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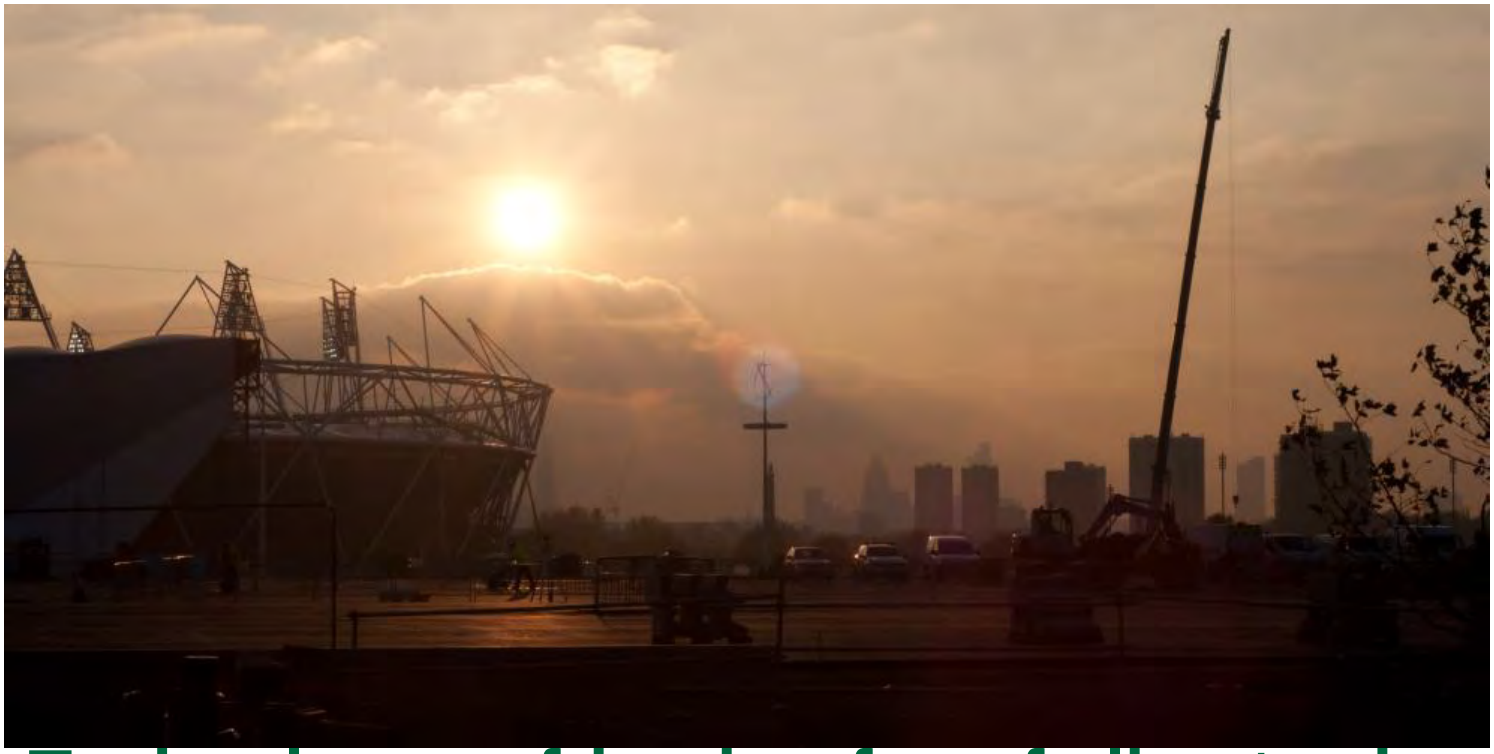
The Chartered Institute for IT

Enabling the information society



Technology: a friend or foe of climate change?

Tecnology and climate change

- E-Waste – Compute's relentless use of resources and energy
- Treating E-Waste - Northern Realisation
- Sustainable iT -
- Big Data Analytics and climate change
  - Case Study - Amazon Beef Ranchers and Rain forest preservation
- Bitcoin and Blockchain
  - Case study - The Wind turbine
- The Smart City putting people at the centre of Data Centric City
  - Case study - A day in the life of a smart sustainable city
- AI – Machine Learning - Overview
  - Case study - Unconscious Bias and self learning algorithms
- Ethical Challenge
  - Self Regulation and the Cambridge Analytics scandal
  - AI and Machine learning ethical questions
  - Toronto Dock Regeneration and Google Sidewalk – Ethics Reviewed
  - Climate Resilient Infrastructure - IT

The Chartered Institute for IT

Enabling the information society

E-Waste – Compute's relentless use of resources and energy

E-WASTE – SOBERING FACTS

Some E-Waste background…

Facts for 2014/15 from World Counts web site : https://www.theworldcounts.com/stories/Electronic-Waste-Facts

- We generate around 40 million tons of electronic waste every year, worldwide. That's like throwing 800 laptops every second.
- An average cellphone user replaces their unit once every 18 months.
- E-waste comprises 70% of our overall toxic waste.
- Only 12.5% of E-Waste is recycled.
- 85% of our E-Waste is sent to landfill and incinerators, and is mostly burned, which releases harmful toxins into the air!
- Electronics contain lead which can damage our central nervous system and kidneys.
- A child's mental development can be affected by low level exposure to lead.
- The most common hazardous electronic items include LCD desktop monitors, LCD televisions, Plasma Televisions, TVs and computers with Cathode Ray Tubes.
- E-waste contains hundreds of substances, many of which are toxic. This includes mercury, lead, arsenic, cadmium, selenium, chromium, and flame retardants.
- 80% of E-Waste in the US and from most other countries is transported to Asia.
- 300 million computers and 1 billion cellphones go into production annually. This is expected to grow by 8% per year. (not forgetting IoT devices!)

A New Circular Vision for Electronics Time for a Global Reboot

See : https://www.itu.int/en/ITU-D/Climate-Change/Documents/2019/A-New-Circular-Vision-for-Electronics.pdf

2019 Report from the great and the good

The Platform for Accelerating the Circular Economy (PACE)

- Aim to bring about the circular economy at speed and scale.
- Public-private collaboration mechanism and project accelerator hosted by the World Economic Forum.

The E-waste Coalition

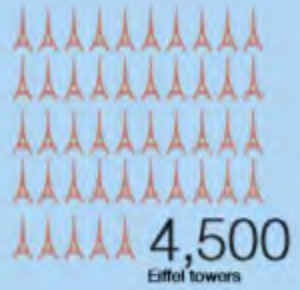
- Aims to increase cooperation and more efficiently provide support to Member States and Parties to address the e-waste challenge.
- Brings together:
  - the International Labour Organisation (ILO);
  - the International Telecommunication Union (ITU);
  - the United Nations Environment Programme (UNEP);
  - the United Nations Industrial Development Organization (UNIDO);
  - the United Nations Institute for Training and Research (UNITAR);
  - the United Nations University (UNU),
  - the Secretariat of the Basel and Stockholm Conventions.
- Supported by the World Business Council for Sustainable Development (WBCSD), the World Health Organisation (WHO) and the World Economic Forum and coordinated by the Secretariat of the Environment Management Group (EMG).

HOW MUCH E-WASTE DO WE GENERATE EVERY YEAR?

We produce 44.7 million tonnes of e-waste a year that is the equivalent of....

It would take Heathrow Airport in London up to six months, day in and day out, to clear that many aircraft from its runways.

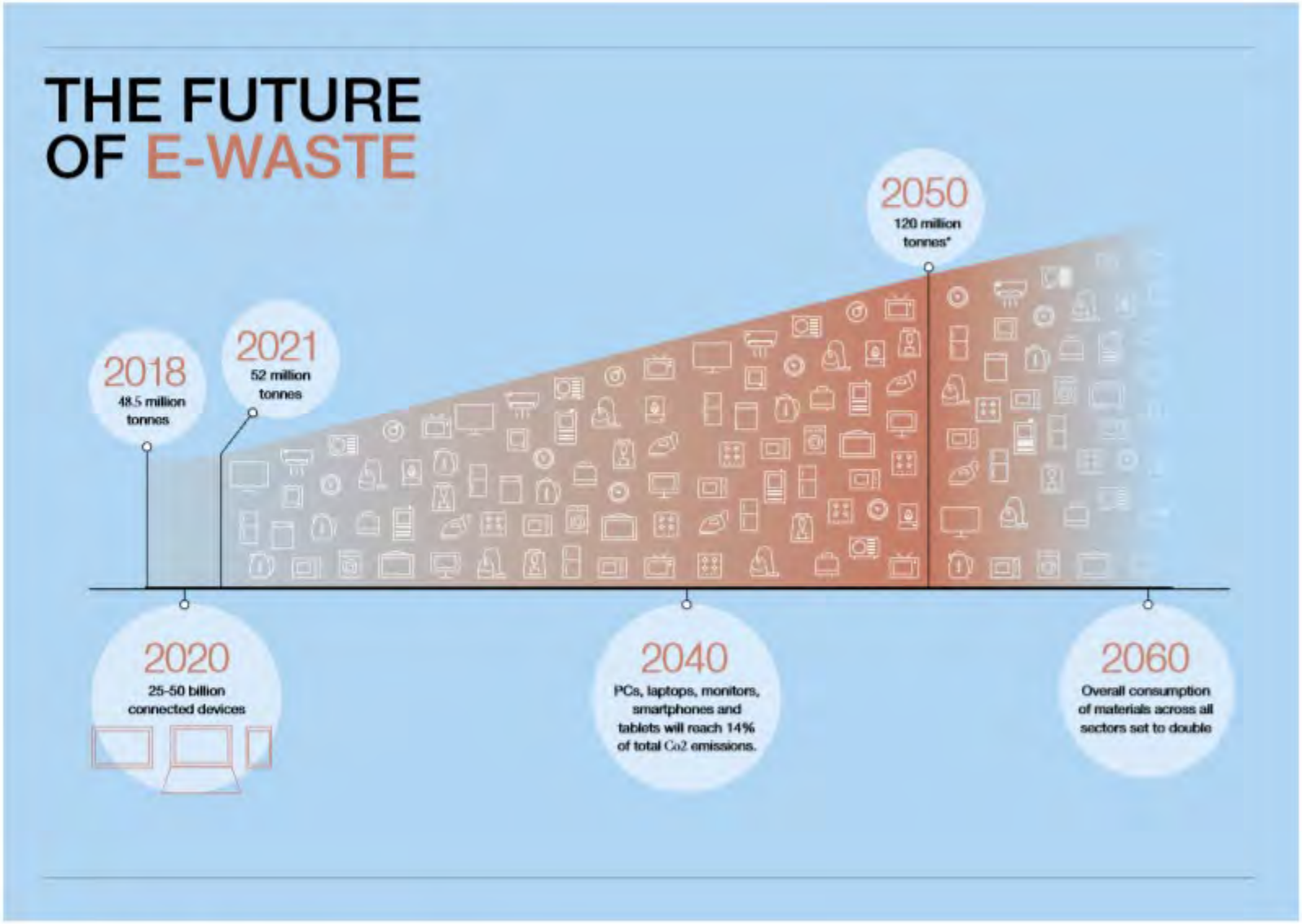
This is an equivalent of almost 4,500 Eiffel towers.



