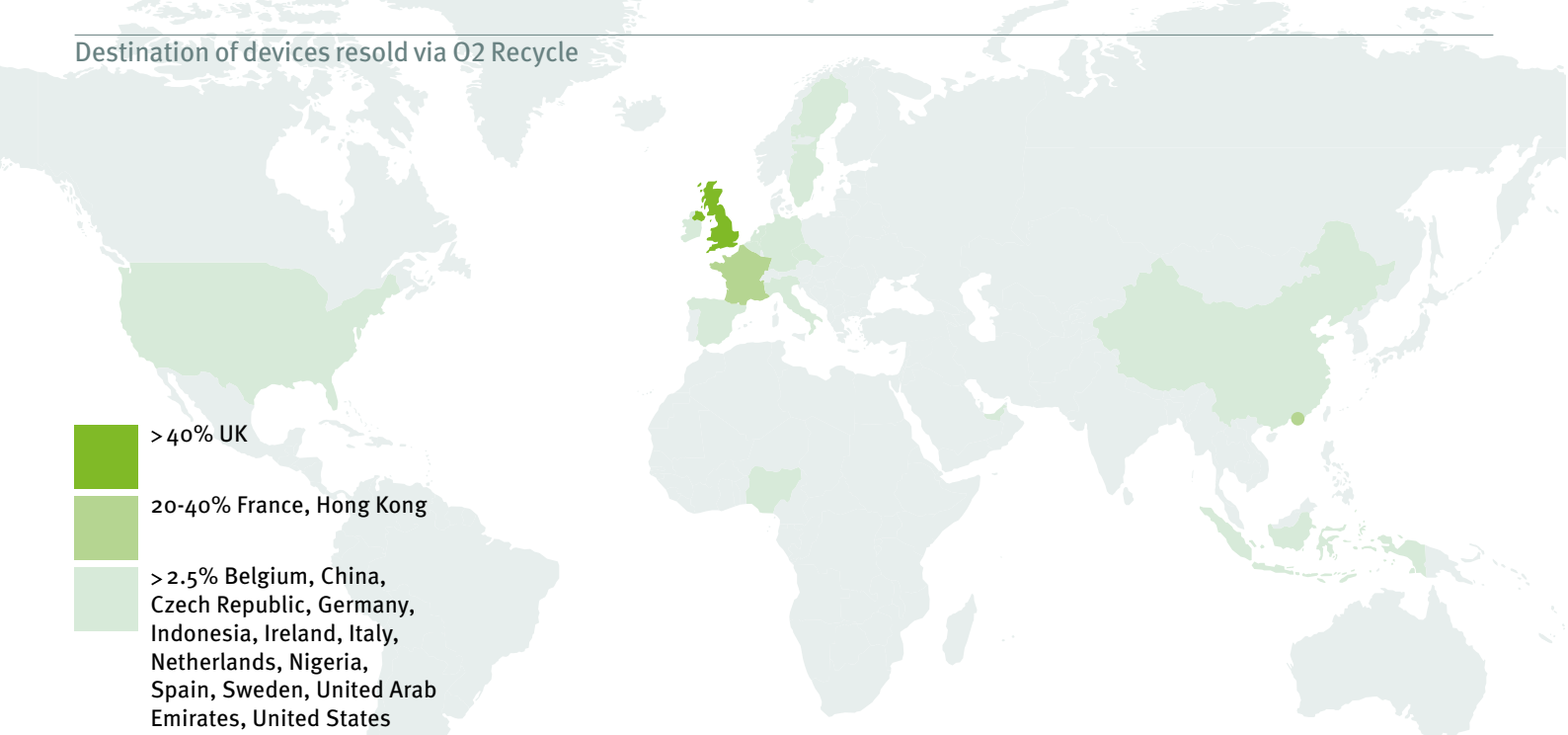
Although the scheme's name refers to recycling, 95 to 99 per cent of the devices that are sold to O2 are in good working order and are sold second hand, with the remainder being recycled.

