Transition to a Data-Driven Circular Economy

Dr. Marios Angelopoulos
Principal Academic
mangelopoulos@Bournemouth.ac.uk

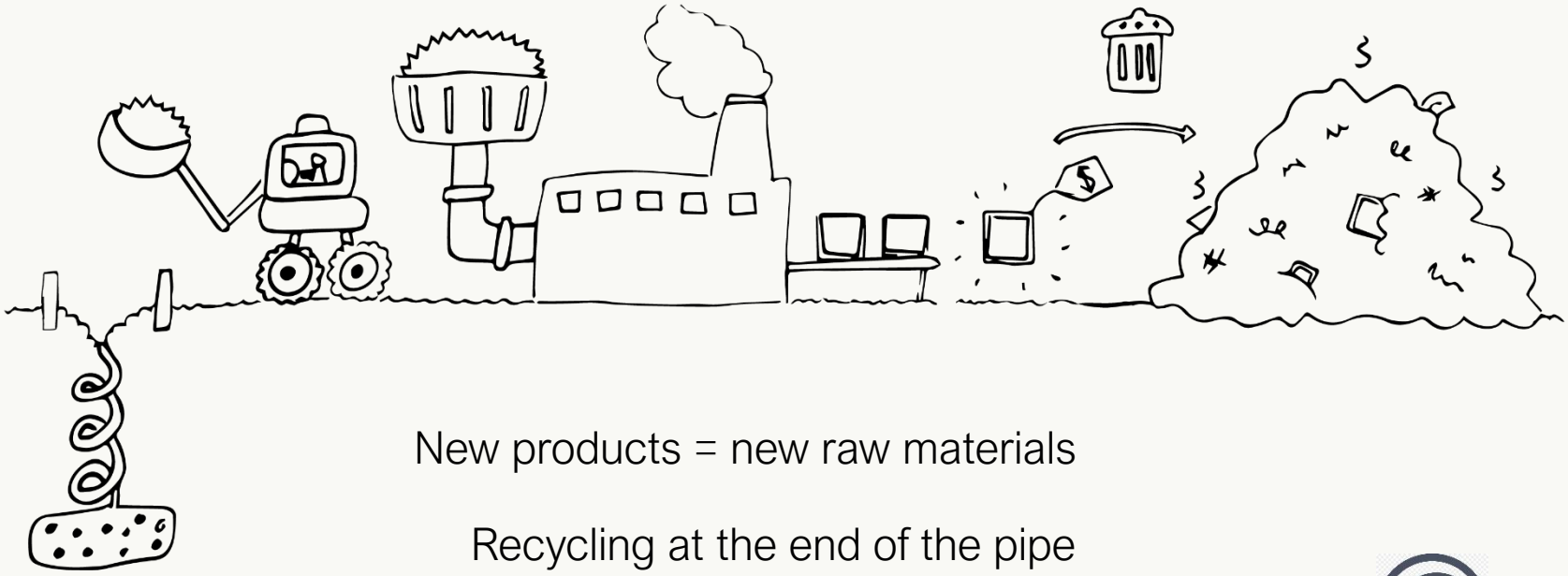
Bournemouth University

IoT Week 2019
Aarhus, Denmark

What is the most impactful invention of human history?