Jam them all in one space, side by side, and they would cover an area the size of Manhattan.

Source: E-waste Monitor, 2017; figures from 2016

E-WASTE – ITS GETTING WORSE…



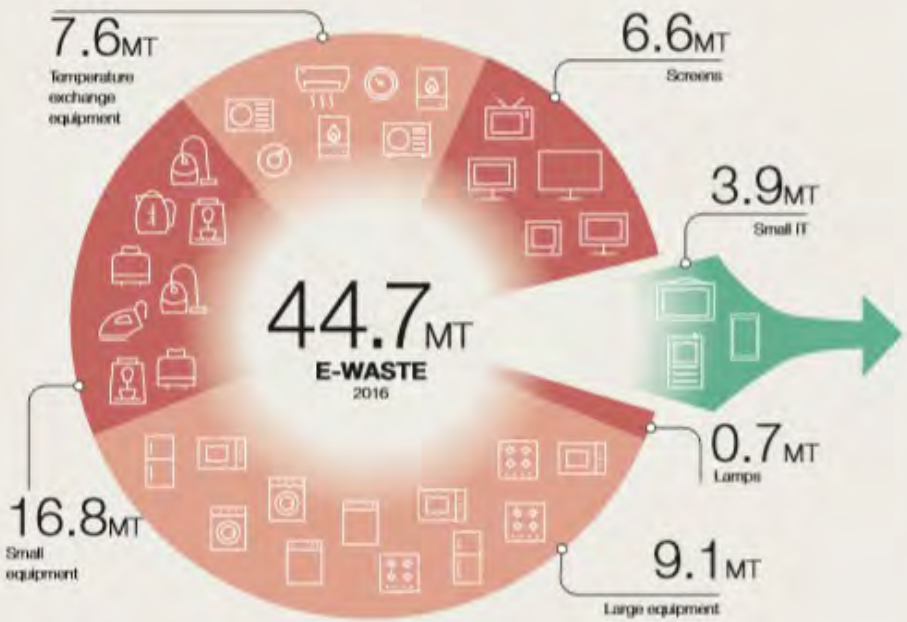
Source: UNU, 2018; OECD, 2018; E-waste Monitor 2017

A New Circular Vision for Electronics Time for a Global Reboot

See : https://www.itu.int/en/ITU-D/Climate-Change/Documents/2019/A-New-Circular-Vision-for-Electronics.pdf

- In 2016 globally 44.7 million tonnes of e-waste was generated, equivalent in weight to all commercial aircraft ever built (roughly 125,000 Jumbo Jets).
- Only 20% is formally recycled, just about 9 million tonnes.
- 36 million tonnes of e-waste are discarded in landfill, burned or illegally traded and treated in a sub-standard way every year.
- If nothing is done, the amount of waste will more than double by 2050, to 120 million tonnes annually.
- A huge opportunity exists. The material value alone is worth $62.5 billion (€55 billion), three times more than the annual output of the world's silver mines and more than the GDP of most countries.

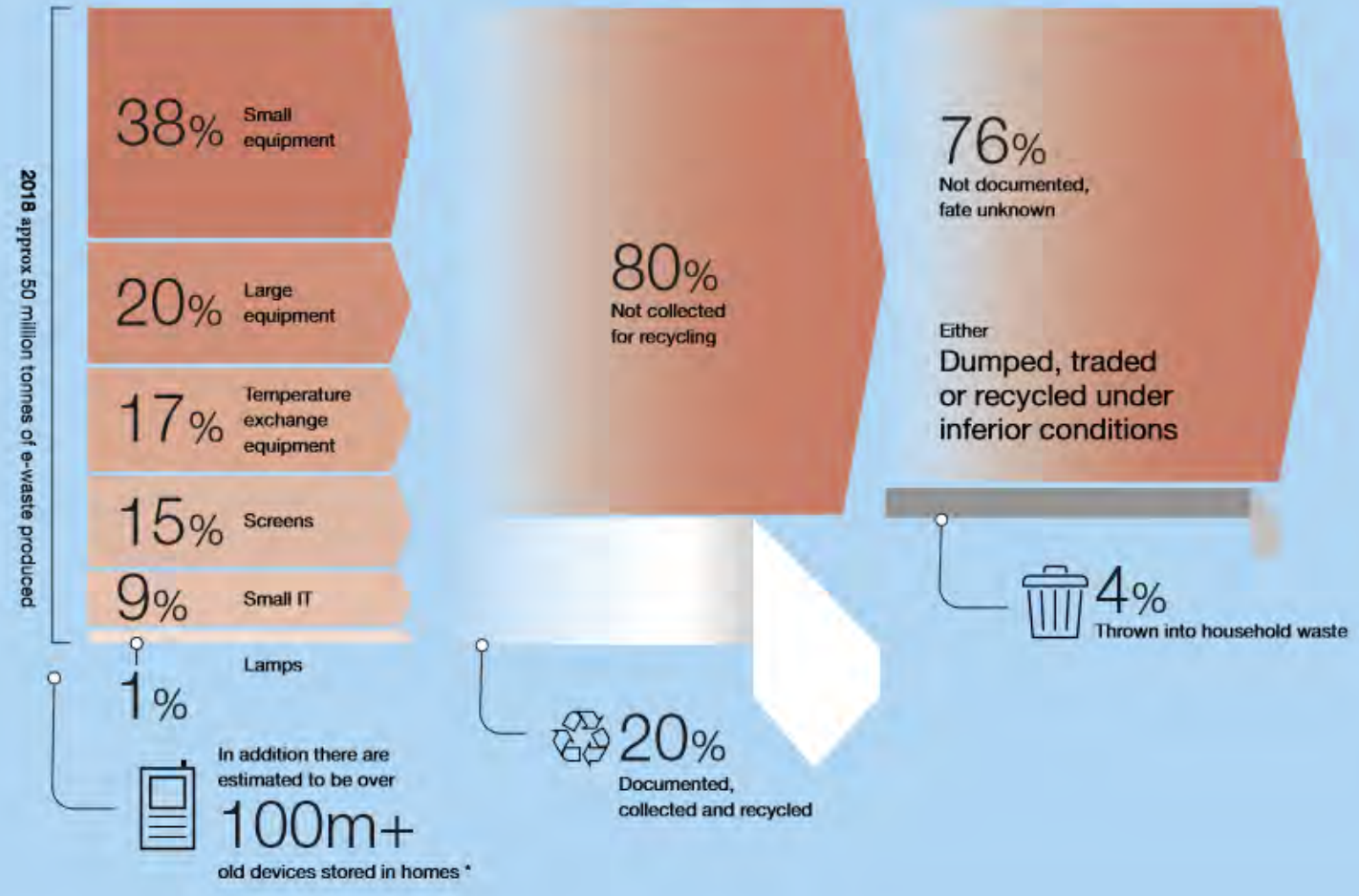
WHAT IS E-WASTE?



What's in a typical mobile phone?

Source: Global E-waste Monitor, 2017

GLOBAL E-WASTE FLOWS



Source: Global E-waste Monitor 2017

Treating E-Waste – Northern Realisation

Recycling process…

Picking: Components removed by hand, such as batteries, UPS battery systems, toner cartridges, and fluorescent lights.

Shredding:
- *Initial Size Reduction* shredding into small 100mm size pieces.
- *Secondary Size Reduction* step further breaks down materials into even smaller fragments preparing for separation process.

Magnetic Removal: Steel and iron fragments.

Metallic and Nonmetallic Separation: Using Eddy currents, optical identification, and magnets to extract other metals, such as aluminum, copper, and brass and separate from non-metallic materials, such as glass and plastic.