Growing popularity of O2 Recycle



In the past, these used phones would be sent to emerging markets to compete with cheaper models available there. But the market is changing. The UK has a growing demand for second hand sales. Of the phones resold through O2 Recycle in 2015, some 43 per cent – 173,000 devices – remained in the UK, while a further 30 per cent went elsewhere in Europe. This suggests that the wealthy world's appetite for owning the newest gadgets may be waning.

Destination of devices resold via O2 Recycle

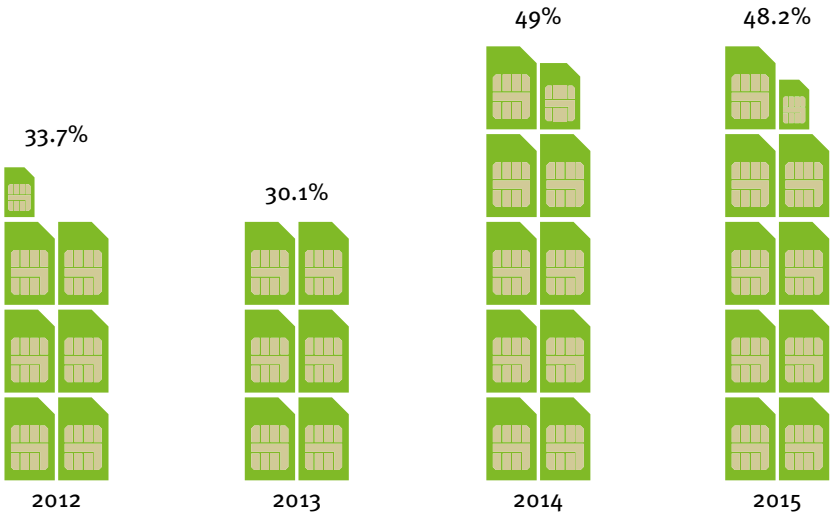


People want to keep their phones longer

The O2 Sim Only programme charges customers just for airtime, rather than bundling a new handset in with their contract. While allowing customers to pay for airtime only is not a new idea, the business model is well suited to consumers with preferences for longer lived devices, and the age profile of the devices used in Sim Only shows this.

Sim Only data shows that, on average, 74 per cent of customers are using their phone for longer than the average 1.8 year mobile phone lifetime, and 40 per cent for longer than three years, while 21 per cent use beyond the maximum economic lifetime, the point at which the device ceases to be worth selling second hand. [11,12]

Growth in devices kept for more than three years on SIM Only

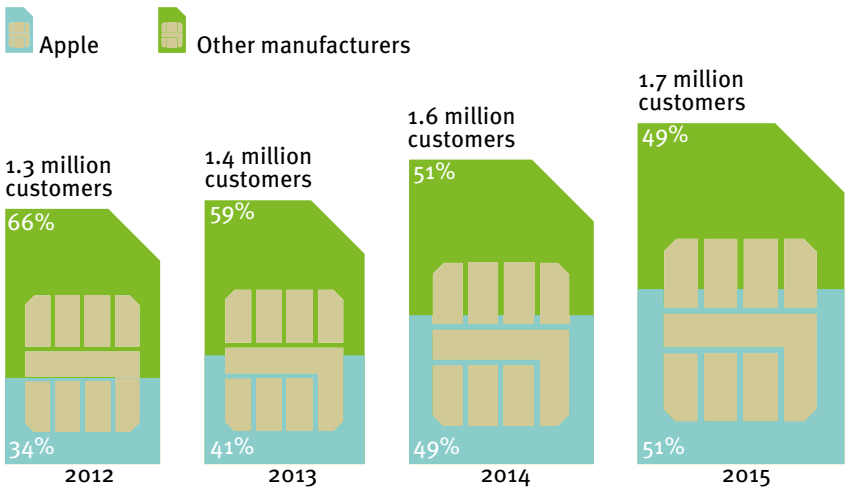


We estimate this to be four and a half years for iPhones and three years for other smartphones. This discrepancy is in part due to the much longer software support for Apple devices, of 37 months on average compared to 21 months for Android, meaning that they become obsolete more slowly.[13]