Bournemouth University

Today's Make-Dispose Economy



New products = new raw materials

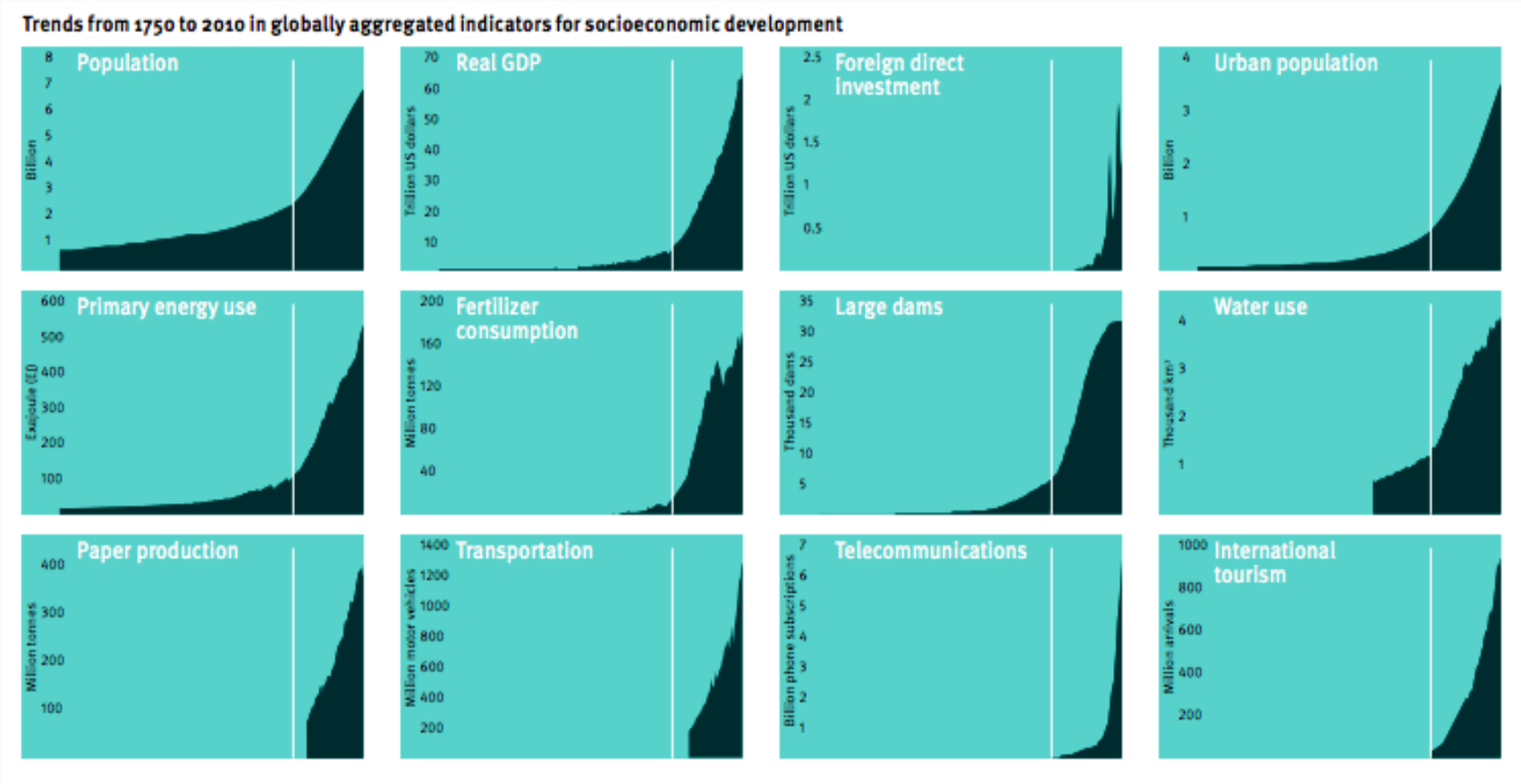
Recycling at the end of the pipe

Waste is historically high

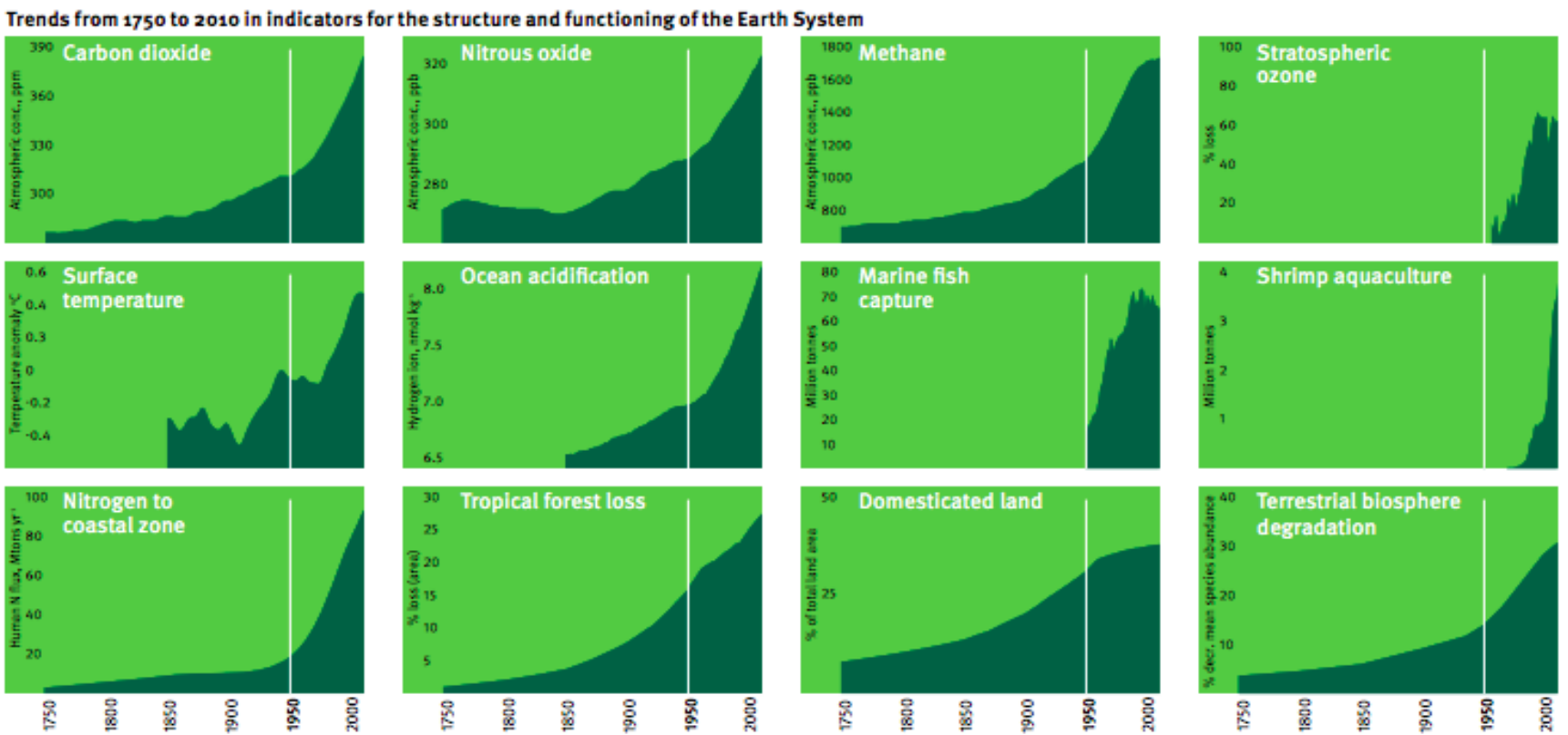
Bournemouth University