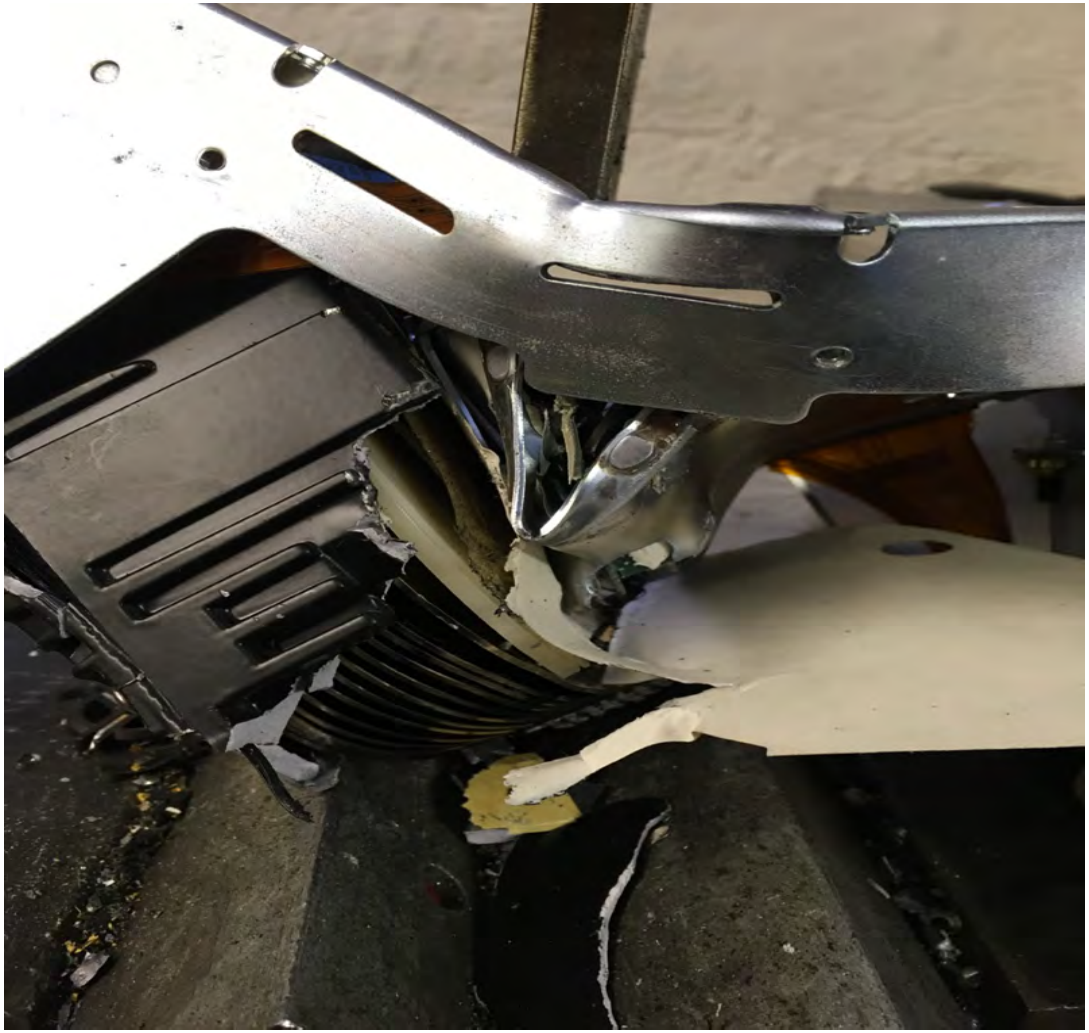
Separation :
- Plastic and glass are separated by using water[2]. Lead-containing glass may be sent to lead smelters to be used to make new products such as batteries, new CRTs, and X-ray shields. Plastics are separated by colour and sold to plastic recyclers[3].
- Circuit boards are ground up and smelted, the gases are captured, and the metals can be sold as raw commodities.

