

POLICY AREA:  
**Circular Economy**

## Better Products By Design

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### Abstract

Our analysis of three products reveals how simple problems that frustrate consumers and waste resources could be easily fixed with new product standards for repairability and durability. None of the solutions require new technology or business models, just market rules that keep manufacturers competing over quality.

Leading economies should set ecodesign standards to deliver better products. The G20 can build on its approach to Energy Efficiency to promote resource efficiency and the circular economy, including measures to encourage better design.

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### Challenge

Rising demand means that it makes economic sense to get as much value as possible out of natural resources and avoid value being lost as waste. Leading companies are already increasing the circularity of their operations. With the right support from policy makers, circular business models can drive growth, cut unemployment and enhance international competitiveness, as well as reduce the pressure on primary resources.

Getting the most value out of natural resources also helps consumers, who at the moment are getting a bad deal: too many new products don't last as long as they should. The result is a huge waste of money and resources. But better products are possible, and G20 governments can play their part in improving them. Simple problems that frustrate consumers and waste resources could be easily fixed with new product standards for repairability and durability.

But better products are possible, and governments can help to improve them.

Our analysis of three products reveals how simple problems that frustrate consumers and waste resources could be easily fixed with new product standards for repairability and durability.

None of the solutions require new technology or business models, just market rules that keep manufacturers competing over quality.

Leading economies should set ecodesign standards to ensure better products, giving consumers a better deal while driving resource efficiency.

## Smartphones

Phones that last longer would be good for people and the planet. British consumers spend £1.1 billion on fixing broken screens, and keeping a phone going for just one extra year can cut its overall carbon footprint by a third.

Today's smartphones fail too soon because of broken screens and outdated software.

Nearly half of people say cost puts them off repairing their phone, and more than half of people upgrade because their phone is broken. On screens specifically:

- 50% of people have cracked their screen at least once
- 21% have a broken screen at the moment.

Phones which can't be upgraded have 'limited to no resale value', meaning perfectly useful hardware ends up being wasted.

- Over 75% of Android users run outdated and insecure software, even though their phones are less than two years old.
- In contrast, a two year old iPhone with software support retains nearly half its original value.

There are solutions to make smartphones more durable and repairable.

More durable screens already exist.

- Standard glass means screens break up to four out of every five times they are dropped.
- The best glass on the market claims to survive up to 80% of falls.
- Motorola's genuinely unbreakable screens are already in two phone models.

Easily replaceable screens already exist:

- HTC One M9: screen repair takes 90 minutes, and costs £100
- iPhone 6: screen repair takes 60 minutes, and costs £110
- Fairphone 2: screen repair takes less than one minute, and costs £70

Longer software support is possible. Apple's iPhone 4 received 45 months of software support and upgrades, whereas the Google Nexus S received support for less than half the time – just 22 months. Both phones have hardware and software that are designed by a single company, and are sold to similar customers.

## Washing machines

The proportion of washing machines being replaced due to manufacturing defects that are less than five years old has more than doubled. If washing machines lasted as long as consumers expect, Europeans would save £3.6 billion and generate 900,000 fewer tonnes of e-waste annually.

- The average lifetime of a washing machine fell by a third between 2000 and 2010.
- They're now replaced once every seven years, even though consumers expect them to last 12 years.

- One in eight machines now fails in its first five years.

But modular design can end early obsolescence.

Components subject to wear and tear can be designed for repair:

- Most washing machines now use unreplaceable bearings and paddles, meaning the whole drum has to be removed, costing over £200.
- Replaceable paddles and bearings cost less than £20 to repair.
- Similarly, detachable hooklets mean these can be replaced without throwing away the whole door.

More durable doesn't have to mean more expensive over a product's lifetime.

- An average washing machine has a 7 year lifetime. It costs £343, or £49 a year for each year it lasts.
- A more durable Bosch washing machine has a 10 year lifetime guarantee. It costs £371 up front, or £37 a year over the course of its lifetime.

## Solar Panels

Solar is one of the greenest forms of power, projected to triple in the next decade. But making solar panels is a resource and energy intensive process. Using panels for longer reduces their carbon footprint and keeps critical materials in use.

