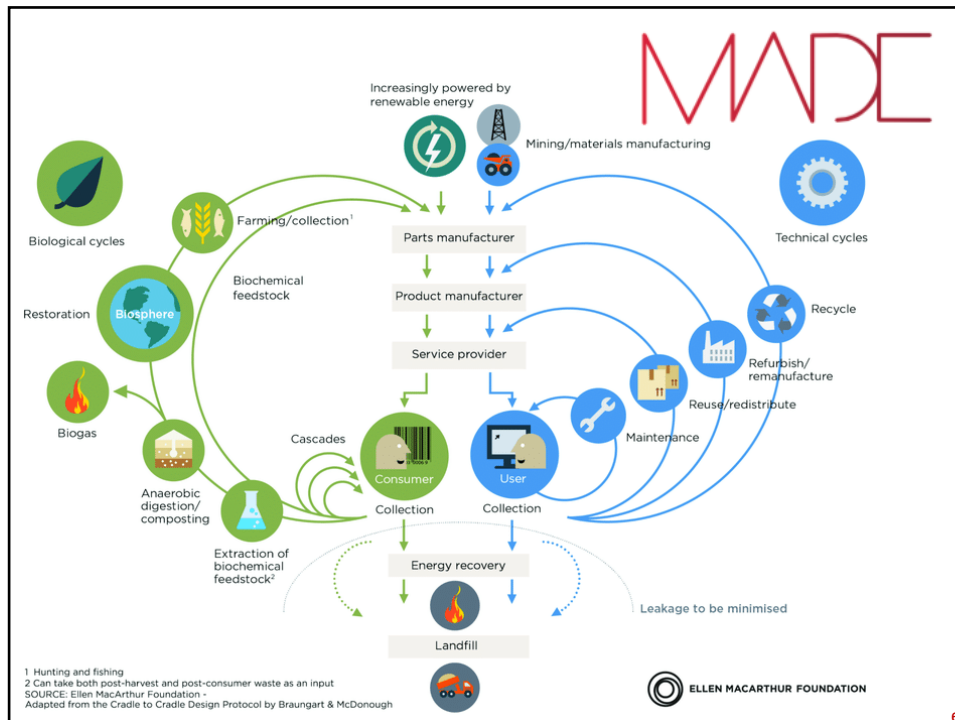




6

Linear Economies

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

- **Take, Make & Dispose**
- Anyone see problems with this?

! Limited resources

! Increasing costs of resources and energy

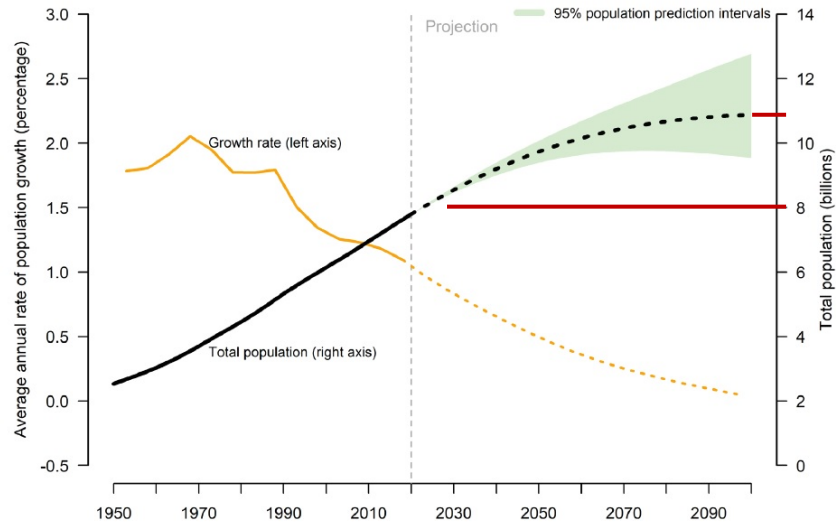
! Increasing consumer population

! Increase in middle class consumers from the developing countries.

8

World population growth

Population growth continues at the global level, but the rate of increase is slowing, and the world's population could cease to grow around the end of the century

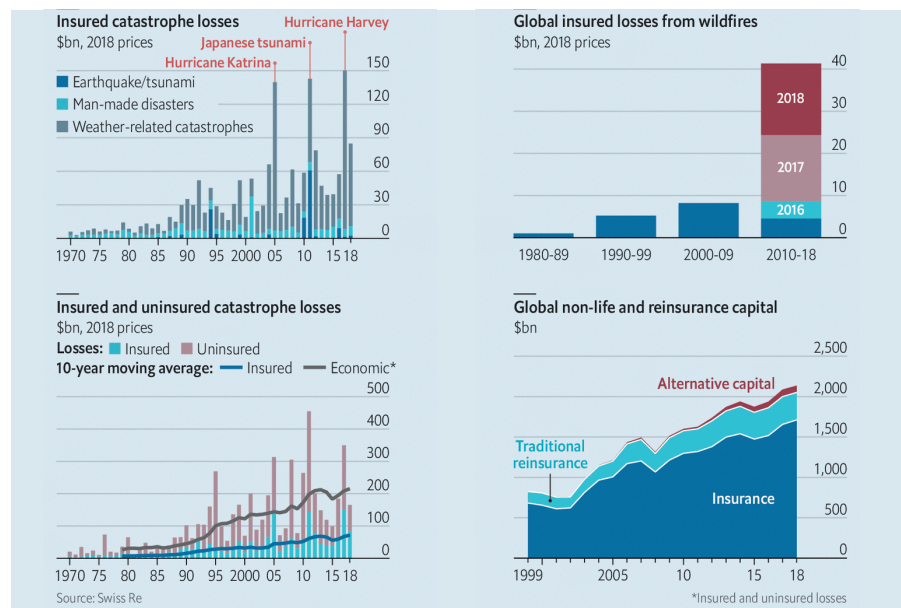


Data source: United Nations, Department of Economic and Social Affairs, Population Division (2019) World Population Prospects 2019