AND IF THERE'S DATA TO REMOVE…

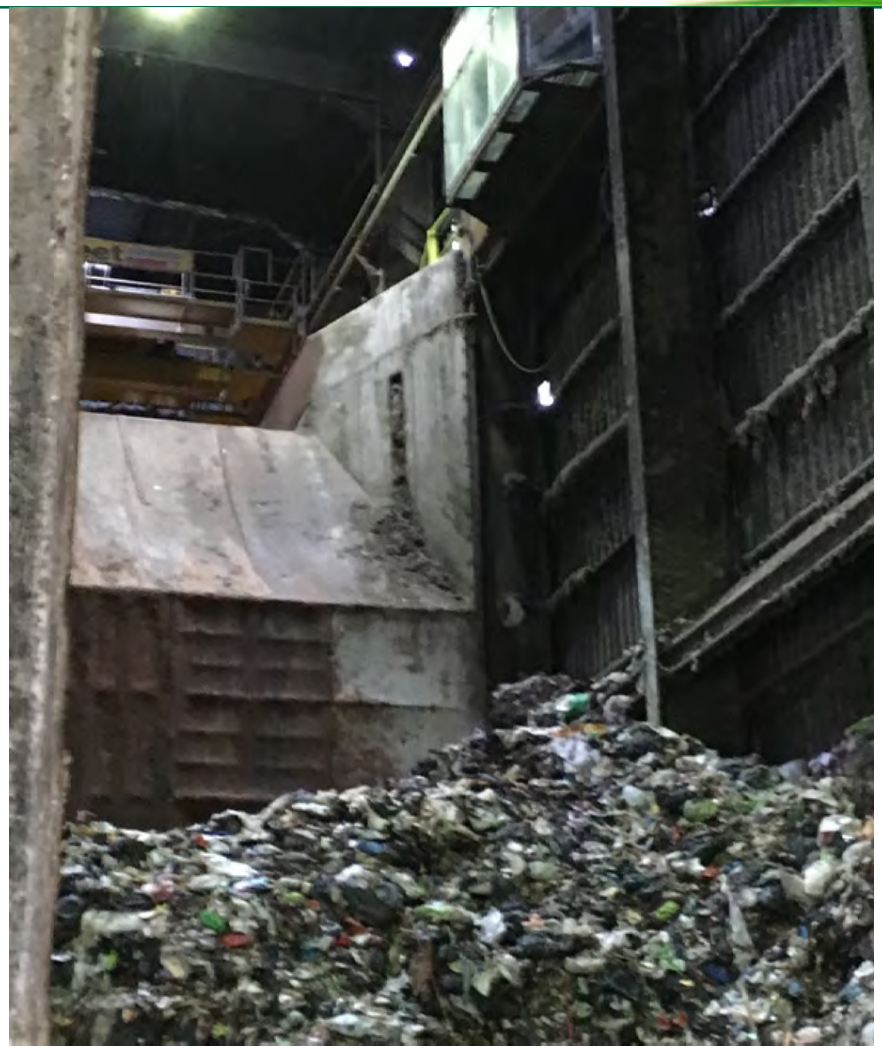
Remove data – De-gausser

Remove data – Shredding disks

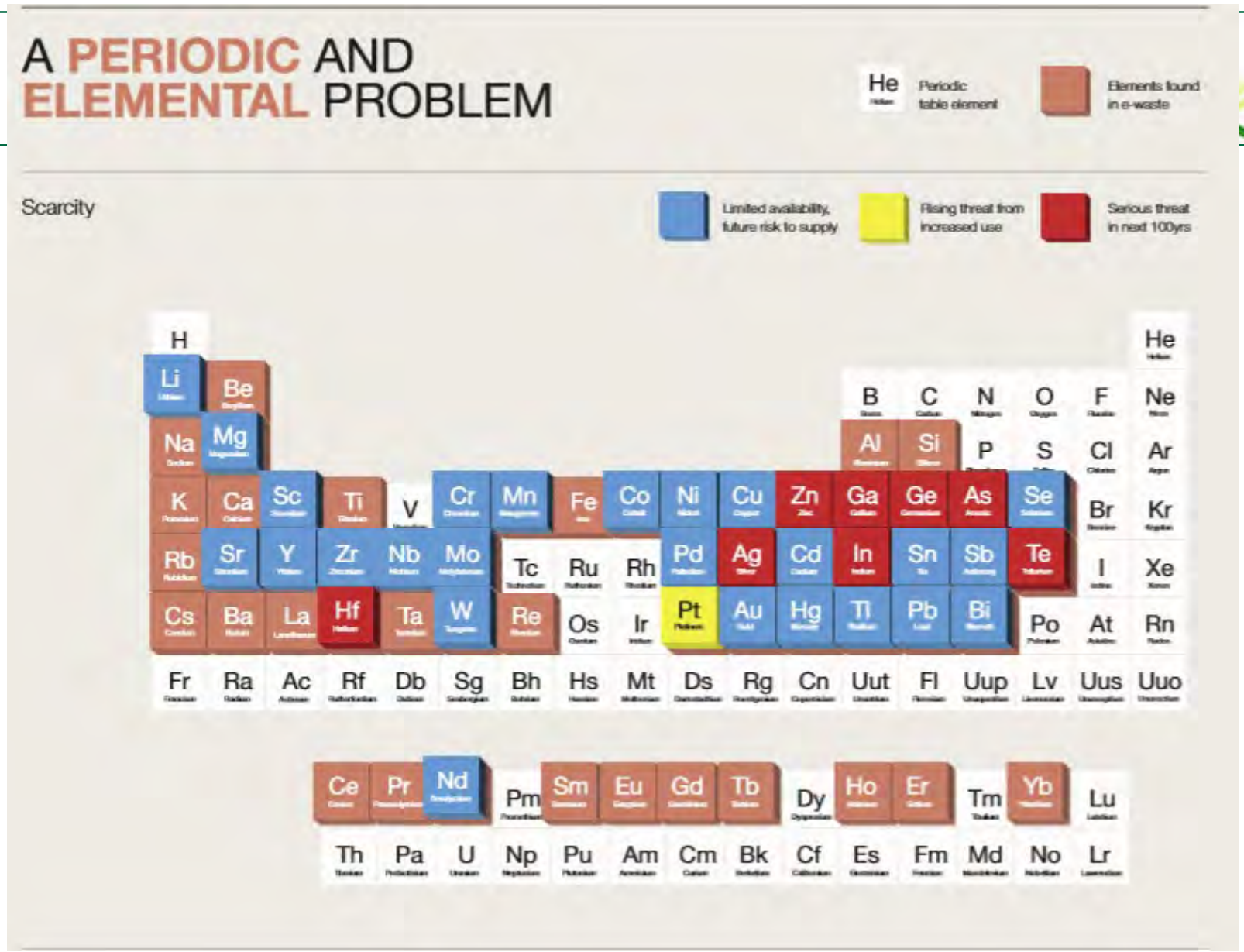
Crunching the disk cabinets



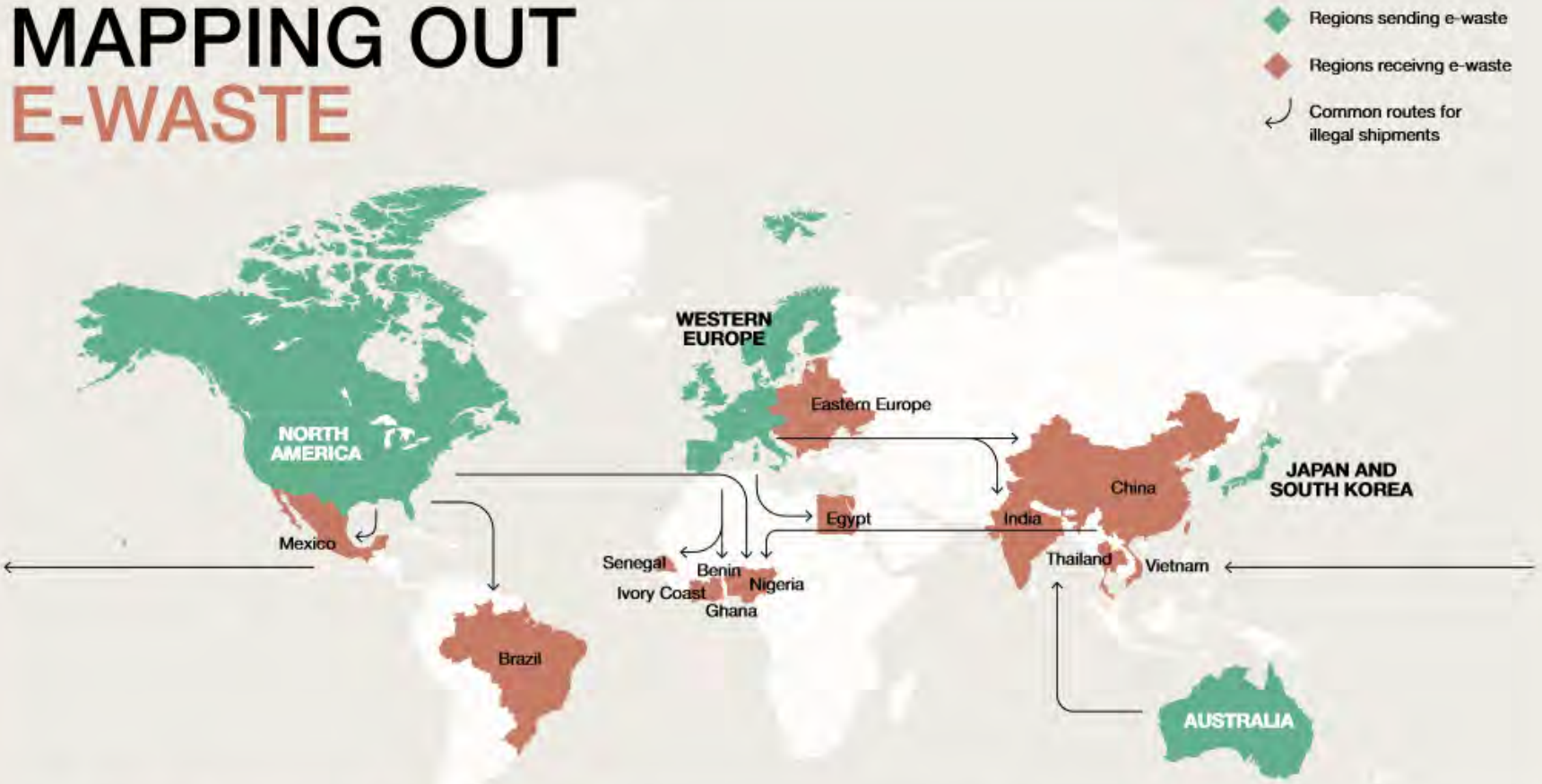
And into the incinerator…



A PERIODIC AND ELEMENTAL PROBLEM



MAPPING OUT E-WASTE



The top 5 highest and lowest e-waste generating nations E-Waste generated (kg per capita), 2016

28.3	26.3	25.9	23.9	23.4	0.4	0.5	0.6	0.6	0.8
Norway	Switzerland	Iceland	Denmark	United Kingdom	Niger	Ethiopia	Afganistan	Uganda	Nepal

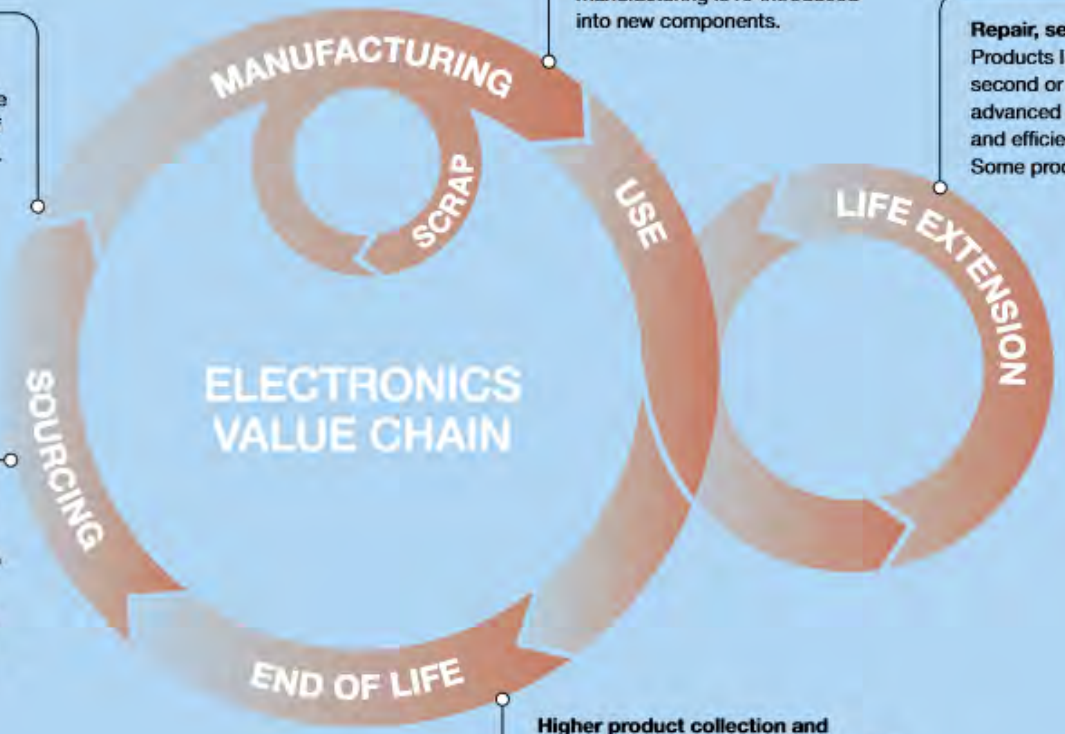
Source: Lewis 2011, The Global E-waste Statistics Partnership, 2018

MOVING AWAY FROM THE CULTURE OF DISPOSABLE DEVICES

Recycling is net positive…

- Saves mining for virgin resources, thus reducing carbon emissions.
- There is a lot of economic value in e-waste, particularly from such materials as gold, silver, copper, platinum and palladium, among others. There is a hundred times more gold in a tonne of smartphones than in a tonne of gold ore. The earth's richest deposits of valuable materials are sitting in landfill sites or people's homes. More needs to be made of these resources.
- Looking at the market for smartphones, 1.46 billion were sold in 2017. At retail, each unit contains electrical components worth more than $100.49. This represents a lot of value entering the market each year. If just the raw materials are recycled, they could be worth up to $11.5 billion. The latest forecasts show that e-waste is worth $62.5 billion annually, which is more than the GDP of most countries. It is also worth three times the output of all the world's silver mines.
- A more effective use of products is a second life, which keeps the materials at a higher value. Global markets for second lives of smartphones are well developed, particularly at the top end of the market. There is, however, significant room for improvement.
- In 2016 alone, 435,000 tonnes of phones were discarded, despite containing billions of dollars worth of materials.
- To capture this opportunity, it will be important to move towards a circular economy for electronics.

A NEW CIRCULAR VISION FOR ELECTRONICS



Design
Products designed for durability, reuse and safe recycling, substances of concern substituted out.

Reintegration of manufacturing scrap
Scrap metal from manufacturing is re-introduced into new components.