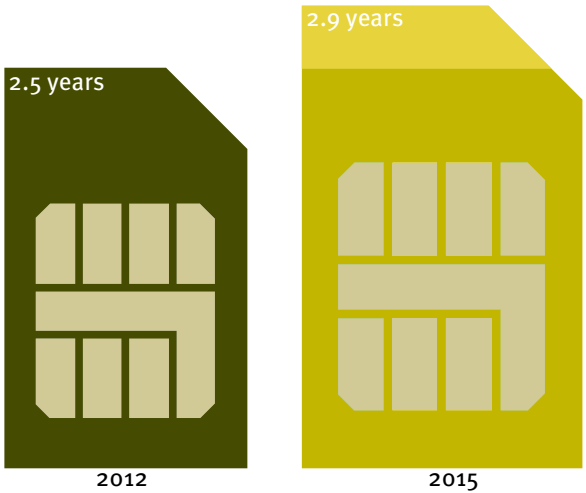
More significantly, the length of time that people use their devices has been rising, with the average age of a Sim Only device growing from 2.55 years in 2012 to 2.93 years in 2015 and, in particular, the percentage of people keeping devices longer than three years increasing markedly.[14]

The Sim Only programme has grown in popularity since it began in 2012, particularly for Apple devices, which retain their value longer.

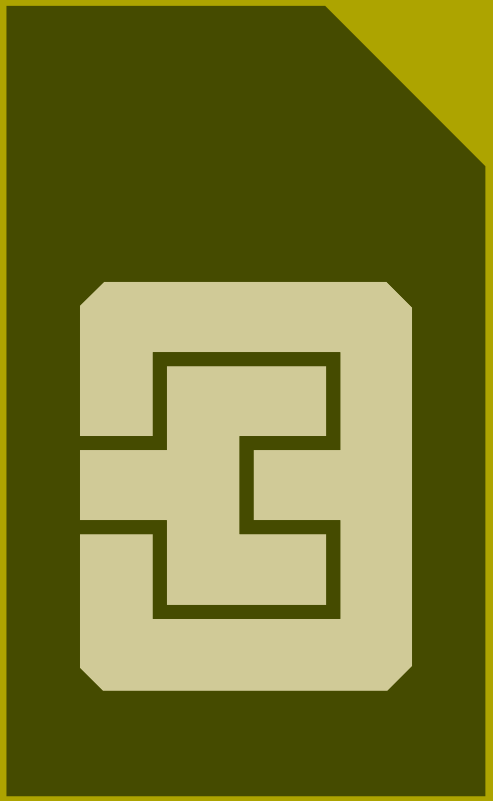
The growing popularity of Sim Only



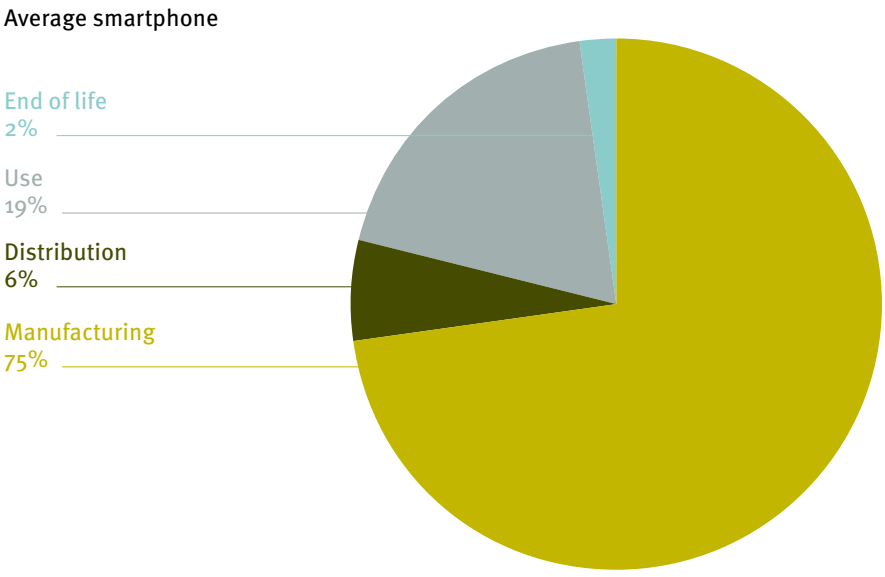
The average age of Sim Only devices is rising