9

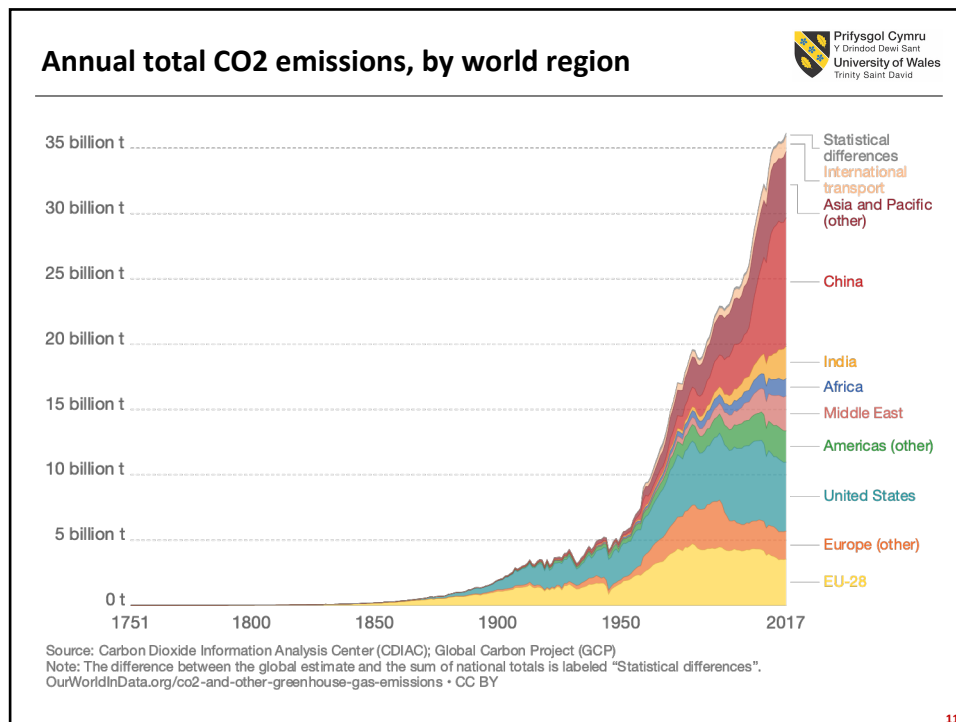
9

Climate effects



10

10



11

Impact of Global Warming of 1.5°C

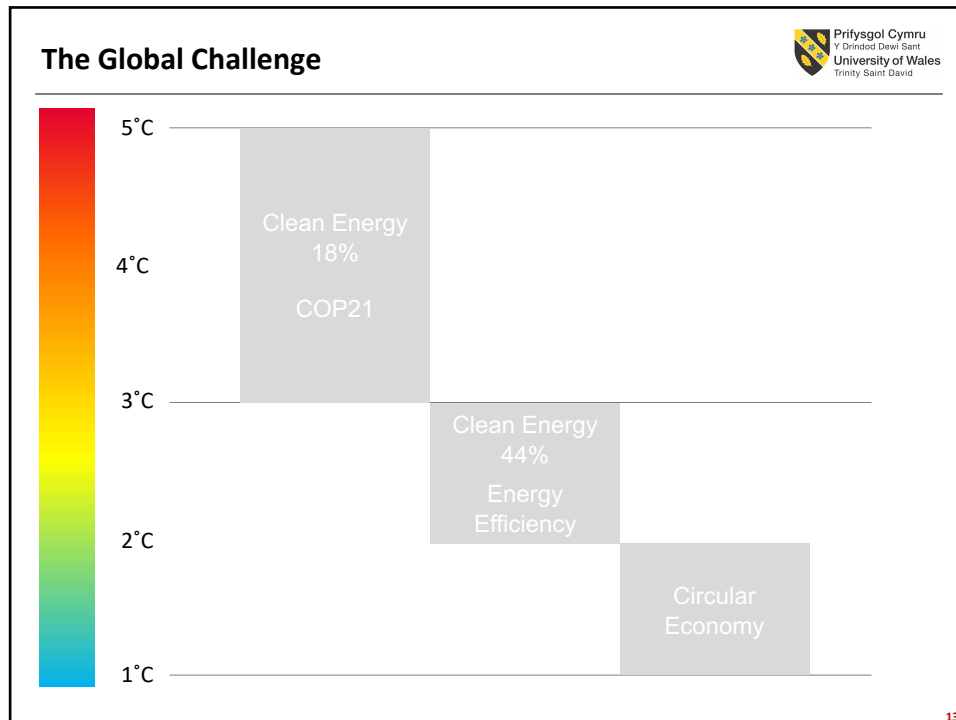
Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

ipcc
INTERGOVERNMENTAL PANEL ON climate change
WHO UNEP

Global Warming of 1.5 °C

An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

12



13

What is a Circular Economy?

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Currently, most economies are Linear;

- Make > Use > Dispose approach.

The idea of a Circular economy is to;

- Keep resources in use as long as possible and extract the maximum value from them whilst in use.
- Recover and regenerate products and materials at the end of each service life so that waste is designed out.
- Biological materials are non-toxic and can easily be returned to the soil by composting or anaerobic digestion.
- Technical materials: polymers, alloys, and other man-made materials are designed to be recovered, refreshed and upgraded, minimising the energy input required and maximising the retention of value (in terms of both economics and resources).