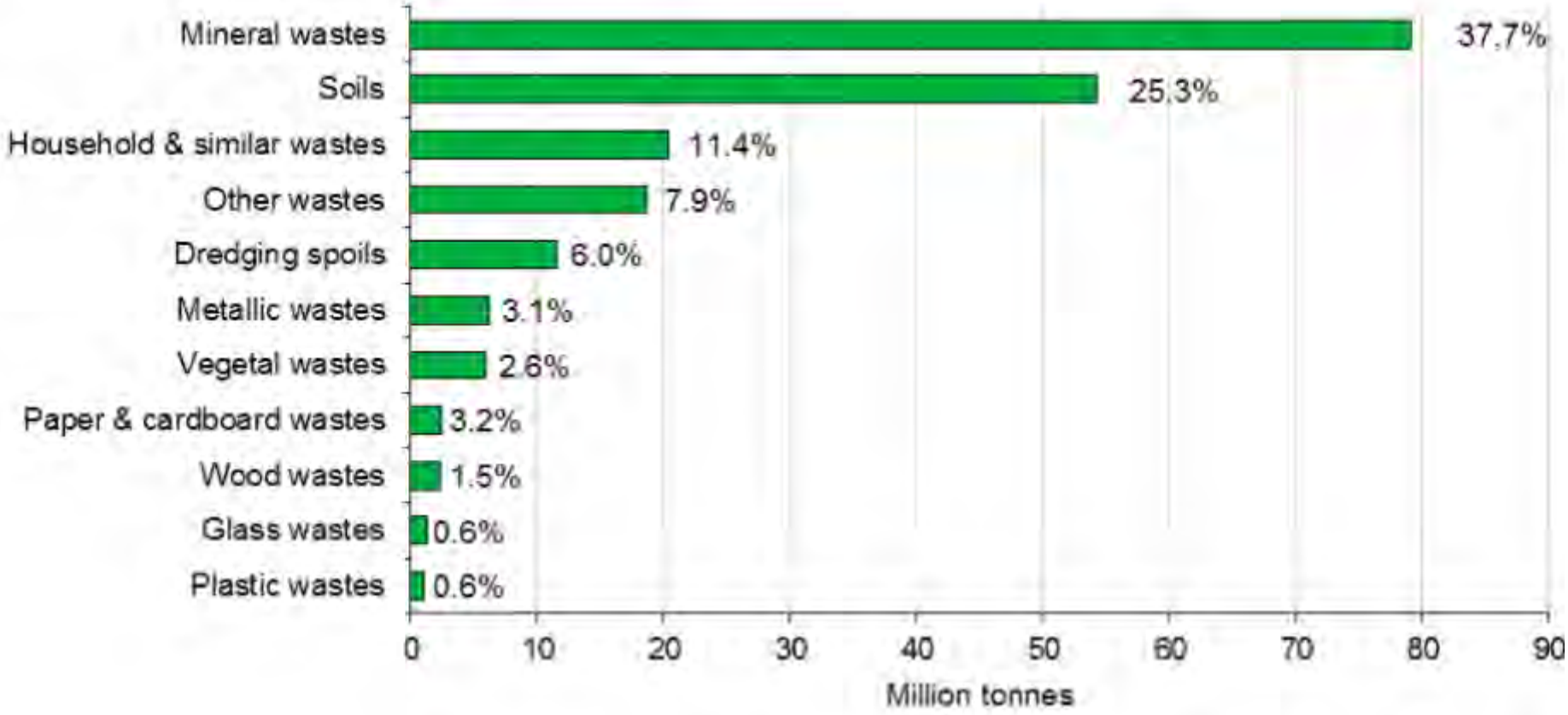
Repair, second life and durability
Products last longer and have second or third lives aided by advanced refurbishment and repair and efficient second hand markets. Some products sold as a service.

Advanced recycling and recapture
Policies to encourage recycling, and the integration of recycled content into new products. High tech recycling extracts broad range of materials and keeps them at the highest quality. All e-waste treated by the formal sector.

Higher product collection and return with incentives for consumers.
Maximize the collection of end of life electronics. In developing countries old products are collected by formalized workers.

So where is the UK in all this…?

Figure 4. Waste generation by waste material, UK, 2014



Source: Defra Statistics

UK data …. ?

- England sent 133k tonnes of electrical and electronic equipment for disposal in 2016 (Defra's Waste Data Interrogator), 23.4kg per person
- Currently we do not have any stats on Recycling rates for e-disposals
- We need more data to be able to understand the scale and nature of e-waste recycling in the UK against a background of a huge growth in the use and disposal of electronic goods
- Opportunity for businesses/SMEs to realise the significant value of recycling
- BCS Green SG to review and make recommendations, seeking funding to resource that review
- Watch this space ….

circular computing

Sustainable iT

For a resource efficient & low carbon economy

SUSTAINABLE
THINKING

Energy Consumption

CO2 from use ? **@ 20%**

eWaste (50mt)

CO2 from Manufacturing **@ 80%**

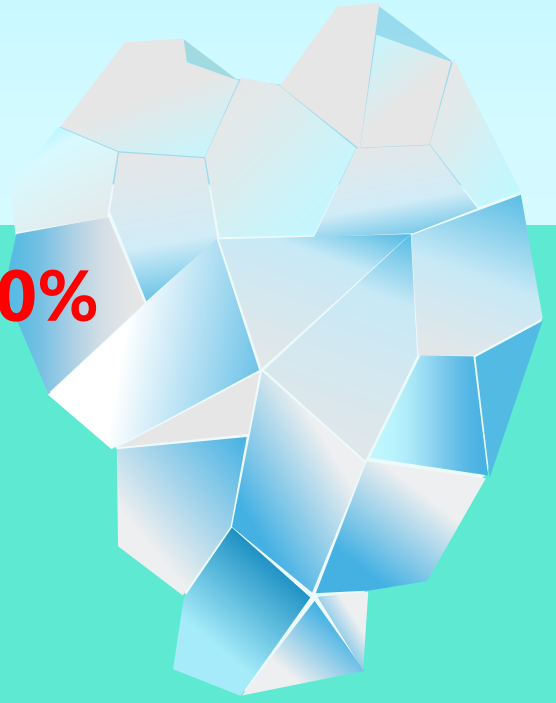
Resource Consumption

Conflict minerals (Cobalt)

Pollution

Ethics & labour issues

Climate change **@ 3%**



LAPTOP EXAMPLE

Just 3 laptops makes over One ton of CO2

(380kgs per laptop)

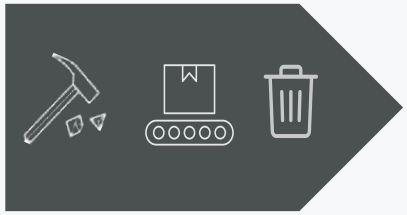
WHY CHANGE ?

POPULATION EXPLOSION

1966 - 3 billion

2016 – 7 billion

2050 – 10 billion



CONSUMERISM

Take, make and dispose

160 MILLION LAPTOPS A YEAR

CONTRIBUTE TO

3% CLIMATE CHANGE
RESOURCE DEPLETION
POLLUTION
WORKER EXPLOITATION

50 MILLION TONS
E-WASTE
TOXIC DUMPING
EXPORTS TO 3RD WORLD

5,000 NEW LAPTOPS
CONTRIBUTE TO
1,900 TONS OF CO2

IT REUSE CYCLE

Enterprise-grade laptops

5+ hour industrial remanufacturing process.

Certified to ISO9001/14001 & BS8887 standards.

Buy-back after three years & Reloop back to factory.

Another 3-5 years of extended use

Google IT Reuse saves $millions & helps people & planet

700,000* Servers
(*19%) are
Remanufactured

& 52% of the component upgrades are Refurbished.

https://sustainability.google/projects/circular-economy/

Google

SUSTAINABLE IT MAKES SENSE

Technology to meet your needs

Reloop & Reduce eWaste

Save Money / Better value TCO

Compliant products
3-year warranty

Corporate CSR Policy

Ethical & Compliant

Reduce CO2
Preserve resources
Avert pollution

Linking internal employees & external stakeholders with market leading initiatives.

SUPPORT FOR CHANGE

http://ec.europa.eu/environment/gpp/pdf/criteria/office_it_equipment.pdf

https://www.pianoo.nl/sites/default/files/documents/documents/rebusfactsheet5-ictdrz-juli2017.pdf

https://www.pianoo.nl/sites/default/files/documents/documents/rebusfactsheet8-ictprovincieutrecht-engels-augustus2017.pdf

https://www.zerowastescotland.org.uk/sites/default/files/Procuring%20for%20Repair%20-Re-use%20Reman%20Guide%20June%202016%20v3.pdf

https://www.parliament.uk/business/committees/committees-a-z/commons-select/environmental-audit-committee/news-parliament-2017/-electronic-waste-and-the-circular-economy-inquiry-launch-17-19/

circular computing

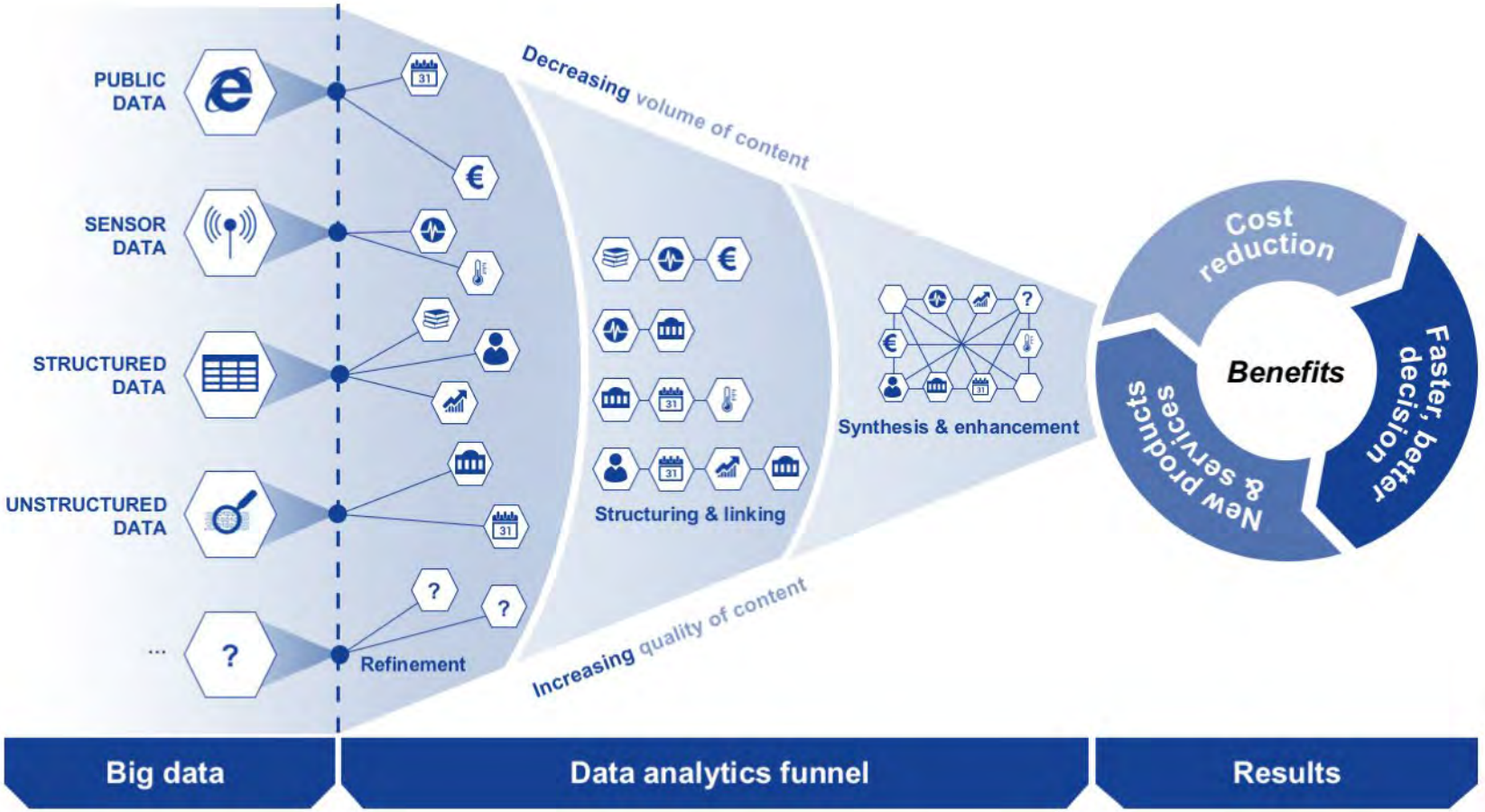
Our mission is simple.

