WBGU

Wissenschaftlicher Beirat der Bundesregierung
Globale Umweltveränderungen

Digitalisation at the Service of Sustainability

Towards our Common Digital Future

Maja Göpel, Ina Schieferdecker

February 18, 2019

Outline

- Short Introduction WBGU
- Sneak Preview Flagship Report on Digitalisation and Sustainability
- Selected Recommendations and Call for Action

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WBGU: Science-Policy-Society-Interface

Fed. Government
BMU & BMBF
Intermin. Committee

Independent scientific policy advice

- **9 professors**: interdisciplinary, appointed 4 years, scientific staff
- **Secretariat** with scientific core team

Deutscher Bundestag

SUSTAINABLE DEVELOPMENT GOALS

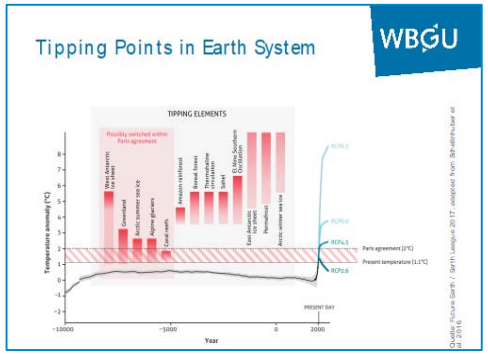
German Advisory Council on Global Change
Science for a Sustainable Future

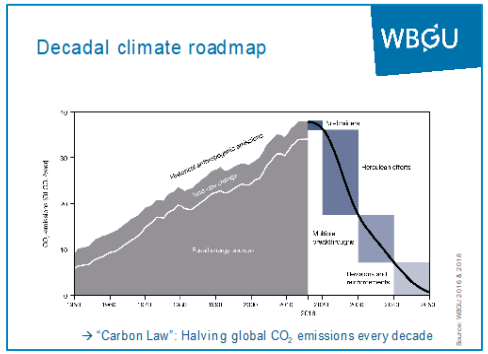
The Council

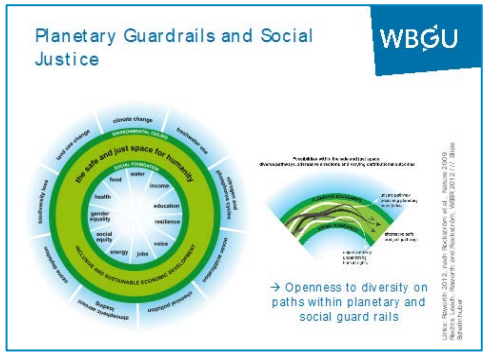
- compiles scientific analyses, develops concepts, and proposes solutions for global sustainability
- Our thinking is systemic, our work independent and interdisciplinary
- Through dialogue with policy-makers, society and international organizations, we uncover ways of achieving the Great Transformation

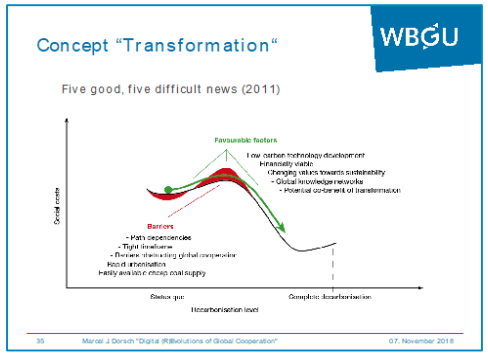
- **Outputs**
  - Syntheses of scientific discourse and evidence
  - Identification of future concerns (early warnings)
  - Assessments of national und international policy processes
  - Policy and research recommendations for the German government

WBGUs **Core Focus**: Sustainability Transformation









Digitalization & **Sustainability** Transformation

„Digitalization: What we need to talk about“

WBGU Stirring Paper (March 2018)

Free download: www.wbgu.de/en

- Impulse to stimulate a debate and to encourage people to get involved in these developments. **#SustainableDigitalAge**
- Message: Place digitalization **at the service of global sustainability**
- **WBGU Flagship Report** → Spring 2019