14

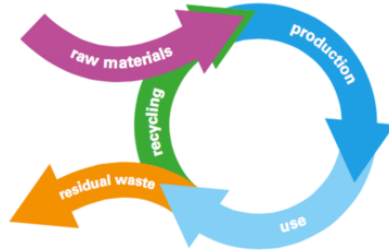
14

From a Linear to a Circular economy

LINEAR ECONOMY



ECONOMY WITH FEEDBACK LOOPS



CIRCULAR ECONOMY



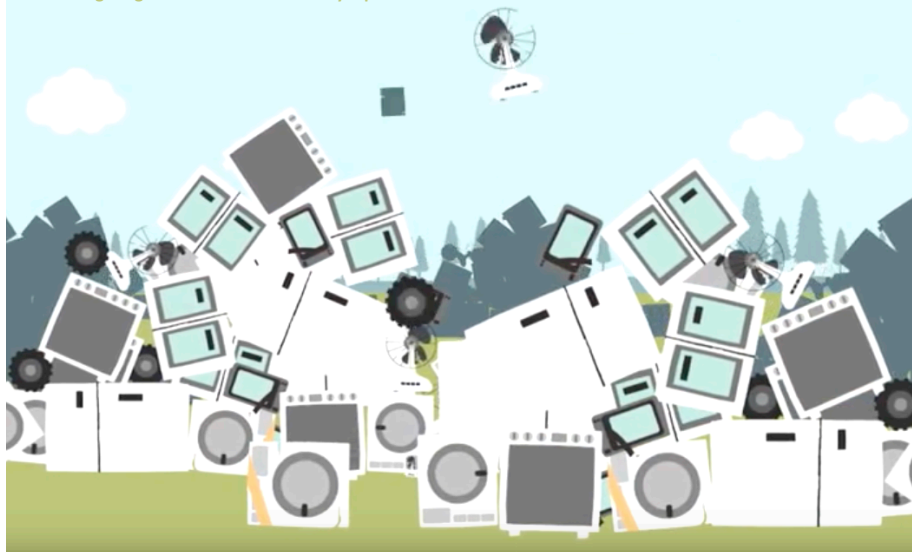
- Take, Make & Dispose
- Can we renew or refurbish and introduce as a new product in the supply chain?
- Keep resources in use if possible and extract the maximum value from them whilst in use.
- Trying to reduce waste and avoid pollution and do this by design, from the very beginning.
- Recover and regenerate products and materials at the end of each service life.

15

15

The concept of the Circular economy

Re-thinking Progress The Circular Economy.mp4



16

16

How does Additive Manufacturing help?

Why is Additive Manufacturing important to enabling a Circular Economy?

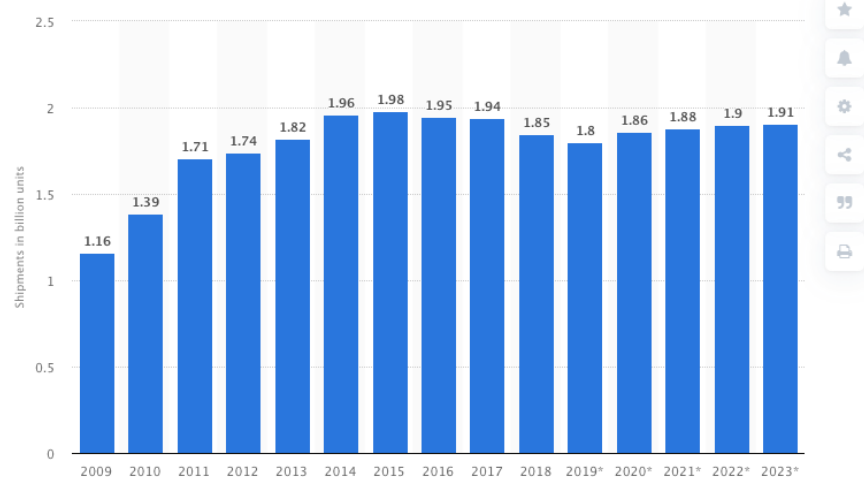
- Waste Reduction
 - Localisation
 - Repair and Reuse loop
 - Bio-based materials
 - Technical Cycle
-
- Additive manufacturing could still be said to be in its infancy, despite some already-notable successes.
 - The many advantages of the technology make it very likely the role of additive manufacturing will only increase as further advancements are made and entry costs continue to fall.

18

18

Mobile phone global sales from 2009 to 2023 (in billions)