To deliver premium, enterprise-grade products that don't cost the earth.

So what can we do…

- Second Life - pass on our working but unwanted electrical stuff to others
- Get broken stuff repaired
- Don’t buy new, buy second hand/refurbished kit
- Follow the waste hierarchy
- Check out how your local council deals with e-waste

Big Data Analytics and Climate Change – What is big Data Analytics?



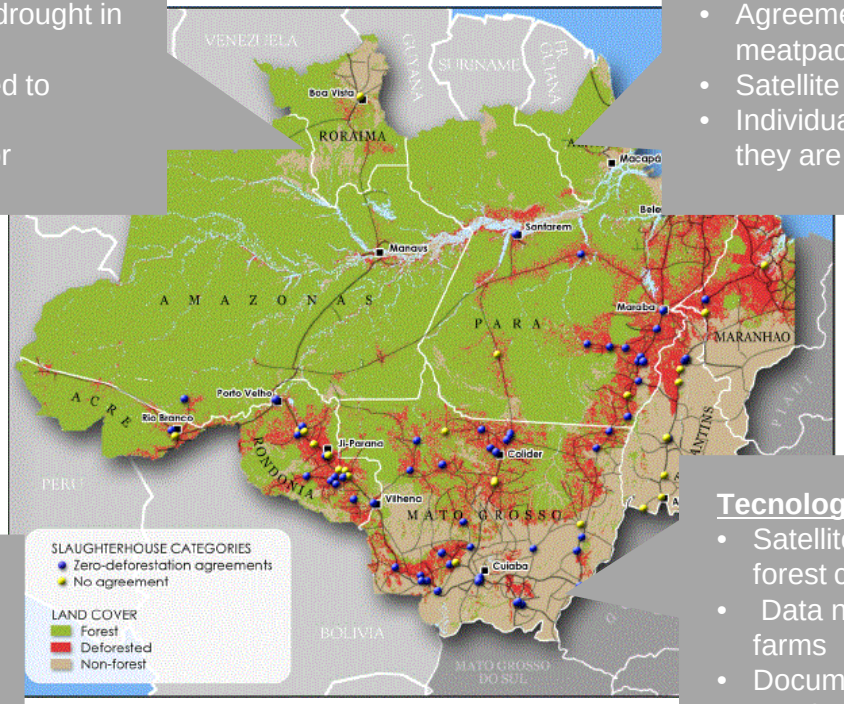
Case Study Amazon Rain Forest protection

Problem

- Deforestation caused by Ranchers cutting down Amazon for cattle grazing.
- The Amazon is a Carbon sink + it generates weather patterns needed to avoid drought in the USA
- Ranchers needed to be encouraged to protect the forest on their land
- How to agree solutions and monitor progress

Solution

- Agreement from multi nationals to stop accepting meat products from farms with recent forest clearing
- Agreements to be signed by the 5 major meatpacking companies
- Satellite data to capture forest information
- Individual farms can be monitored to see if they are meeting agreements

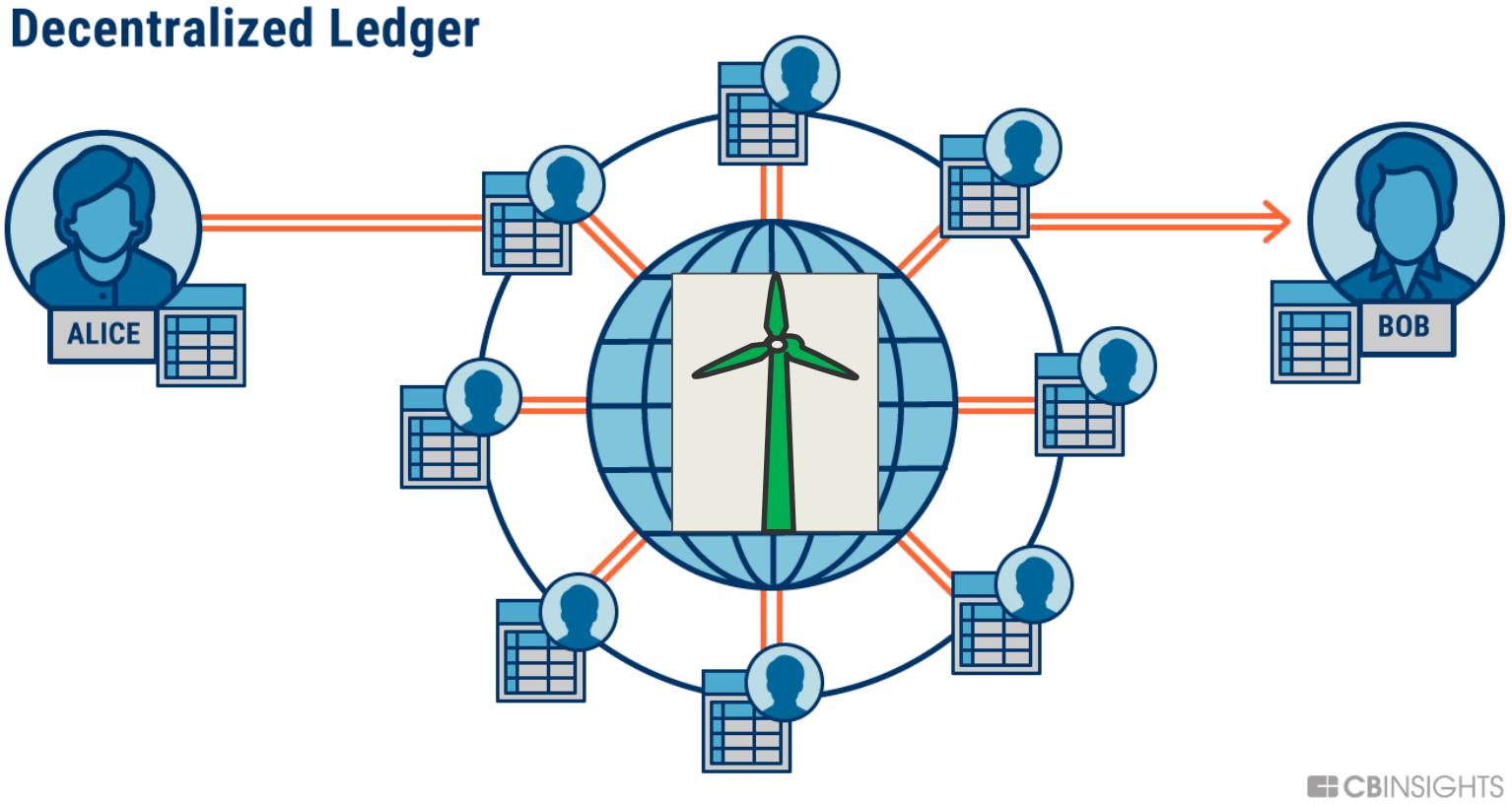


Outcome

- Satellites provide the data needed to monitor usage
- Deforestation rates dropped by more than 80% between 2004 and 2014
- Political factors may undermine this

Tecnology

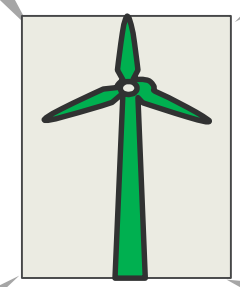
- Satellites generate a lot of data relating to forest coverage
- Data needs cross refencing to individual farms
- Documenting forest changes over time needed to validate conservation agreement
- Not possible manually, A big data platform is required to monitor forest destruction


Decentralized Ledger
ALICE
BOB
CBINSIGHTS

Case study the Wind turbine

Problem
- Are Wind Turbines sustainable?
- To be honest we are not sure
  - The Manufacturer assembles turbines
  - Parts come from a complicated supply chain
  - Resources are mined way up the supply chain
  - Transport costs for each component

Solution
- Can we manage each step of the supply chain process?
- Can we capture sustainability data?
- Can we capture the sustainability standards our suppliers meet in the chain?
- Can we understand the overall carbon footprint?



Reality
- The Tecnology is still a long way off to understand the Wind Turbine total carbon footprint
- Dutch Supermarket Aleber Heijn is tracking the end to end supply chain for orange juice
- Growers in Brazil to your table

Tecnology
- Blockchain captures each step in the supply chain
- Data included in the steps can build an end to end view
- Each step of the chain has an audit path.
- Blockchain can deliver infinite chain.

The Smart City - putting people at the centre of a Data Centric City

What does our Smart city do?

- Networking with work colleagues, family and friends
- Re-ordering food stuffs
- Purchases
- Using transport from taxis, buses, metro, trains
- Seeking locations and services
- Bookings for example accommodation, transport, entertainment, restaurants
- Fixing broken stuff
- Control of dwelling light

As well as moving people around our Smart cities need to move information and data around. One could almost say that data is the 4th utility, as our cities are becoming smarter in many ways.