Recycling solar panels is good, but it doesn't always capture the critical materials that go into solar panels:

- 91 per cent of solar panels are made of purified silicon. This is a critical material, essential to the industry but subject to supply disruptions.
- The remaining nine per cent of solar panels are made from thin films, which depend on five other critical materials: Indium, Tellurium, Gallium, Selenium and Cadmium.

The solar cell is the most valuable component of the panel, and 76 per cent of the panel's embodied energy is from purifying the silicon inside the cells. But solar cells are embedded in non-melting plastics so cannot be recovered by standard recycling processes. Instead panels are crushed to recover low value materials, destroying the cells.

The result is that less than 2% of the panel's value is recovered.

Better designs save resources and last longer. In particular, reuse cuts solar's carbon footprint by two thirds. This can be achieved by:

- Using detachable frames and glass mean solar panels can be disassembled for reuse.
- Using thermoplastics to seal panels (rather than unmeltable plastics) means solar cells can be recovered by melting the plastics away instead of being crushed.
- Average panels lose 20% of their efficiency after 25 years due to water ingress, contamination and material weaknesses. But good design means leading manufacturers' panels last at least ten years longer. The best panels don't degrade at all.

## Proposal

### Creating a G20 dialogue on resource efficiency

#### Developing a G20 Resource Efficiency Action Plan

In 2014 the G20 endorsed the [G20 Energy Efficiency Action Plan](#). In 2016 the [G20 Energy Efficiency Leading Programme](#) was developed.

Resource efficiency is increasingly recognized as a key economic driver, creating employment and economic opportunities, whilst delivering environmental benefits at the same time.

Building upon the G20 work on Energy Efficiency, the G20 should develop activities to promote resource efficiency.

The [G7 Alliance on Resource Efficiency](#) can provide a model. For the first time, in 2017, initiatives on resource efficiency and the circular economy have been introduced to the G20 process via the T20 taskforce on the Circular Economy, and the [B20 Energy, Climate and Resource Efficiency taskforce](#).

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### Promoting better products by design

#### Including exchanges on ecodesign principles within a G20 Resource Efficiency Action Plan

Simple design choices make the difference between high quality products and premature obsolescence. Better design should be discussed at international level since most national markets aren't big enough to justify setting their own rules, and having to meet different regulations in different countries would drive up product costs. Ecodesign has been recognised as a significant element in the transition to the circular economy by the G7 when establishing the G7 Alliance on Resource Efficiency.

Future G20 work on resource efficiency should include discussion between G20 members, B20 businesses, T20 think tanks, and civil society organisations on how to promote better product design to drive resource efficiency.