MADE



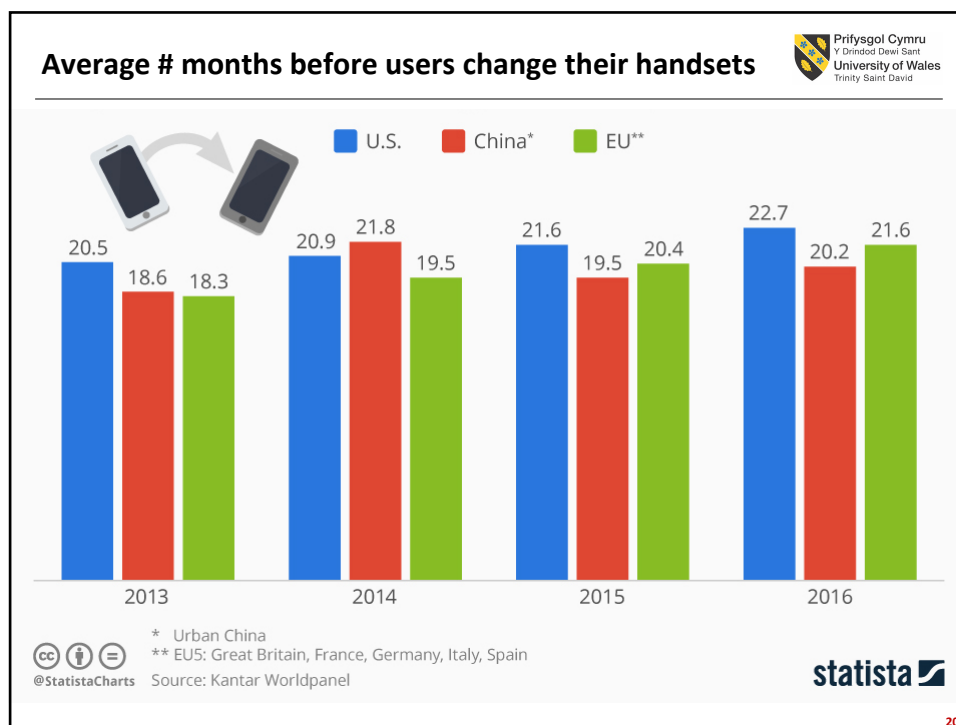
© Statista 2020

[Additional Information](#)

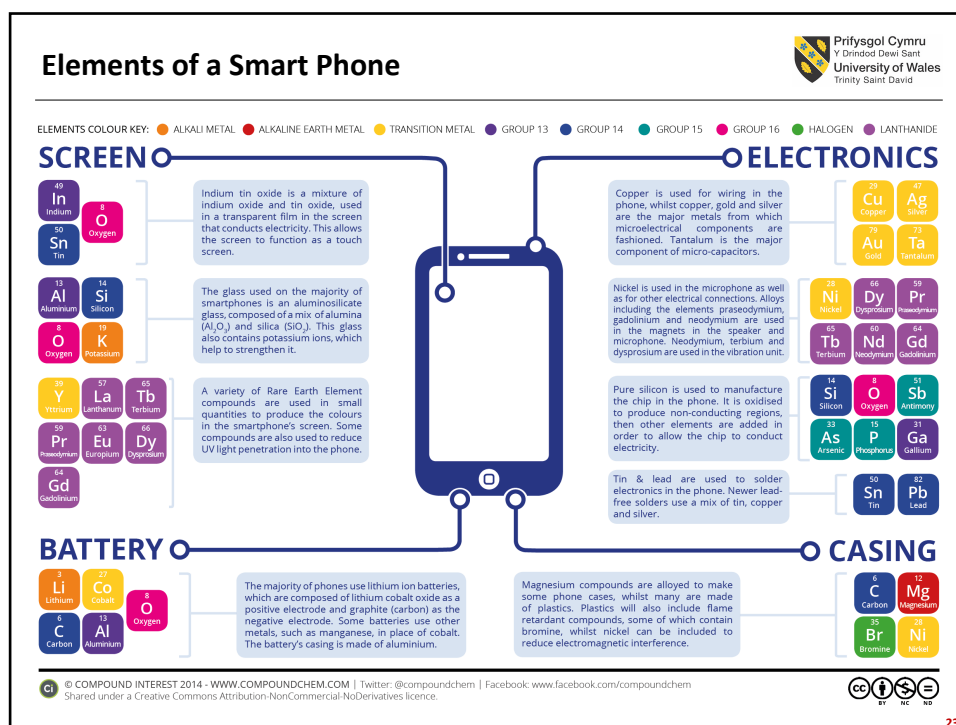
[Show source](#)

11

19

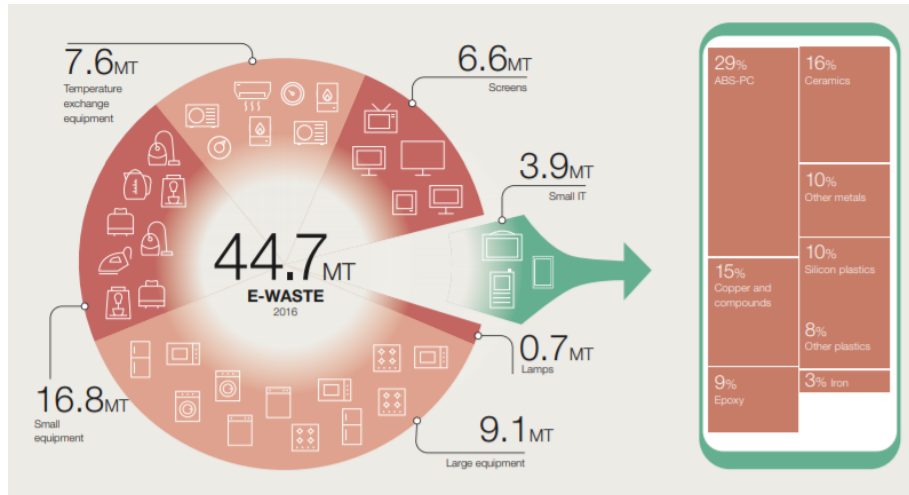


20



23

What can we recycle from a Mobile Phone?



24

24

What would this mean? (For the 174 million phones shipped in 2013)

Cobalt 700 tonnes	Gold 4.2 tonnes	Palladium 0.5 tonnes	Silver 17 tonnes	Copper 1,740 tonnes
-----------------------------	---------------------------	--------------------------------	----------------------------	-------------------------------



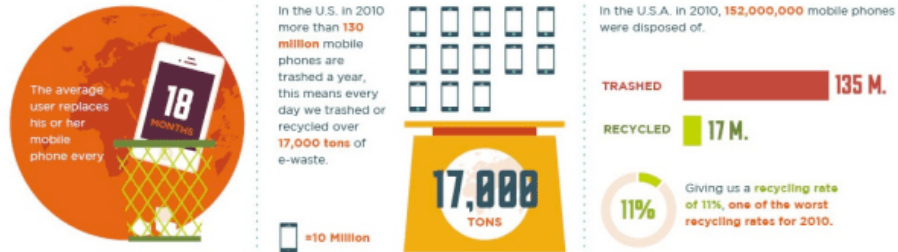
Liam, Apple's super-secret, 29-armed robot that tears down iPhones
Capacity to tear-down 2.4 million iPhones per year (www.digitaltrends.com, 2016)
215.3 million iPhones sold in the same year.