Case study a day in the life of a smart sustainable city?

Problem

- Cities are Growing
- Every week 1.5 million people are moving to Cities
- Soon most people will live in cities
- Smart city are able to deliver: Improved health and wellbeing, reduced pollution, less congestion, reduced energy use, better waste management
- Cities are becoming the largest consumers of energy and resources, which in turn contribute to climate change
- 2050 – requires radical changes. Zero emissions, what does this mean?

Solution

- Can data help city populations make decisions?
- Smart cities to deliver a better living environment
- Better link between the city planners/ managers and the city population
- Will all of this help mitigate climate change?
- How can a smart city cope with climate change?
- Reduce energy consumption – 300% energy efficiency improvement is required
- Prepare people to consume more efficiently (Which means consuming less)

Reality

- We have seen digital cities in the UK. Peterborough , Leeds, Bristol, Manchester
- Melbourne Australia – internet of trees
- Coping with climate change

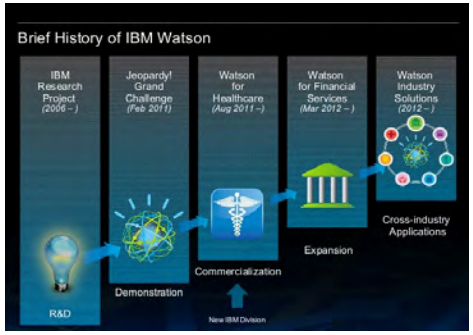
Technologies

- Data – Through apps, API's, digital terminals, digital platforms to empower sustainable decision making
- TFL publish transport API's
- Strava provide City Cycle data
- Providing Data networks to link the city together
- Local energy trading Cooperatives providing renewable energy

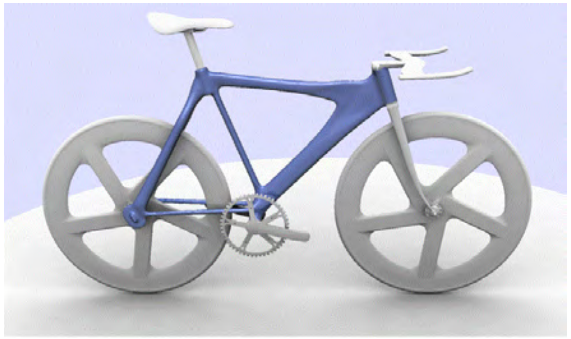
AI Machine Learning – Overview

Mythical Ideas

More realistic view



Architecture of AI

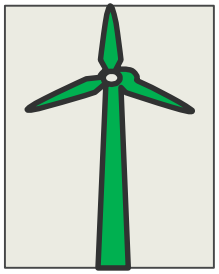


We humans make sense of the world by looking for patterns, filtering them through what we think we already know, and making decisions accordingly. When we talk about handing decisions off to artificial intelligence (AI), we expect it to do the same, only better.

DeepMind's machine learning algorithms predict` the wind output from the farms. You can now schedule set deliveries of energy output, which are more valuable to the grid than standard, non-time-based deliveries.

Wind farms use AI to better understand the management of their turbines with over 500 sensor. Management is now beyond the ability of people.

Supply is dependent on the weather, storage is still being developed. – renewables are distributed rather than centralised



Case study - Unconscious Bias and self learning algorithms

Problem

- People's perceptions and habits are the hardest thing to change
- How do we change our course when there are so many variables constantly shifting?
- Limitations of human thought slows down progress
- Algorithmic models and big data analytics need human interventions
- To tackle climate change we have to change people's habits
- We have to manage data without the need for human intervention

Solution

- Use AI and Machine learning to remove subconscious bias that delivers negative effects on climate change, and install positive subconscious bias
- Machine learning and AI – When we say AI we are talking about self learning algorithms.

Reality

- We are still at an early stage, still hype rather than reality (Not in all cases)
- There is an ethical question which must be considered

Tecnology

- We use AI platforms
- The platform is an architecture we understand
- AI is just a software platform
- Models are developed using maths
- Difference is once you start the process the Algorithm updates and adapts itself based on inputs

Ethical Challenges

- The ethical challenges and their impact on society and the environmental issues are considerations that need to be an integral aspect of the design process where an increase in communication and collaboration is needed between designers of technology, users, psychologists, sociologists, philosophers and health experts regarding the adoption of these new emerging technologies.

- Will intelligent machines have an ability to learn, develop emotional intelligence, and become moral agents capable of making moral decisions and be responsible for their own actions? Military robots have changed the nature of warfare and the inevitable evolution of intelligent machine relationships will undoubtedly change the nature of human beings and our society.

- In the section on Governance, standards and regulations in the House of Commons Science and Technology report, the following statement was made:

"We recommend that a standing Commission on Artificial Intelligence be established, based at the Alan Turing Institute, to examine the social, ethical and legal implications of recent and potential developments in AI. It should focus on establishing principles to govern the development and application of AI techniques, as well as advising the Government of any regulation required on limits to its progression. It will need to be closely coordinated with the work of the Council of Data Ethics which the Government is currently setting up following the recommendation made in our Big Data Dilemma report."

(House of Commons, Science and Technology Committee, 2016, p. 41)

- The problem of sustainability is exacerbated by the increasing demands we place on technologies, driving spiralling technology developments and issues, demanding a change in our perceptions and behaviours if we are to make sense of and come to manage these developments. We need to expose and prioritise social and ethical issues, alongside the environmental impacts, power savings, energy efficiency, hazardous substances and pollutants behind e-technologies.

Toronto Dock Regeneration and Google Sidewalk – Ethics Reviewed

Overview

- One of the first totally smart cities, regeneration of the Toronto Docks
- Partnership between Google's Side Walk Labs, Toronto City and Developers
- First Truly Smart City built from the bottom up with connected innovation included
- Mix of residential and commercial areas

Lesson

- We have to define the standards for a truly smart city
- Need to understand that people are still at the core
- Once trust is lost it is very difficult to recover

Challenge

- Timing – Cambridge Analytica
- Secrecy, Contractual issues that were not open about data usage
- This is a public driven initiative
- Residents have expressed grave concerns about data governance
- What were the ethical models that were implemented?
- People feel their data is just that and should remain under their control

Action

- Ethics have to to be core to the project
- Civic Data Trust to handle digital governance issues
- Action to define an ethical set of data standards for all Smart City initiatives
- Early social media and smart data focused on achievement rather than ethics

Thank you – Contact details

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abardell

Carbon³ IT

Climate Resilient Infrastructure - IT
using the
EU Code of Conduct for Data Centres (Energy Efficiency) & EN50600

BCS Green IT SG

London 1st July 2019

Carbon^3 IT

John Booth

- Managing Director - Carbon3IT Ltd

- Global “Certified Energy Efficiency Data Centres Award” (CEEDA) Lead Assessor/Auditor
- Certified Data Centre Audit Professional (CDCAP$_{TM}$)
- BSI TCT 7/3 EN50600 - Committee Member
- EU Code of Conduct for Data Centres (Energy Efficiency) - Reviewer/BP Committee Member
- Vice Chair - BCS Green IT SG & Treasurer/Committee - BCS Data Centres SG
- Chair - Data Centre Alliance Energy Efficiency & Sustainability SG

- Sustainability for London (SFL) – Executive Director
- National Data Centre Academy (NDCA) - Technical Director

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Climate Resilient Infrastructure

- Our infrastructures, the basic physical and organizational structures and facilities, (e.g. buildings, roads, hospitals, railways, power supplies) needed for the operation of a society or enterprise, are already vulnerable to today's extreme weather.

- Climate changes will increase these vulnerabilities affecting supply, access to resources, operations and patterns of demand.

- But….

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No Information Technology?

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National Infrastructure Commission "Infrastructure & Digital Systems Resilience" Final Report November 2017

- "Networks of digitally -connected infrastructure systems (or 'system -of- systems') are widely predicted to emerge and develop in the next 10-30 years. This will create opportunities , to enhance resilience through smarter and faster responses, alongside unintended vulnerabilities, to accidents and disruption, which are inevitable in tightly coupled and complex systems…

- "Infrastructure systems are already complex, highly interdependent, and tightly coupled . Overlaying these systems with digital systems is already prevalent, and will become more so in future. This will further increase complexity, and will probably create new 'emergent' properties that we do not yet fully appreciate."

https://www.nic.org.uk/wp-content/uploads/CCCC17A21-Resilience-of-Digitally-Connected-Infrastructure-Systems-20171121.pdf

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National Infrastructure Commission "Infrastructure & Digital Systems Resilience" Final Report November 2017

- "Embedding resilience thinking into the planning and design of infrastructure projects requires a collaborative and cross sector approach, and this is not limited to the case of digitally-connected infrastructure"
- Consideration of resilience in this context may require broader expertise– such as when considering vulnerabilities associated with overlaid software systems. The NIC is in a good position to promote such interactions
- Our infrastructure systems are becoming increasingly interdependent, a characteristic that will be exacerbated by the use of digital technology, and methodologies for fully evaluating these interdependencies, including those between people and the systems they rely on, will become increasingly important.

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National Infrastructure Commission "Infrastructure & Digital Systems Resilience" Final Report November 2017

- This will need to include a better understanding of how the overlaying of digital systems onto infrastructure can affect the behaviour and properties of that infrastructure. Modelling, event simulation and workshops to understand interdependencies should be introduced at an early stage of the infrastructure planning process.

- Data is an inherent part of digitally-connect infrastructure systems. Data can be considered as part of our infrastructure, and should be valued as such, planned for, understood and used appropriately to inform the right decisions. Data should not be a by-product, and should not be collected 'just because we can'. Better sharing of data between organisations will form an important part of a collaborative and cross-sector approach to this issue.