ELLEN MACARTHUR FOUNDATION

Impact of Socio Economic Development



Impact on Living Systems



Images source: *The Anthropocene Review*, 2015

Circular Economy

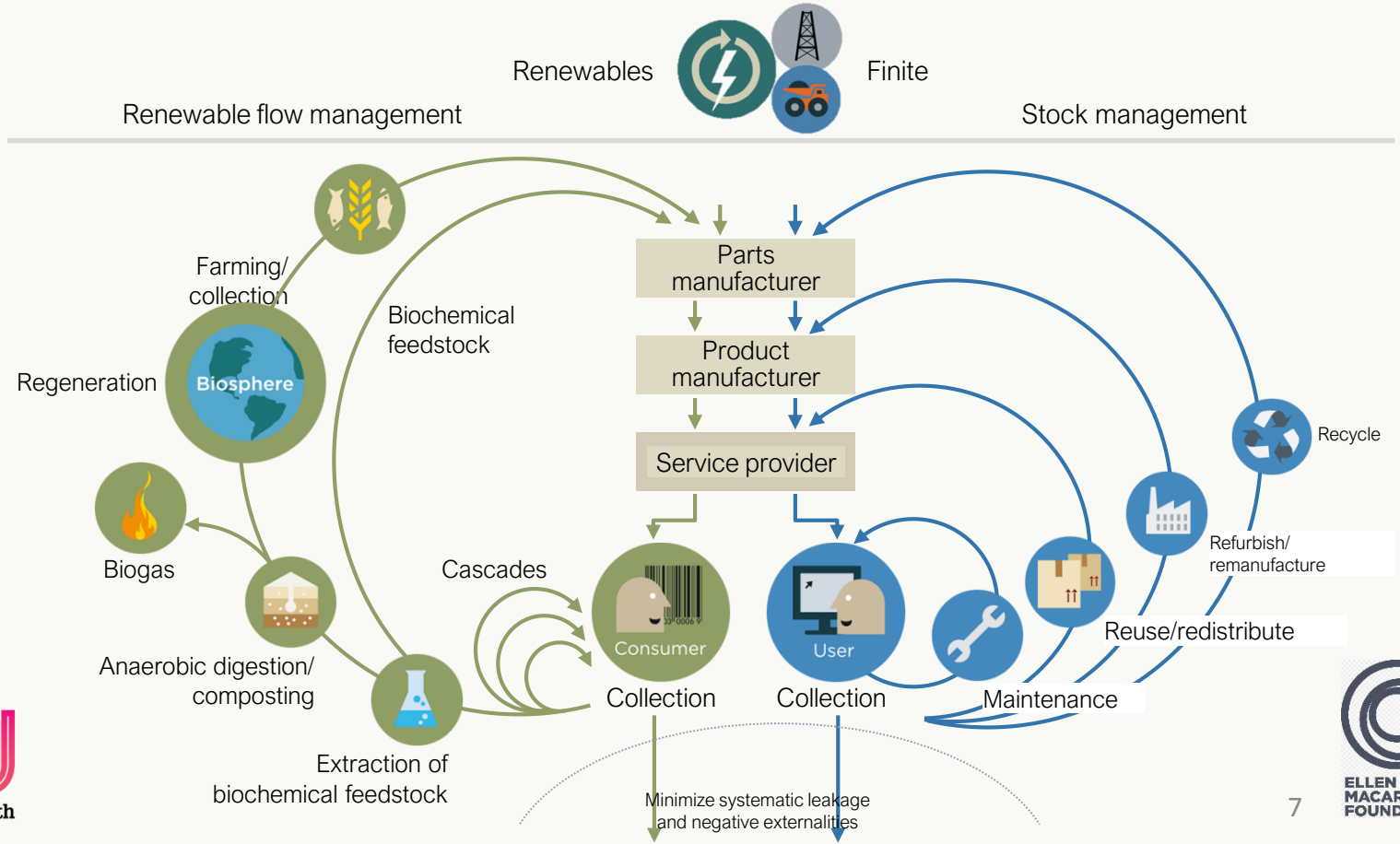
An Economy that is regenerative and restorative by design

…keeping products, components and materials at their **highest utility and value**, at all times

…**eliminating** the concept of **waste**, with materials ultimately re-entering the economy at end of use as defined, valuable technical or biological nutrients