25

25

Waste by Numbers

E-WASTE BY THE NUMBERS: HOW MUCH ARE WE GETTING RID OF?

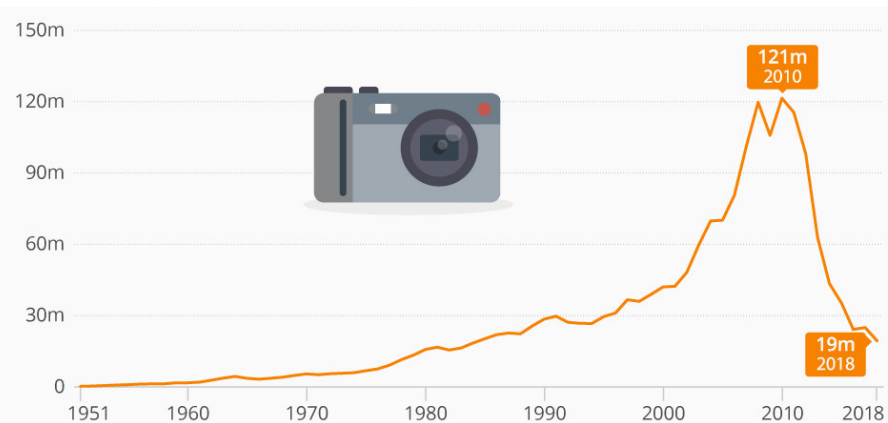


WHAT HAVE PEOPLE DONE WITH THEIR OLD MOBILE PHONES?



26

What Smartphones have done to the Camera industry

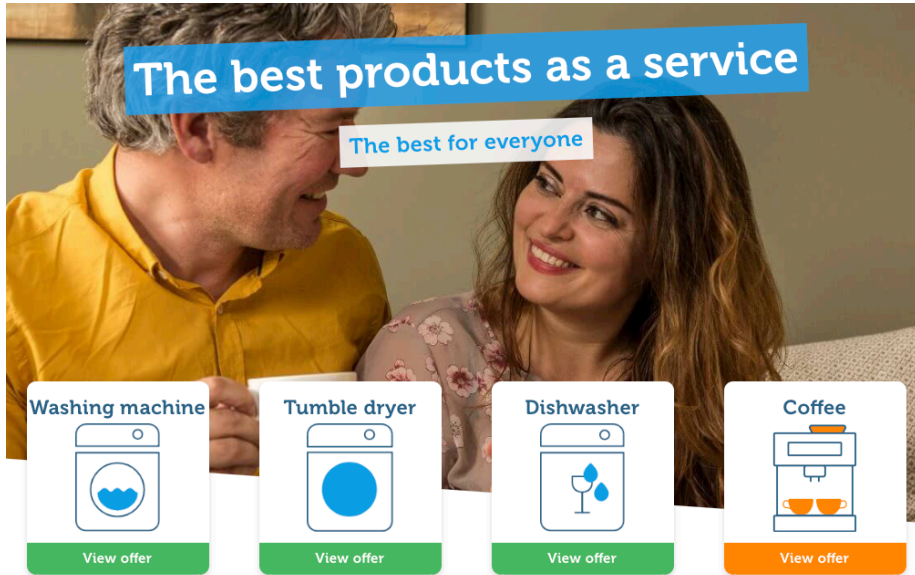


* CIPA (Camera & Imaging Products Association) is an international industry group consisting of members engaged in the development, production or sale of imaging related devices. Members include Olympus, Casio, Canon, Fujifilm, Sony and Nikon among others.

@StatistaCharts Source: CIPA

statista

27



The best products as a service

The best for everyone

- Washing machine  View offer
- Tumble dryer  View offer
- Dishwasher  View offer
- Coffee  View offer

28

28

- In 2013, Marcel Peters found out that laundry creates a lot of waste. He claimed that the use of sustainable appliances can be cheaper than the ownership of low-quality disposable appliances (throw-away appliances) if we start using it in a smarter way. This would increase the fun and reduce the waste.
- He became inspired by visionary thinkers, such as Walter Stahel (Performance Economy) and Ellen MacArthur (Circular Economy), quitted his job as an innovation manager for a large Energy Utility, and founded Bundles in 2014
- Bundles take responsibility for maintenance in order to increase the lifetime of the appliances. Moreover, they take care of upcycling and repairs of broken appliances aiming to capture the value of the applied materials.



29

29

Impacts of Fast Fashion



30

30

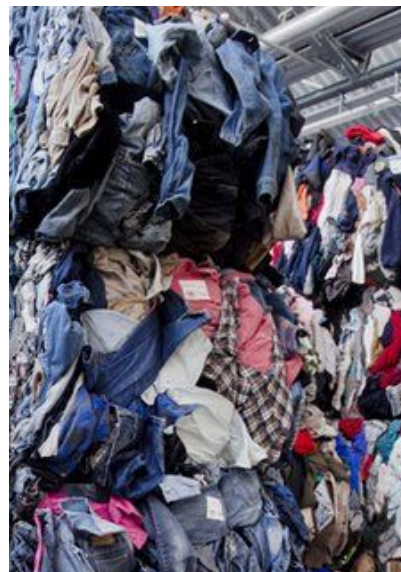
Impact of Fast Fashion

2 tonnes of clothing bought each minute in the UK

This produces **50 tonnes** of carbon emissions, equivalent to driving **162,000 miles** in a car.