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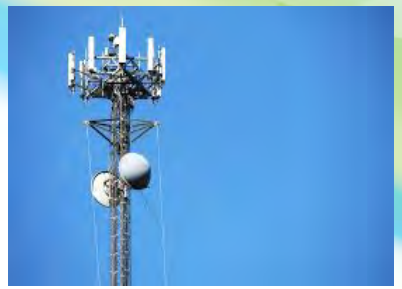
What are Digitally Connected Infrastructure Systems?



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Cascading Infrastructure Failures
City of Lancaster
December 2015

- Over the first weekend in December 2015, Storm Desmond brought unprecedented flooding to North Lancashire and Cumbria, including to parts of central Lancaster.

- At 10.45pm on Saturday, 5 December, electricity supplies to 61,000 properties in the city were cut and power cuts continued to cause disruption from the 5th to the 9th December.

- This resulted from the flooding of just one substation.

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Lancaster Substation – Flood Conditions

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Cascading Infrastructure Failures
City of Lancaster
December 2015

- **The failure of electricity supply caused widespread and unanticipated consequences. Whether the original cause was preventable or not, the focus here is on learning from this event to improve the response and recovery process.**

- Mobile phone coverage was lost over most of the city, and while landline phone services were available many households had replaced their handsets with cordless phones that rely on electricity to operate.

- Local digital radio services were lost and so only FM services were on air. However, many people did not have battery or wind up radios capable of receiving FM signals.

- Of the FM services that were on air, limited useful reporting meant that the local community were not kept aware of the wider impacts and operational response that was taking place.

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Cascading Infrastructure Failures
City of Lancaster
December 2015

- High rise buildings where booster pumps are used to get water to higher floors lost water supply.
- Buildings that use ‘grey water’ (second -hand water from showers or washing) to flush toilets found that without electricity they were unable to flush toilets.
- The rail station could not be opened after dusk without lighting on the platforms.

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Cascading Infrastructure Failures
City of Lancaster
December 2015

- Retail and banking were severely affected by both the floods and the electricity cut: card payment terminals that relied on the internet were not working. As a result, any shops that were open relied on cash only.

- By contrast, some ATMs that used a conventional phone line to contact the bank and had back up electricity (e.g. through a diesel generator) were operational.

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Cascading Infrastructure Failures
City of Lancaster
December 2015

- **Whilst this event was not a failure in digital systems or a normal accident , it illustrates well the dependence society now has on our digital infrastructure, which has a high degree of coupling with electricity supply.**

- **The consequences listed above could have been predicted, and the fact that they were not expected shows how planning and response does not always consider the full 'system-of-systems'.**

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Lancaster Substation – Mitigations Measures

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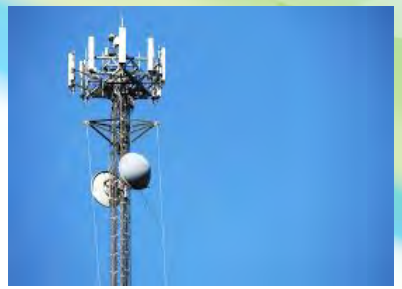
What are Digitally Connected Infrastructure Systems?



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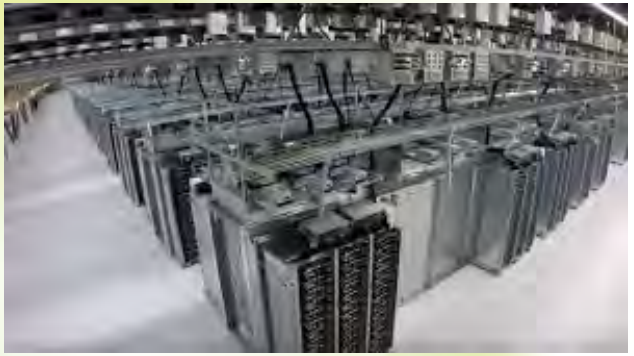
Err….what are data centres and why should I be worried?



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Amazon, Google and Facebook…

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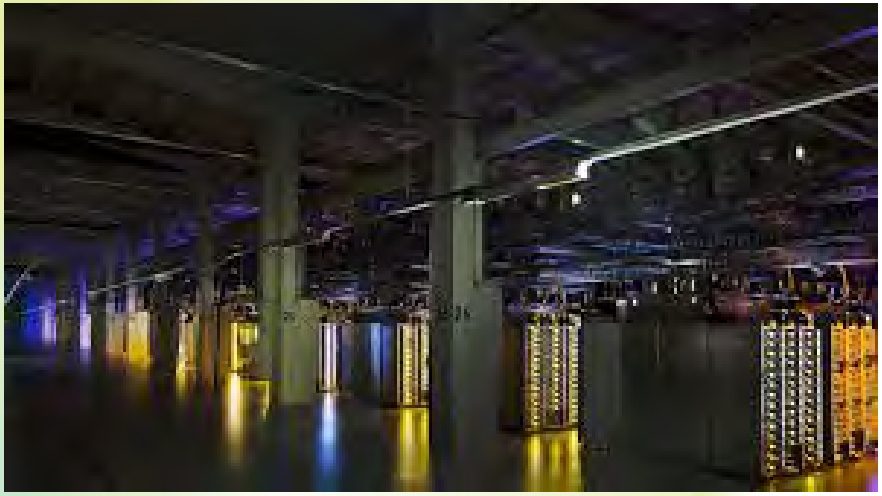
A “Data Centre” consists of…

- Power Systems
- UPSs
- Batteries
- Generators
- Fuel Storage

- Cooling Systems
- Networks/Communications Equipment
- Power/Network Cabling
- Fire Systems
- Leak Detection Systems
- Security/Access Control Systems

- People
- Policies, Processes and Procedures



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To Deliver…

- "Digital Services" to….
  - Internal &
  - External Customers
- At the "lowest possible cost"
- Based on "Risk Profile"

- Logo http://ictanddigitalstrategy.org.uk/2014/08/delivering-digital-services/

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Data Centre Design & Build

EN50600 Series (ISO22237) as Technical Specifications

EN50600 -1 General Principles
EN50600 -2-1 Building Construction
EN50600 2-2 Power Distribution
EN50600 2-3 Environmental Control
EN50600 2-4 Telecommunications Cabling Systems
EN50600 2-5 Security Systems

ISO International Organization for Standardization

Design & Build

EN50600 Series (ISO22237) as Technical Specifications

EN50600 -1 General Principles
Requires:
Clause 4 – Risk Analysis, which triggers the:

Availability Class selected
Protection Class selected
Energy Efficiency Enablement level

General Design principles (Annex A)

International Organization for Standardization

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Design & Build

EN50600 Series (ISO22237) as Technical Specifications

EN50600 -2-1 Building Construction

Requires:

- Location Assessment
- Site Requirements
- Building Construction
- Building Configuration
- Fire Protection
- Quality

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Design & Build

EN50600 -2-1 Building Construction (5.1.1)

The location of a site for a data centre can be assessed either for a "green field" construction of a new data centre or the evaluation of an existing site.

The location shall be assessed against the following criteria:

a) geographical location (see 5.2);

b) natural environment (see 5.3);

c) adjacencies (see 5.4);

d) infrastructural factors (see 5.5);

e) budgetary factors such as site costs and cost to bring utilities to the site;

f) local regulation issues.

ISO International Organization for Standardization

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Certification?

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Data Centre Certifications

CODE OF CONDUCT
DATA CENTRES

ISO International Organization for Standardization

CODE FOR A SUSTAINABLE BUILT ENVIRONMENT
BREEAM
BRE GLOBAL

CEEDA
Certified Energy Efficient Datacentre Award
bcs The Chartered Institute for IT
BRONZE SILVER GOLD

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General Management Systems Standards

ISO 9001 – Quality Management Systems

ISO 14001 – Environmental Management Systems

ISO 50001 – Energy Management Systems

ISO 27001 – Information Security Management Systems

ISO 22301 – Business Continuity Management Systems

ISO International Organization for Standardization

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Data Centre Design & Build

EN50600 Series (ISO22237) as Technical Specifications

EN50600 -1 General Principles
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EN50600 2-4 Telecommunications Cabling Systems
EN50600 2-5 Security Systems

ISO International Organization for Standardization

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Operations

ISO 9001 – Quality Management Systems
ISO 14001 – Environmental Management Systems
ISO 50001 – Energy Management Systems
ISO 27001 – Information Security Management Systems

ISO 22301 – Business Continuity Management Systems

EN50600 Series (ISO22237 Technical Specification)

EN50600 3-1 Operational & Maintenance

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Energy Efficiency

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Energy Efficiency

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Energy Efficiency

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EU Code of Conduct for Data Centres (Energy Efficiency)

- 150+ Best Practices

- Management/Administration
- IT Procurement
- Cooling
- Power
- Other power systems
- Building Location/Design
- Monitoring & Measurement

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EU Code of Conduct for Data Centres (Energy Efficiency)

- Over 350 Participants

- EU
- UK
- US
- APAC

- US DCEP Programme
- International Telecommunications Union
- SS564 - Singapore

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Summary

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Tips & Tricks

- Conduct a General Risk Assessment on IT Systems
  - Internally or Externally
- Consider ISO22301 certification

- If you use Colocation/Cloud services..
  - Ask to see their Certifications or Policies relating to Climate Change
  - ISO22301/27001 Certification
  - Built to EN50600/UTI?
  - EUCOC Participant?

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Tips & Tricks

- Internal BC/DR plan
- Recovery Points/Time

- If you have a Managed Service Provider
  - What's their "plan"
  - Written Policy, process, procedures?

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Tips & Tricks

- Don’t assume anything with suppliers
- Extreme Weather Events affect EVERYBODY!
- Take Regular Backups
  - Stored offsite or in upper floors
  - Check that Backups WORK!
- IT Battle Box
  - Laminated Processes/Recovery Plans
  - Mobile/Sat Phones

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National Infrastructure Commission
"Infrastructure & Digital Systems Resilience"
Final Report November 2017

- Recommendation
- "Understand role of data centres as part of complex systems"
- Recommended Stakeholder
- "Industry led by NIC"

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THANK
YOU
FOR
LISTENING
ANY QUESTIONS?
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