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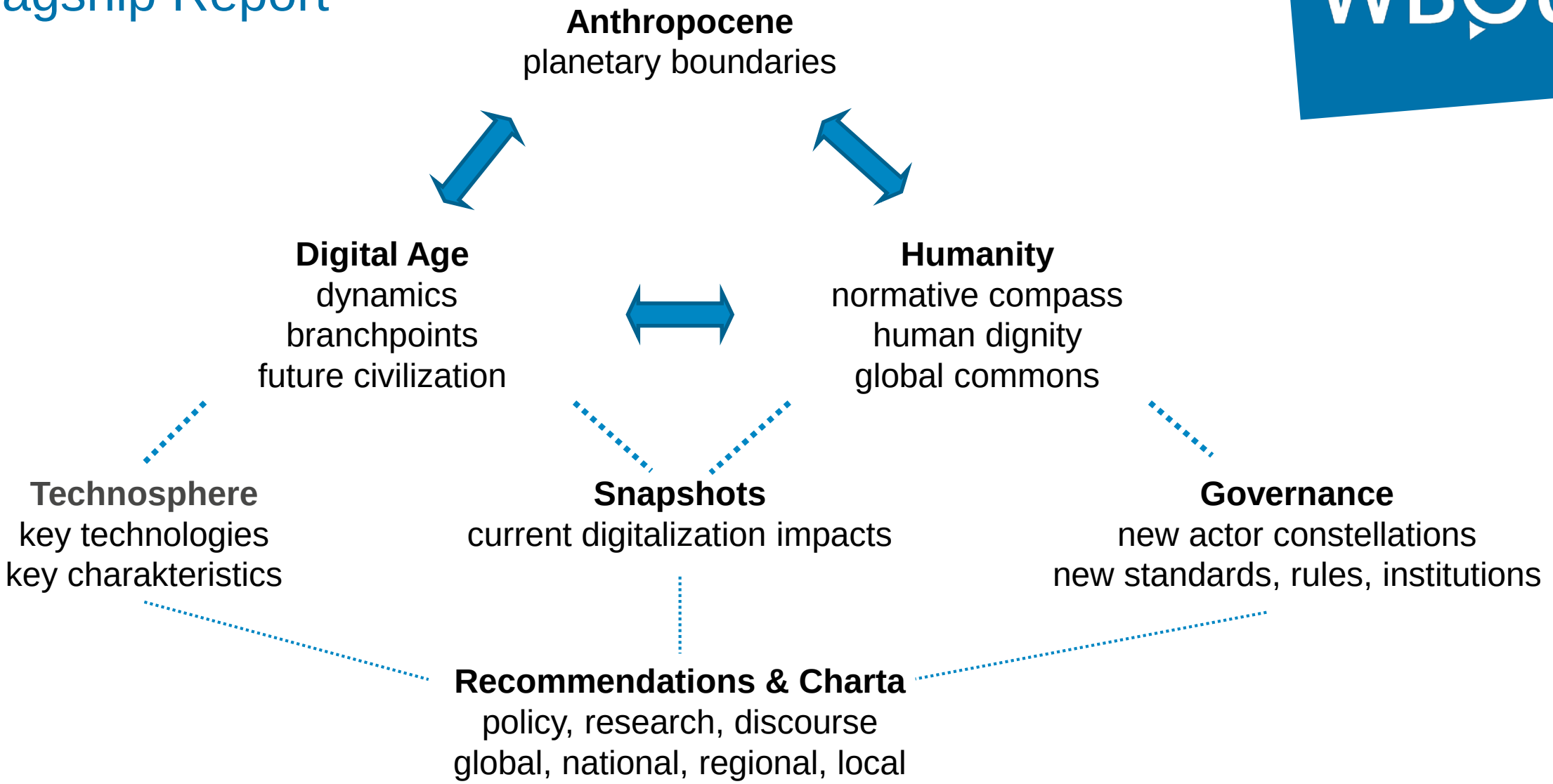
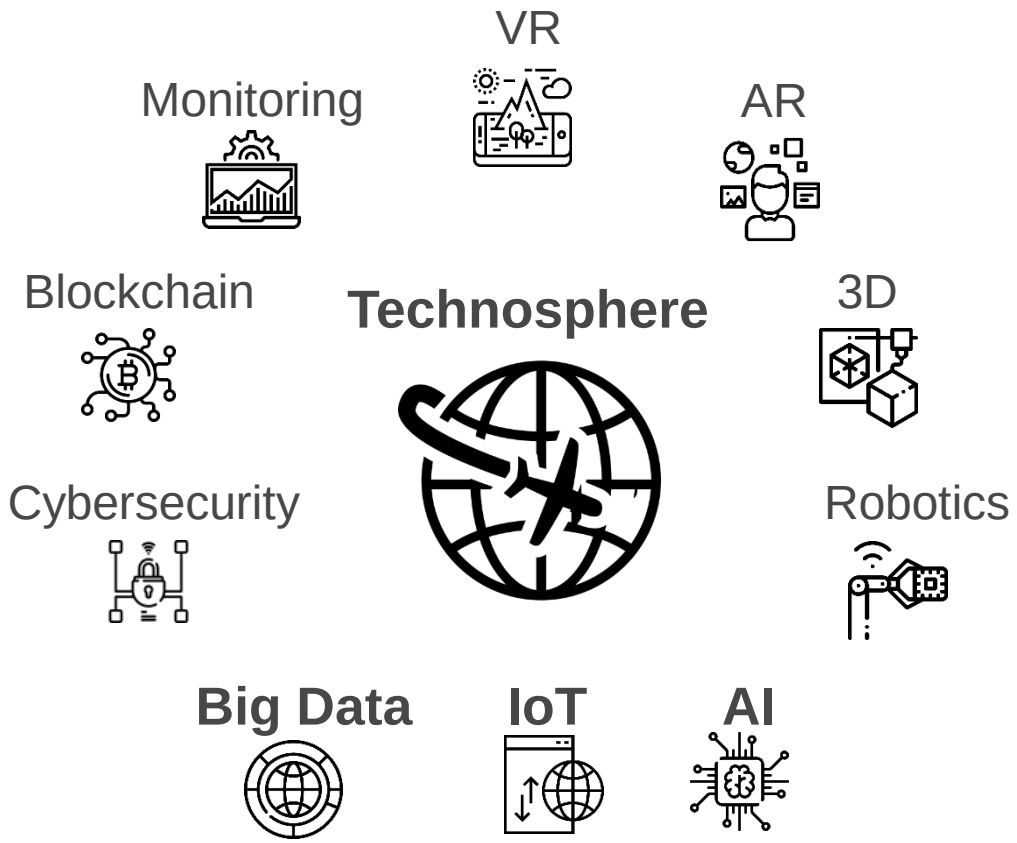
Flagship Report