New business models can reduce waste and emissions



Most CO_2 emissions come from manufacturing



A growing carbon footprint

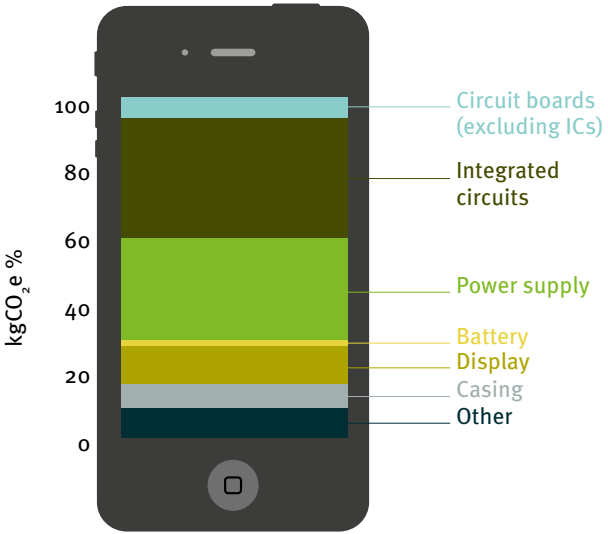
The rapid expansion and the moving upgrade cycle of the smartphone industry create a sizeable environmental impact. Like other electronic devices, smartphones contribute to the growing ewaste problem, because they are difficult to disassemble and contain toxic materials. The manufacturing process of these products is also a carbon and water intensive process, and draws on materials which face supply constraints, such as neodymium, and environmental concerns, such as tin from unsustainable mines in Indonesia.[15,16] This report concentrates on the carbon impact. Other environmental impacts and business risks are outlined in more detail in Green Alliance's 2015 report *A circular economy for smart devices*.

The key to reducing the carbon impact of mobile phones is to keep them in use for as long as possible. This is for three reasons. First, 81 per cent of the embodied carbon emissions of a device come from its manufacture, distribution and end of life treatment rather than use. This is unlike

other electrical equipment, such as refrigerators or ovens, which produce the majority of emissions while being used. The product lifetime is, therefore, the key determinant of overall environmental impact, because a device that lasts longer spreads its manufacturing impacts over a longer time period.

Second, embodied carbon in smartphones is concentrated in several components, like integrated circuit boards and screens. These are nearly impossible to reuse in the manufacture of new devices, so extending the lifetime of the whole device is the best way to minimise its carbon impact.