Bournemouth University

A Regenerative Economy by Design

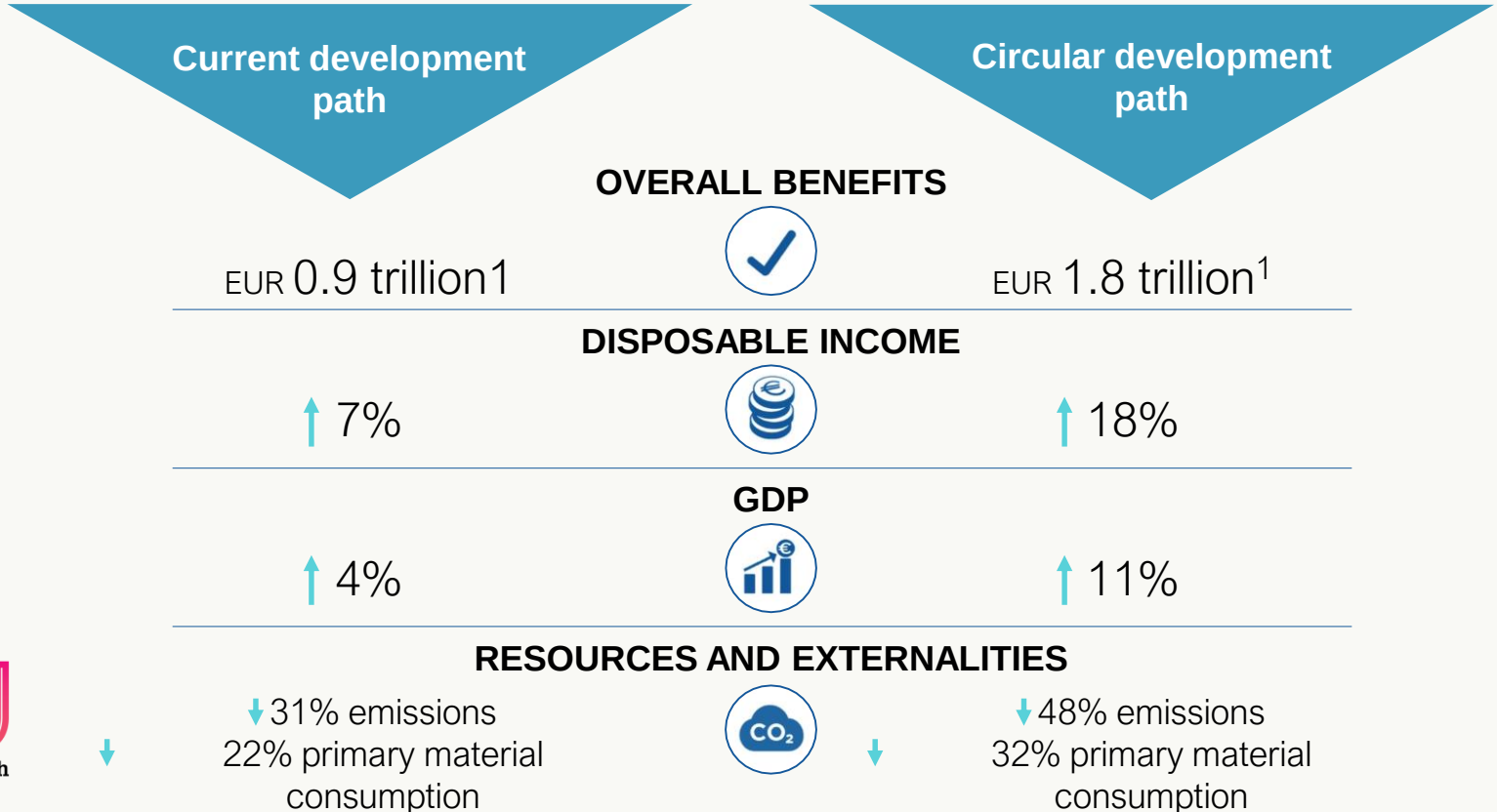


Bournemouth University

ELLEN MACARTHUR FOUNDATION

The Compelling Business Rational

€1.8 tri in benefits for Europe by 2030 in mobility, food and the built environment