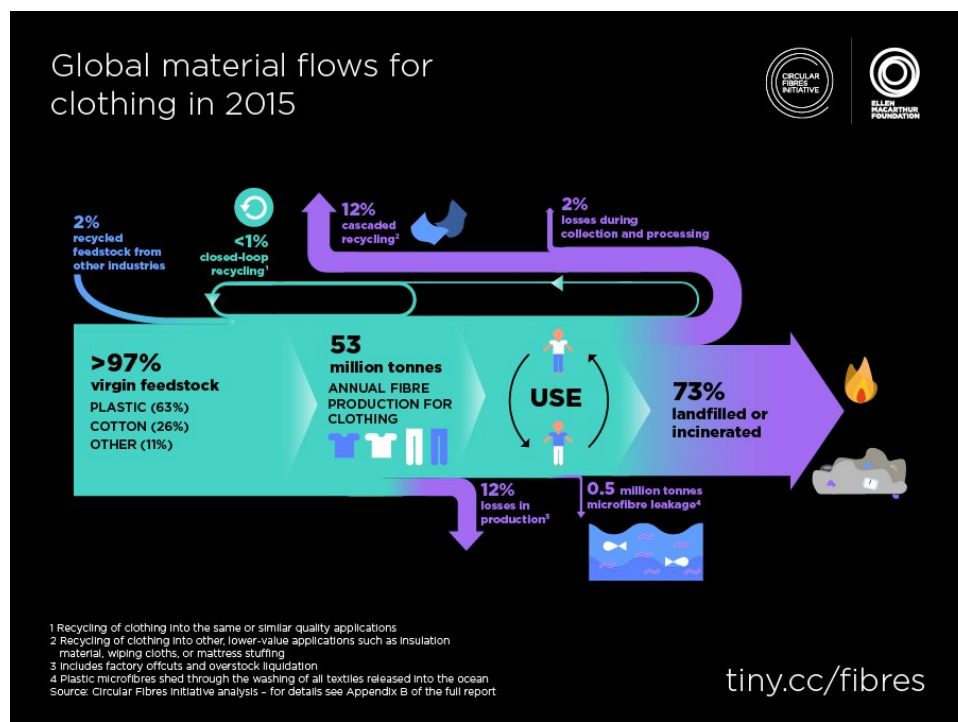
2014 saw the fashion industry produce **100 billion** garments.

14 items per person and **30%** will never be sold.