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## References

### Smartphones

- “Cracked Screens and Broken Hearts: The 2015 Motorola Global Shattered Screen Survey”, 29<sup>th</sup> October, 2015, Motorola, <http://motorola-blog.blogspot.co.uk/2015/10/cracked-screens-and-broken-hearts-2015.html>
- p35, Corinna Fischer et al, *Preparatory Study to establish the Ecodesign WorkingPlan 2015-2017 implementing Directive 2009/125/EC*, Bio by Deloitte, 12<sup>th</sup> September, 2014, [http://www.eurovaprint.eu/fileadmin/eurovaprint\\_files/pdfs/Ecodesign\\_WP3\\_Task\\_3\\_Draft\\_Final\\_Report\\_17092014.pdf](http://www.eurovaprint.eu/fileadmin/eurovaprint_files/pdfs/Ecodesign_WP3_Task_3_Draft_Final_Report_17092014.pdf)
- Martim Lobao, "Software Updates: A Visual Comparison Of Support Lifetimes For iOS vs. Nexus Devices", 17th September 2015, *Android Police*,
- Toni Sacconaghi, 7 August 2013, *The long view: the used smartphone market, part 1: what, where and how big?*, Bernstein Research, p 11
- Green Alliance calculations, see D Benton, E Coats and J Hazell, 2015, *A circular economy for smart devices*, Green Alliance, [www.green-alliance.org.uk/a\\_circular\\_economy\\_for\\_smart\\_devices.php](http://www.green-alliance.org.uk/a_circular_economy_for_smart_devices.php)
- Green Alliance calculations, using *Revealed: Britain's £5 billion mobile problem*, Squaretrade, 22<sup>nd</sup> September, 2014, <https://www.squaretrade.co.uk/merchant/pdf/uk/revealed-britains-5-billion-mobile-program.pdf> and Kevin Culligan and Brian Menzies, 29 March 2013, The value of consumer electronics for trade-in and re-sale, WRAP, appendices, available on request, [www.wrap.org.uk/node/18473](http://www.wrap.org.uk/node/18473)
- Green Alliance calculations, D Benton, E Coats and J Hazell, 2015, *A circular economy for smart devices*, Green Alliance, [www.green-alliance.org.uk/a\\_circular\\_economy\\_for\\_smart\\_devices.php](http://www.green-alliance.org.uk/a_circular_economy_for_smart_devices.php)
- Ron Amadeo “Corning Gorilla Glass 5 survives drops “up to 80%” of the time”, *Ars Technica UK*, 21st July, 2016, <http://arstechnica.co.uk/gadgets/2016/07/corning-gorilla-glass-5-released/>
- iSmash <https://www.ismash.com/>
- Green Alliance calculations, see D Benton, E Coats and J Hazell, 2015, *A circular economy for smart devices*, Green Alliance, [www.green-alliance.org.uk/a\\_circular\\_economy\\_for\\_smart\\_devices.php](http://www.green-alliance.org.uk/a_circular_economy_for_smart_devices.php) and Martim Lobao “Software Updates: A Visual Comparison Of Support Lifetimes For iOS vs. Nexus Devices”, 17<sup>th</sup> September 2015, <http://www.androidpolice.com/2015/09/17/software-updates-a-visual-comparison-of-support-lifetimes-for-ios-vs-nexus-devices>
- Nigel Cassidy, “Getting in a spin: Why washing machines are no longer built to last”, 2nd May, 2014, BBC, <http://www.bbc.co.uk/news/business-27253103>
- Sean Poulter, “Washing machines 'cheaper to replace than fix': Manufacturers accused of making appliances too costly and complicated to repair”, 28th June 2015, Mail Online, <http://www.dailymail.co.uk/news/article-3130577/Washing-machines-cheaper-replace-fix-Manufacturers-accused-making-appliances-costly-complicated-repair.html>
- Siddharth Prakash et al, *Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung: Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen „Obsoleszenz“*, Umwelt Bundesamt, October 2015, [https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte\\_10\\_20\\_15\\_einfluss\\_der\\_nutzungsdauer\\_von\\_produkten\\_auf\\_ihre\\_umwelt\\_obsoleszenz\\_17.3.2015.pdf](https://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_10_20_15_einfluss_der_nutzungsdauer_von_produkten_auf_ihre_umwelt_obsoleszenz_17.3.2015.pdf)
- Green Alliance calculations using *Ecodesign and Energy label revision : Household Washing machines and washer-dryer*, JRC, April 2015, [http://susproc.jrc.ec.europa.eu/Washing\\_machines\\_and\\_washer\\_dryers/docs/Prepstudy\\_WAS](http://susproc.jrc.ec.europa.eu/Washing_machines_and_washer_dryers/docs/Prepstudy_WAS)

[H\\_20150601\\_FINAL\\_v2.pdf](#),

and <http://www.pordata.pt/en/Europe/Private+households+total+and+by+number+of+children-1615>