Key Enabling Technologies

- **Big Data**
- **Internet of Things (IoT)**
- Blockchain
- **Artificial Intelligence**
- Cloud
- Additive manufacturing (3D Printing)
- Robotics
- Virtual Reality
- Autonomous Vehicles (Man or Unmanned, Land or Air)

Bournemouth University

THE RESOLVE FRAMEWORK

REGENERATE

- Shift to renewable energy and materials
- Reclaim, retain, and restore health of ecosystems
- Return recovered biological resources to the biosphere

Examples: P-REX, Nespresso, Iberdrola, SLM, Savory Institute

SHARE

- Share assets (e.g. cars, rooms, appliances)
- Reuse/secondhand
- Prolong life through maintenance, design for durability, upgradability, etc.

Examples: airbnb, patagonia, Nearly New Car by Mercedes-Benz, autolib', BlaBlaCar

OPTIMISE

- Increase performance/efficiency of product
- Remove waste in production and supply chain
- Leverage big data, automation, remote sensing and steering

Examples: Cisco, wrap, Toyota, BSB Broad Sustainable Building, The Vauban Quarter

LOOP

- Remanufacture products or components
- Recycle materials
- Digest anaerobic
- Extract biochemicals from organic waste

Examples: CAT, patagonia, Renault, Dell, Paques, Veolia, Winsun, mazuma mobile

VIRTUALISE

- Dematerialise directly, e.g., books, CDs, DVDs, travel
- Dematerialise indirectly, e.g., online shopping, autonomous vehicles

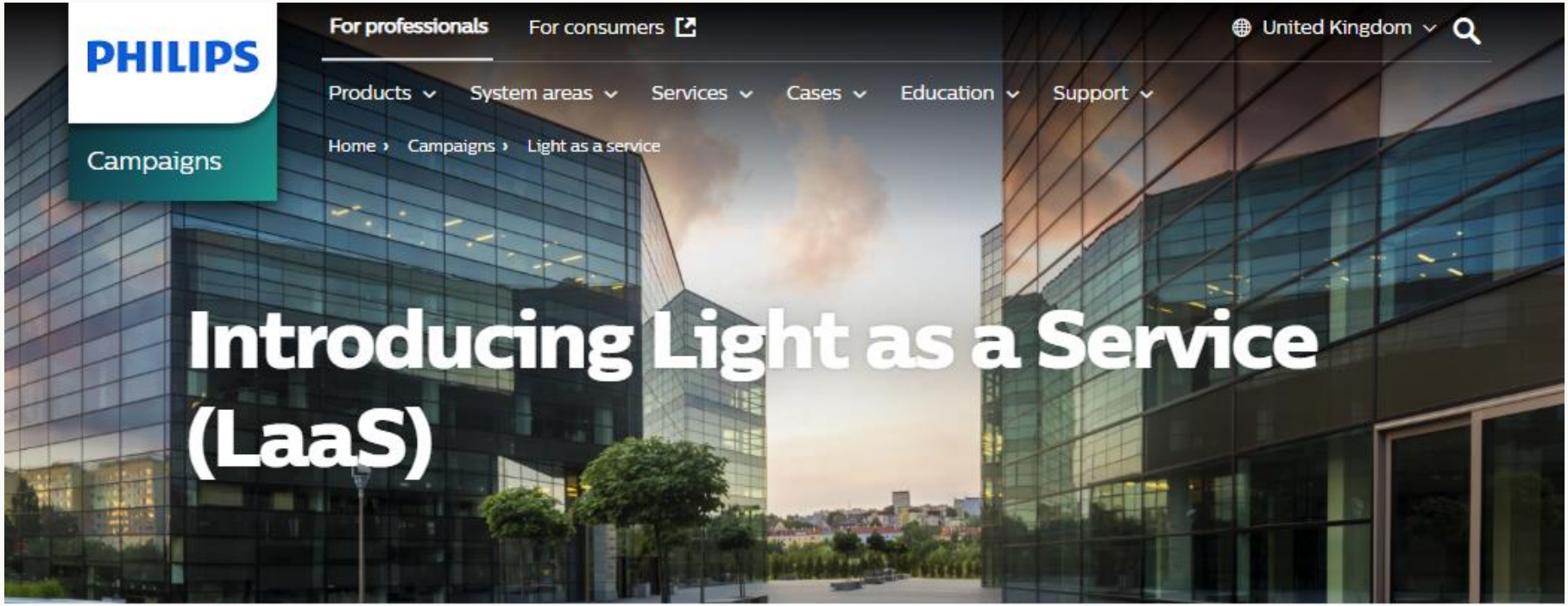
Examples: kindle, zalando, Cisco, Netflix, skype, Google, iTunes