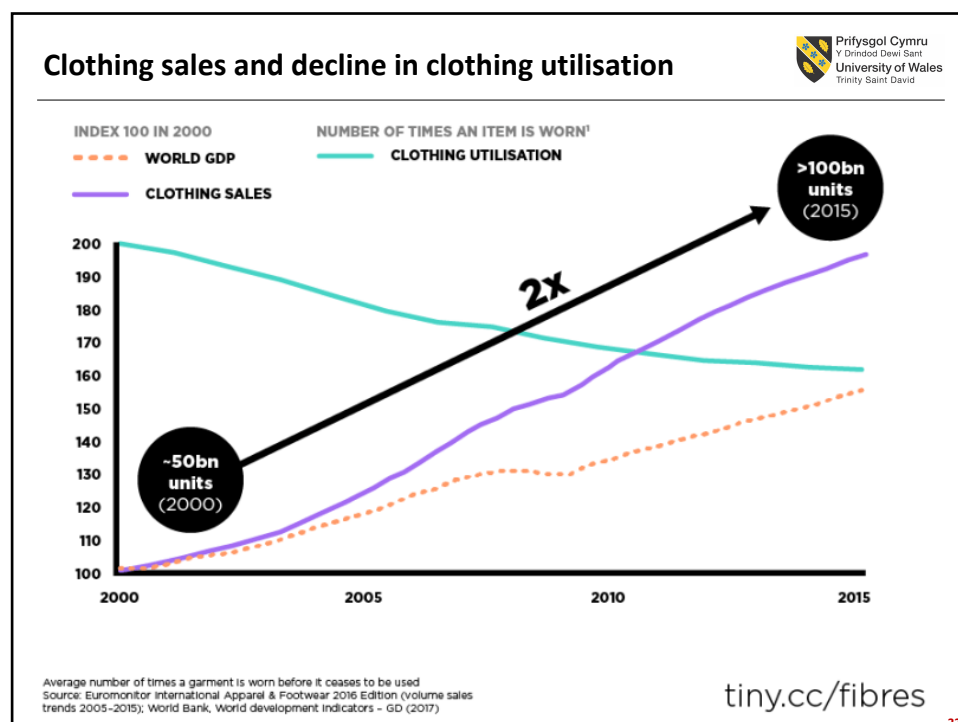


31

31



32



33

H&M Recycling initiative



34

34

The True Cost



35

35

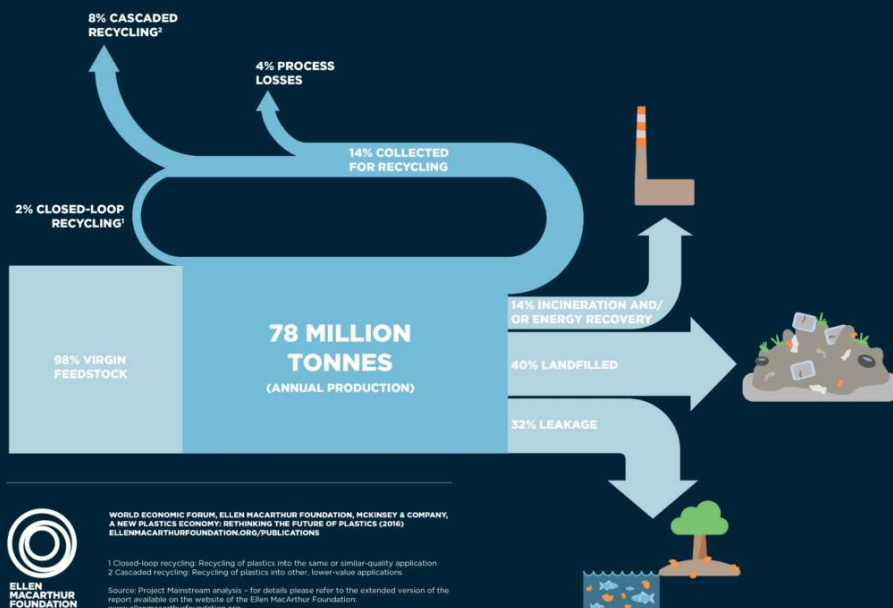
ELLEN MACARTHUR FOUNDATION THE CIRCULAR ECONOMY 100



36

36

TODAY, PLASTIC PACKAGING MATERIAL FLOWS ARE LARGELY LINEAR



37

Laser Printer Cartridge Recycling



38

38

British Standard 8001:2017

BS 8001:2017



BSI Standards Publication

**Framework for implementing the
principles of the circular economy in
organizations – Guide**

39

39

Critical appraisal of BS 8001:2017

Full length article

Critical appraisal of the circular economy standard BS 8001:2017 and a dashboard of quantitative system indicators for its implementation in organizations



Stefan Pauliuk

Industrial Ecology Group, Faculty of Environment and Natural Resources, University of Freiburg, Tennenbacher Strasse 4, D-79106 Freiburg, Germany

ARTICLE INFO

Keywords:

Circular economy
Circularity indicator
BS 8001
3R
Material flow analysis
Life cycle assessment

ABSTRACT

So far, organizations had no authoritative guidance on circular economy (CE) principles, strategies, implementation, and monitoring. Consequentially, the British Standards Institution recently launched a new standard "BS 8001:2017 – Framework for implementing the principles of the circular economy in organizations".

BS 8001:2017 tries to reconcile the far-reaching ambitions of the CE with established business routines. The standard contains a comprehensive list of CE terms and definitions, a set of general CE principles, a flexible management framework for implementing CE strategies in organizations, and a detailed description of economic, environmental, design, marketing, and legal issues related to the CE.

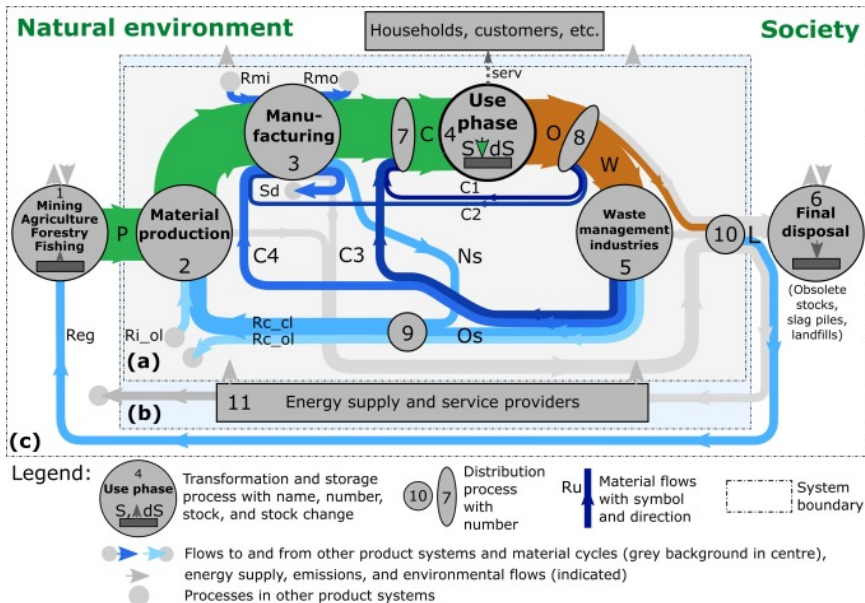
The guidance on monitoring CE strategy implementation, however, remains vague. The standard stipulates that organizations are solely responsible for choosing appropriate CE indicators. Its authors do not elaborate on the links between CE strategy monitoring and the relevant and already standardized quantitative tools life cycle assessment (LCA) and material flow cost accounting (MPCA).

Here a general system definition for deriving CE indicators is proposed. Based on the system definition and the indicator literature a dashboard of new and established quantitative indicators for CE strategy assessment in organizations is then compiled. The dashboard indicators are mostly based on material flow analysis (MFA), MPFA, and LCA. Steel cycle data are used to illustrate potential core CE indicators, notably, the residence time of a material in the techno-sphere (currently 250–300 years for steel). Moreover, organizations need to monitor their contribution to in-use-stock growth, a central driver of resource depletion and hindrance to closing material cycles.

40

40

Critical appraisal of BS 8001:2017



41

41

Beer kegs



42

42

Kegspertise

Managing reusable kegs poses a challenge for brewers. The metal containers are typically valued at around £100, with over 100,000 in the supply chain.

Breweries can receive useful cycle data regarding kegs that were shipped out and returned empty.

It can then provide information to Carlsberg UK, such as when order volume increases, which seasons may put extra demands on production lines, and thus what ordering behaviour the brewer can expect in the future.