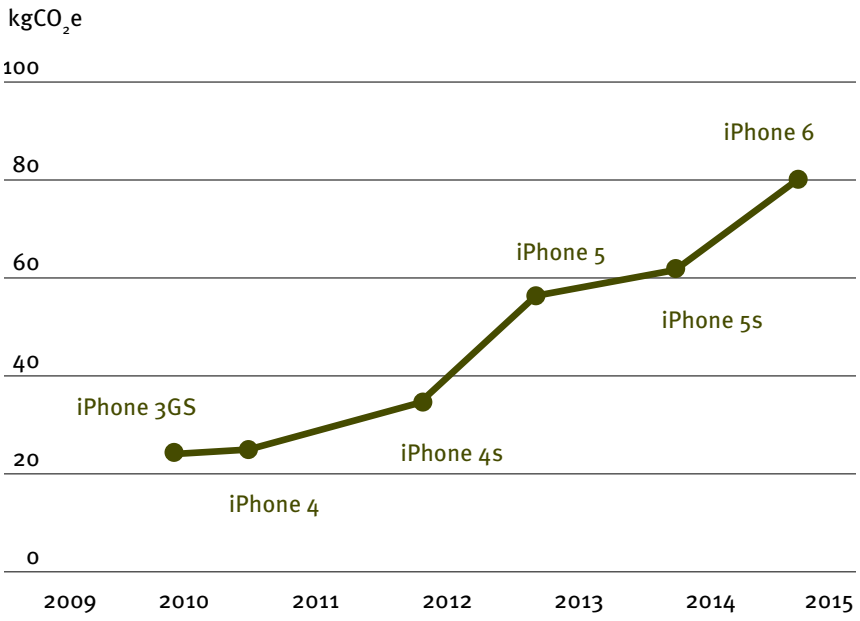
Embodied carbon is concentrated in several hard to reuse components



Apple iPod Touch 8gb third generation (2009) (proxy for iPhone)

Finally, with technology driving higher specifications, particularly faster processors and larger screens, embodied carbon is growing. This is particularly evident in Apple devices, which means it is even more important to keep newer devices in use for longer.[17] Unfortunately, this may mean that consumer preferences for keeping devices for longer only hold emissions from mobile phones steady, rather than cause an absolute decrease.

Embodied carbon of Apple devices rises as specifications increase

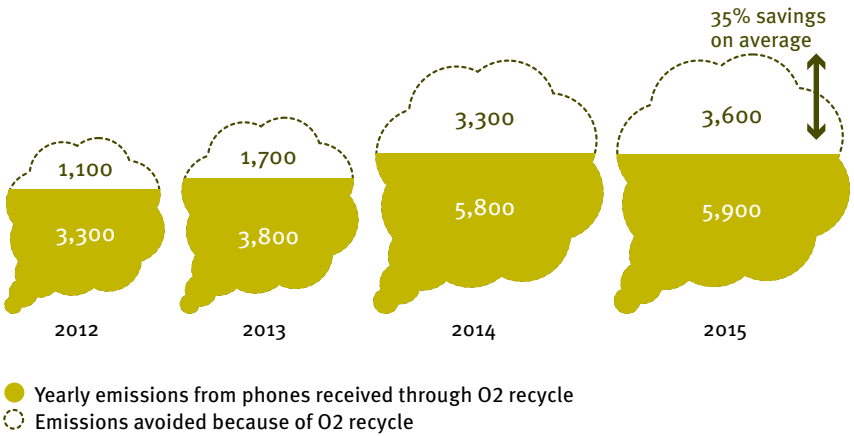


Reuse gives devices a second life, which cuts emissions

By giving phones a second life, the O2 Recycle programme has enabled savings of a total of ten thousand tonnes of carbon emissions since its inception in 2012. This is equivalent to around 35 per cent of the emissions that would have been produced had these devices been used for the standard UK average of 1.8 years. In absolute terms, it equates to 1.1 per cent of O2's UK CO_2 emissions.[18]

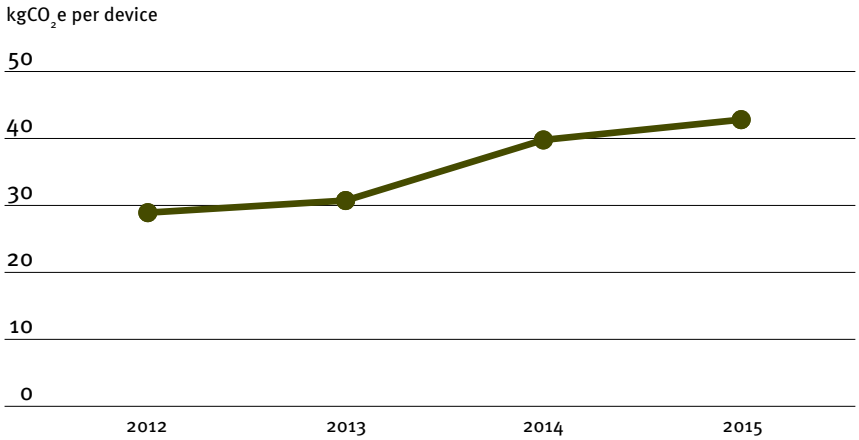
The year on year increase in savings can partly be attributed to the growing popularity of the scheme.