EXPLORE

- Replace old with advanced non-renewable materials
- Apply new technologies (e.g. 3D printing)
- Choose new product/service (e.g. multimodal transport)

Examples: DESSO A Tarkett Company, Tesla, Beyond Meat, Philips Lighting, skyTran

Bournemouth University



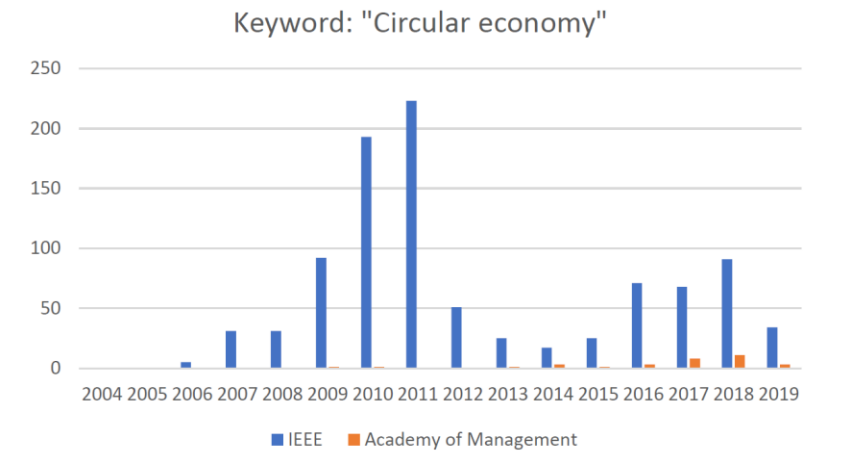
Let your light pay for itself and cut energy costs instantly

We designed Light as a Service (LaaS), a lighting solution that delivers instant energy savings with no upfront investment, a one- stop shop for performance, operations, maintenance & financing.

The Edge (Deloitte, Amsterdam)

- **The Edge** is the most Sustainable building in the world (98%)
- It includes a number of Innovations like **Light over Ethernet powered by LED system** and not from a traditional 230 Volt cable.
- The **32000 sensors** in the building enabled a tremendous data flow (big data)
- They have achieved a remarkable space optimisation given that approximately **35% of the offices** are empty during a working week
- Cleaning services are being **optimised** based on actual use of spaces Health has been also in the focus. **Airflow management** based on office occupancy and density.
- Heating is tweaked to a **precise degree** to be able conserve energy by detecting when spaces are unoccupied.
- **<u>Very important:</u>** The Edge is producing **10% more** energy than the one consuming

On going research



Credit: Prof. David Langley; TNO – UoGroningen

Main Community Challenges:

- To spur/engage the community
- To demystify emerging techs
- To bridge the language gap across disciplines

Main Research Challenges:

- To elicit the fundamental principles of Circularity
- Apply those on different domains
- To demonstrate added value creation

Bournemouth University

Thank you.

Dr. Marios Angelopoulos
mangelopoulos@bournemouth.ac.uk

Bournemouth University