Key Technologies



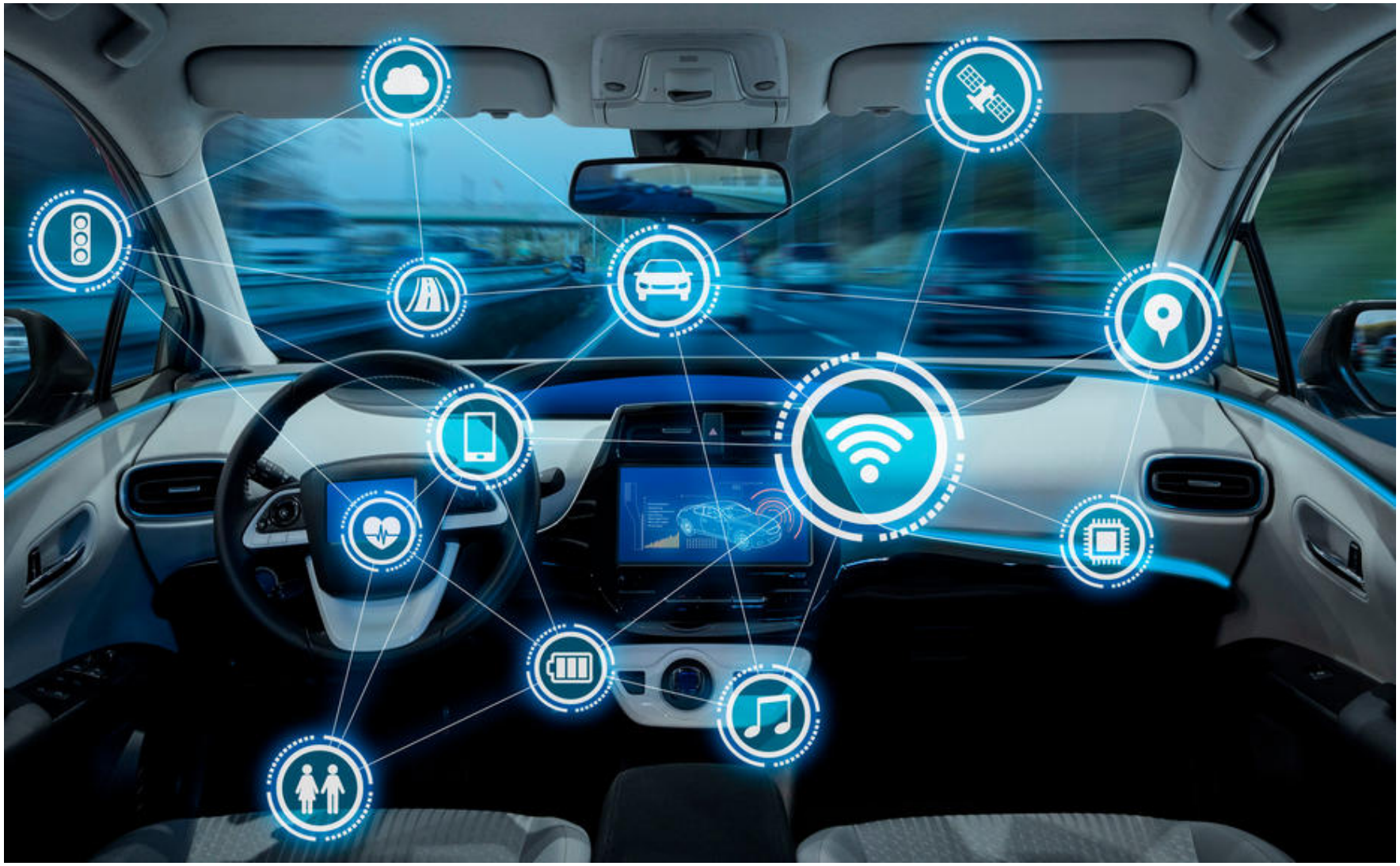
Free icons from www.flaticon.com

The Digital Age: (1) Connectivity

The Digital Age: (2) Explosion of knowledge

The Digital Age: (3) Cognition

The Digital Age: (4) Autonomy



The Digital Age: (5) Virtuality

Digitalization as a **Sustainability Topic**! Examples

- **Sustainable digital infrastructures & digital tools for sustainability**
  - e.g. **energy** and mobility systems
  - e.g. materials and **resources** (circular economy, ‘dematerialization’, rare earth metals, land use)