Emissions created and avoided, O2 Recycle



The rise in savings is also due to several other factors. In particular, the proportion of Apple devices sent to the programme has increased, which have higher embodied emissions.This means that reusing them saves disproportionately more emissions than reusing phones with lower footprints.The increase in Apple devices also increases the savings for another reason: used iPhones hold value better than other used smartphones and so can be reused for longer, which spreads their manufacturing impact over a longer period.

Average embodied carbon of devices reused through O2 Recycle

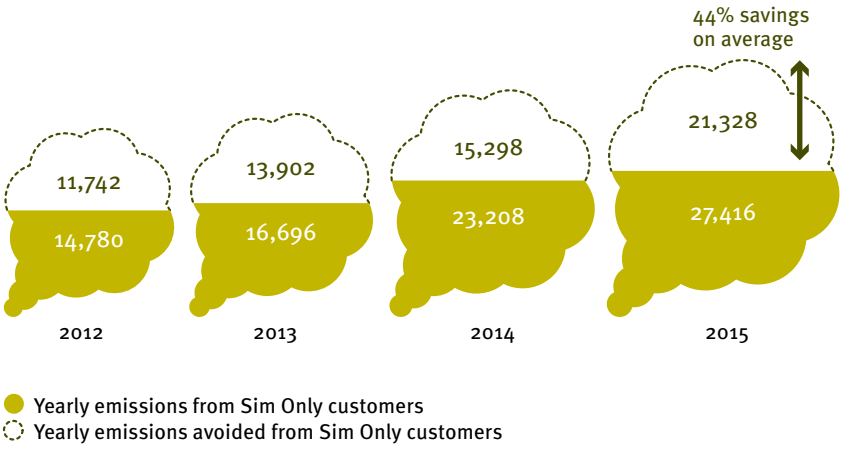


Airtime only plans enable a longer first life

By providing a plan that just charges for airtime, Sim Only customers have average emissions which are nearly half that of their counterparts on contracts with regular phone upgrades.

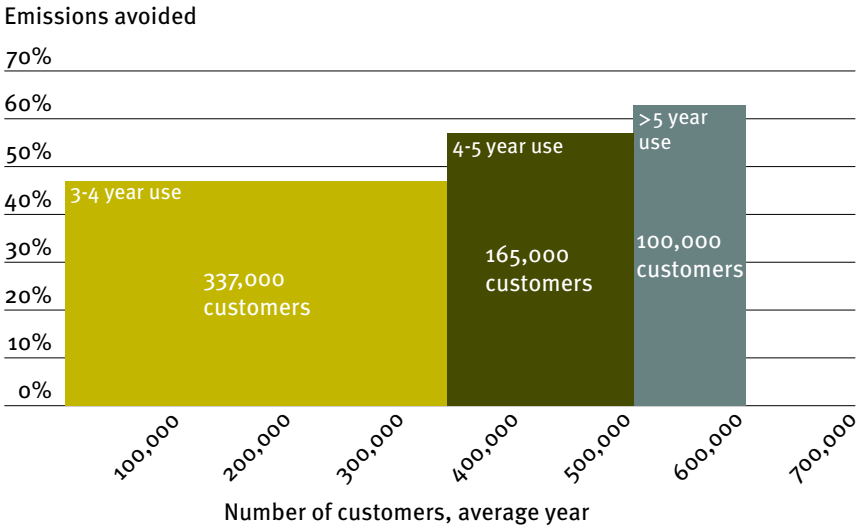
Overall, in 2015, Sim Only customers saved at least 21,000 tonnes of CO_2, compared to the typical 1.8 year upgrade cycle.