43

43

Economic benefits

The implementation of a circular economy vision could foster the emergence of:

Thriving cities in which economic productivity increases through reduced congestion, eliminated waste, and reduced costs. New growth and business opportunities support skills development and jobs

Liveable cities with improved air quality, reduced pollution, and enhanced social interactions

Resilient cities, reducing reliance on raw materials by keeping products in use and balancing local production with global supply chains



45

45

Economic benefits



10-15% of building material wasted during construction

0-0.5% productivity increase per year in most European countries **1990-2015**, whereas **2%** per year achieved in some countries



60% of European offices are not used even in working hours

50% of residential dwellers report living in too much space



20-40% of energy in existing buildings can be profitably conserved

Passive building standards at or near profitability for most new-build segments, but still only constitute minority of buildings



54% of demolition materials landfilled, while some countries only landfill **6%**

Most materials unsuitable for reuse as they contain toxic elements

46

46

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Miro Visual Collaboration

<https://miro.com/welcome/ujoKYmlwneWV/kav0Z40dZ2oObrZ2uFmudyMMvJuS88z2Z5TKn0ir3xJ8WELCbWK>

47

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

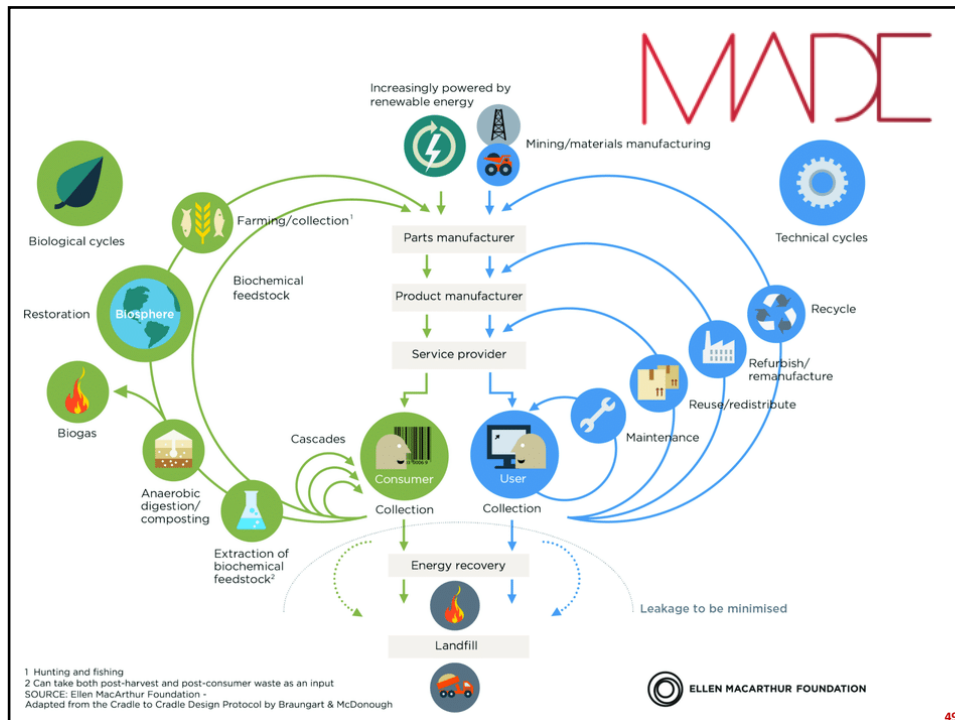
The world is now only 8.6% circular

The global economy is consuming **100 billion tonnes** of materials a year for the first time ever, but the **cycling rate of resources has gone into reverse.**

Circularity Gap Reporting Initiative highlights the urgent need to transition to a circular economy.

www.circularity-gap.world

48



49

Leave no trace, Go Circular; Recommend you look at...



Films

- Closing the Loop
- The True Cost

YouTube

- [IPCC SR15 Press Conference Live Oct 8th 2018](#)
-

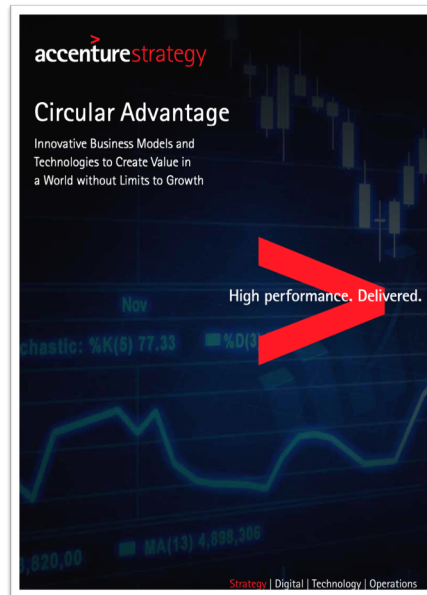
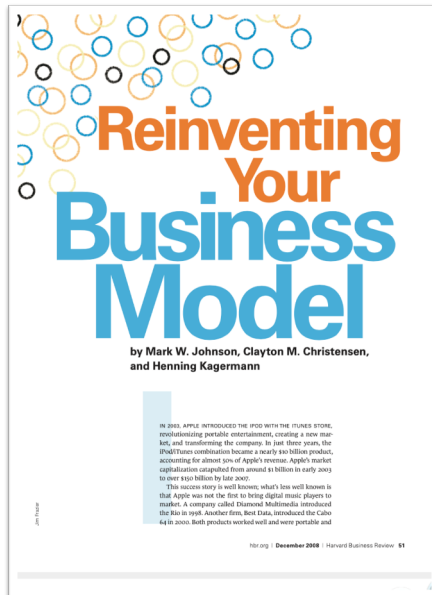
Other resources

- www.circulardesignguide.com
- www.circularity-gap.world

50

50

Further reading...



51

51

Leave no trace, Go Circular



52

52

Current activity is the tip of the iceberg



53