#### *Washing Machines*

- “Are washing machines built to fail?”, Which?, 17<sup>th</sup> June 2015, <http://www.which.co.uk/news/2015/06/are-washing-machines-built-to-fail-406177/>
- BEUC, November 2014, *Planned Obsolescence of Products: Prevalence, Manifestations, Causes, Remedies* [http://www.beuc.eu/documents/files/FC/durablegoods/conference/presentations/Christian\\_Kreiss.pdf](http://www.beuc.eu/documents/files/FC/durablegoods/conference/presentations/Christian_Kreiss.pdf)
- Green Alliance calculations, using WRAP, *Specifying durability and repair in washing machines*, June 2011, <http://www.wrapcymru.org.uk/sites/files/wrap/Washing%20machine%20case%20study%20AG.pdf>
- DECC, July 2014, *Energy efficient products - helping us cut energy use* [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/328083/Energy\\_efficient\\_products\\_helping\\_us\\_to\\_cut\\_energy\\_use\\_publication\\_version\\_final.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/328083/Energy_efficient_products_helping_us_to_cut_energy_use_publication_version_final.pdf)
- p19, Fraunhofer Institute for Solar Energy Systems, ISE, *Photovoltaics report*, 6<sup>th</sup> June 2016, <https://www.ise.fraunhofer.de/de/downloads/pdf-files/aktuelles/photovoltaics-report-in-englischer-sprache.pdf>
- Solar Energy Industries Association, “Critical Materials & Rare Earths”, <http://www.seia.org/policy/manufacturing-trade/critical-materials-rare-earth>
- p4, Carol Olson, Bart Geerligs, Maurice Goris, Ian Bennett and Jan Clyncke, “Current and future priorities for mass and material in silicon PV module recycling”, EUPVSEC, September 2013, <ftp://ftp.ecn.nl/pub/www/library/report/2013/m13040.pdf>
- Green Alliance calculations
- p36, Michael Schmela, *Global Market Outlook*, Solar Power Europe, 23<sup>rd</sup> June 2016, <http://www.solarpowereurope.org/insights/new-global-market-outlook-2016/>

#### *Solar panels*

- M.A.A. Goris, V. Rosca, L.J. Geerligs, B. de Gier, “Production of recyclable crystalline Si PV module”, EU PVSEC, September 2015, [http://www.sustainablepv.eu/fileadmin/sustainablepv/user/doc/5EO\\_1\\_2\\_paper.pdf](http://www.sustainablepv.eu/fileadmin/sustainablepv/user/doc/5EO_1_2_paper.pdf)
- conversations with researchers
- John Fitzgerald Weaver, “SolarCity pushing industry to 40% increase in useful lifetime of solar power installations”, 4<sup>th</sup> July, 2016, <https://electrek.co/2016/07/04/solarcity-increase-useful-lifetime-of-solar-power-installations/>
- Andreas Meisel et al, *SolarCity, SolarCity Photovoltaic Modules with 35 Year Useful Life*, 2016, <http://www.solarcity.com/sites/default/files/reports/SolarCity%20Photovoltaic%20Modules%20with%2035%20year%20Useful%20Life.pdf>
- “Kyocera solar modules at actual 20+ year-old installations still performing with high-efficiency”, 30<sup>th</sup> November 2011, [http://www.kyocerasolar.eu/index/news/previous\\_news/news\\_archive\\_detail.L3NvbGFyX2VsZWN0cmJX3N5c3RlbXMvbmV3cy8yMDExL0t5b2NlcmFfc29sYXJfbW9kdWxlc19hdF9hY3R1YWxfMjBfX3llYXItb2xkX2luc3RhbGxhdGlvbNfc3RpbGxfcGVyZm9ybWluZ193aXRoX2hpZ2gtZWZmaWNpZW5jeQ~.html](http://www.kyocerasolar.eu/index/news/previous_news/news_archive_detail.L3NvbGFyX2VsZWN0cmJX3N5c3RlbXMvbmV3cy8yMDExL0t5b2NlcmFfc29sYXJfbW9kdWxlc19hdF9hY3R1YWxfMjBfX3llYXItb2xkX2luc3RhbGxhdGlvbNfc3RpbGxfcGVyZm9ybWluZ193aXRoX2hpZ2gtZWZmaWNpZW5jeQ~.html)

## Implementation Overview

- European Union: the [Ecodesign Directive](#) provides regulatory basis for promoting product design based upon energy efficiency and resource efficiency.
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## Existing Agreements

- 2014 G20 Energy Efficiency Action Plan
  - 2016 G20 Energy Efficiency Leading Programme
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## Existing Policies and Monitoring

- The 2016-2019 European Union [Ecodesign Working Plan](#) extends the use of ecodesign to cover resource efficiency for specified products. This working plan will be put in to action over the next two years.