Emissions created and avoided, Sim Only

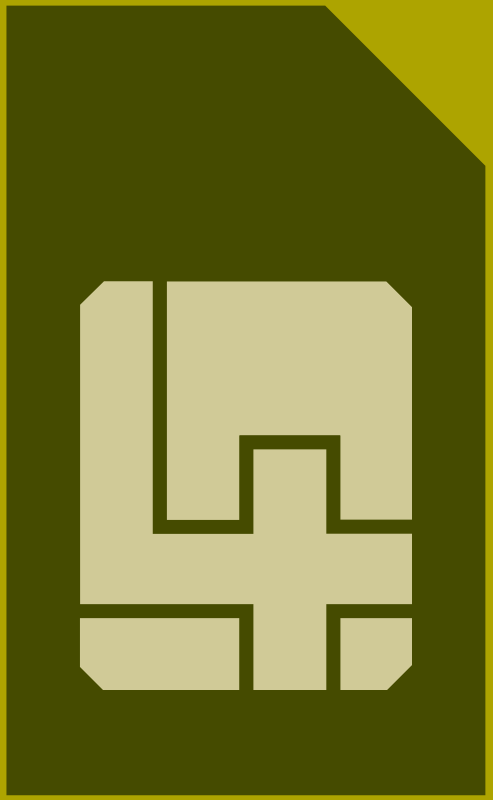


The average figures mask the fact that a significant number of Sim Only customers keep their devices for much longer, than the Sim Only average of 2.7 years. For customers with five year old phones, this can cut the carbon impact by more than 60 per cent.

Emissions avoided by Sim Only compared to standard 1.8 year use



How to enable greater uptake of circular models



O2's data shows that there is substantial demand for second hand devices and a market for customers who want to keep them in use for longer. There is, in theory, also ample supply of older devices but, these are generally sitting in people's drawers where they quickly lose their value. Finding better ways to link up supply and demand, and get second hand devices into the hands of the people that want them, will ensure that more phones can be useful for longer.

What companies can do

A number of opportunities exist for software providers, manufacturers, retailers and network operators to create more circular business models, as outlined in our 2015 report *A circular economy for smart devices.*

To make returning old phones the default option, companies can provide a leasing rather than ownership plan. Such programmes, which offer cheaper contracts but require customers to hand their phone in before they upgrade, have become popular in the US over recent years.

A less substantive change to existing business models would be to make it as easy and worthwhile as possible to sell old devices when a customer upgrades. This could be done right now: the app used to transfer data from an old phone to a new one could check the value of the old phone and offer a one-click sale, crediting the user's bank account. Combined with simple collection options, and the ability to securely wipe data, such an app would make it easier to resell an old phone than leave it in a drawer.

A third means of increasing returns would be to address the reason that many people keep hold of their old phones: the fear that their new device will break and they will need a back up while it is being repaired. Companies could address this concern by offering access to a temporary substitute phone as part of a contract.

What governments can do

Governments can also play a role in enabling more devices to stay in use for longer. They can stimulate circular business models to grow faster and enable consumers to choose when they want to upgrade. The most immediate opportunity for a government is to extend the EU's Ecodesign Directive to require mobile phone manufacturers to provide extended software support and longer lasting hardware.

Software obsolescence often occurs before the hardware breaks, meaning that working smartphones with unsupported operating systems have "limited to no resale value".[19] A requirement to provide software support for a minimum period of time would enable EU customers and companies to make better use of older hardware. The fact that Apple already provides software upgrades for nearly double the time that Android manufacturers do shows that extended software support is achievable, and the higher resale value of Apple devices suggests this is also valued by customers.

Similarly, cosmetic damage can halve a device's value on the resale market.[20] There is currently a huge variation in both the durability of devices and the cost of repair. Many devices do not have easily removable batteries or replaceable screens, the components which most frequently need replacing. Those that can be fixed cheaply and easily can be economic to repair for up to five years.[21] Requirements for durability and ease of disassembly could prevent many devices being prematurely retired.

Taken together, business innovation and sensible consumer-focused regulation would help circular business models to grow. The result would be longer lived devices, a mobile phone industry that is better aligned with consumer preferences, and much lower environmental impacts.

Methodology

For this report we, have broadly followed the methodology we developed for our 2015 report *A circular economy for smart devices*. Data from O2 has shown which models are actually being life extended and, in the case of Sim Only, how long for, allowing us to provide more realistic estimates of the environmental benefits of life extension.

Baseline scenario

Our baseline for the average lifetime of a device was 1.8 years. We then assumed that devices receive no second life. We determined the baseline environmental impact of a year of device use by dividing the total impact in the baseline use scenario by the baseline lifetime.

Life extension scenarios

Although the impacts from the use phase increased with a longer lifetime, the much greater manufacturing impacts were spread over a longer period and so reduced the overall impact per year.

For O2 Recycle, we extended the lifetime of the device to reach four and half years for Apple devices and three years for others. This is based on what we determined to be the average 'maximum economic lifetime', the point at which it is no longer profitable to resell a device. This is explained in *A circular economy for smart devices*.

The savings from each device type were calculated by subtracting the yearly impacts of a device used for the longer period from the yearly impacts of a device used for the baseline period. The total savings were calculated by multiplying the savings from each device by the number of devices of each type and aggregating the number of devices. Our calculations were as follows:

For Sim Only we took the average actual age of devices being used. This is a conservative estimate of savings because devices are probably not at the end of their lifetimes. However, they are likely to be closer to their end than average, given the attraction of the programme for customers who have paid off their two year contracts. It wasn't possible to approximate how close to the end of life these devices were, so additional savings would be incurred if this could be derived.

The savings were the difference between the average annual impacts per customer of Sim Only customers and average annual impacts of the 1.8 year phone using customer, multiplied by the number of Sim Only customers.

Sim Only savings cannot be aggregated over years due to the inclusion of previous years' customers in each data set.

Measuring embodied carbon and water

Estimates vary widely on the total embodied carbon, water and energy in electronic devices, which analysts attribute to different accounting methodology and the absence of regulatory standards, as much as differences between devices.

Where possible, we have used the estimates provided by manufacturers for individual

models. Published emissions data is only available from Nokia, Apple, Sony and Samsung and, excepting Apple, only for a fraction of the phone models being used on O2. Where not available we have made estimates based on models of a similar age and specification, where possible from the same manufacturer. Water estimates have come from Google.

Attributing emissions savings

While the single use of a device for 1.8 years is the norm, this is definitely not the case for all consumers. With currently more than 60 registered phone recycling companies operating in the UK, and up to 20 per cent of phones being handed on to a friend or relative, O2's Recycle programme is not unique in enabling a second life for used phones, though it is the largest in Europe.[22,23] Without the scheme, some O2 Recycle customers would no doubt have sold their phone elsewhere. O2 Recycle is, nevertheless, a pioneering programme, and savings from the scheme can be reasonably attributed to O2's activity.

On the other hand, O2 cannot definitively claim responsibility for Sim Only savings. Sim Only has encouraged customers to stay on O2 contracts without purchasing a new phone, and while this creates significant savings compared to a customer who does upgrade, Sim Only and pay as you go equivalents have always existed on O2 and other carriers.

The savings from these programmes are, in any case, significant and the fact that O2 is not the only company offering them is positive for the environment. As more companies adopt these business models, the environmental burden of the industry will continue to decrease, or at least grow more slowly.

Endnotes

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Green Alliance
Green Alliance is a charity and independent think tank focused on ambitious leadership for the environment. We have a track record of over 35 years, working with the most influential leaders from the NGO, business, and political communities. Our work generates new thinking and dialogue, and has increased political action and support for environmental solutions in the UK.

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