  - e.g. **development** (poverty, access & inclusion, rural development)

- **“Digital Sustainable Societies”**
  - e.g. social **cohesion** (digital divides, (in)equality, ‘work of the future’)
  - e.g. **power** imbalances and abuse (big five, authoritarianism, individual exposure)
  - e.g. **democracy** (public discourse, privacy, accountability)

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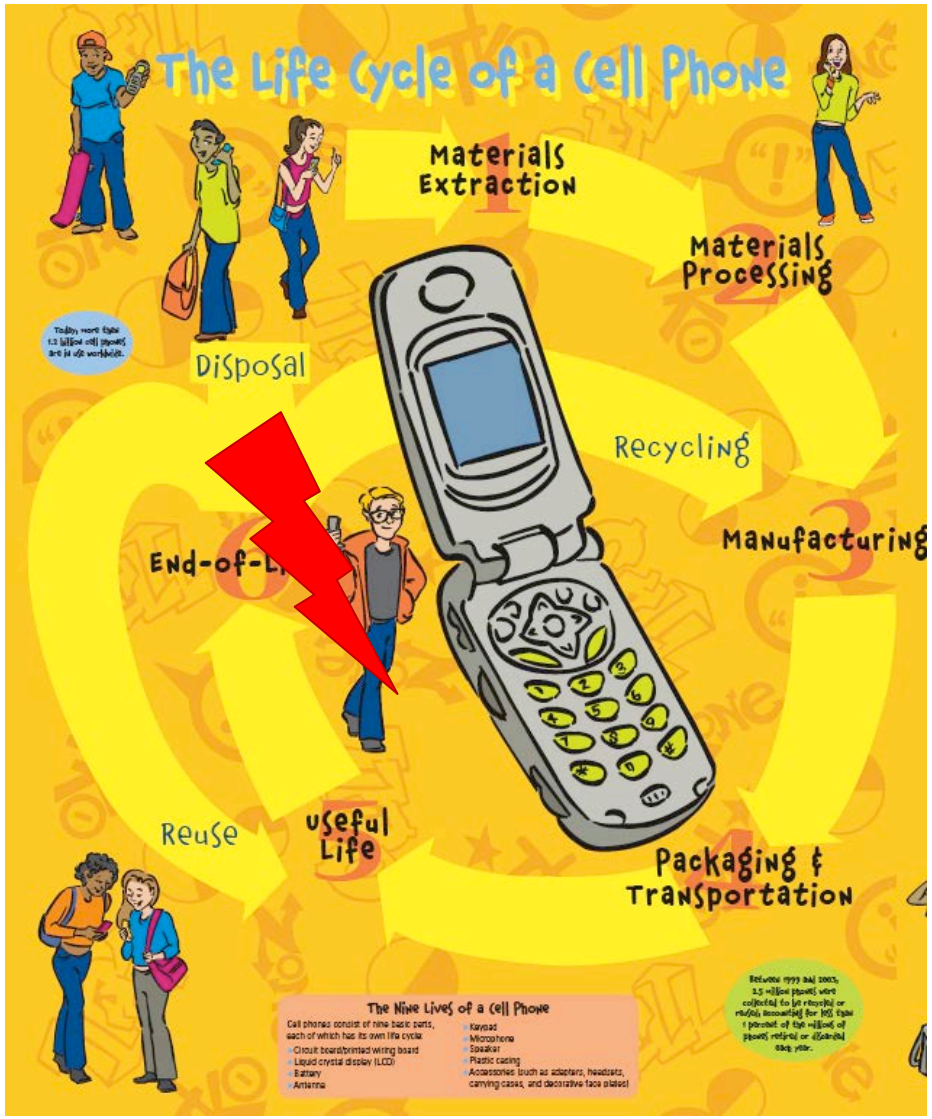
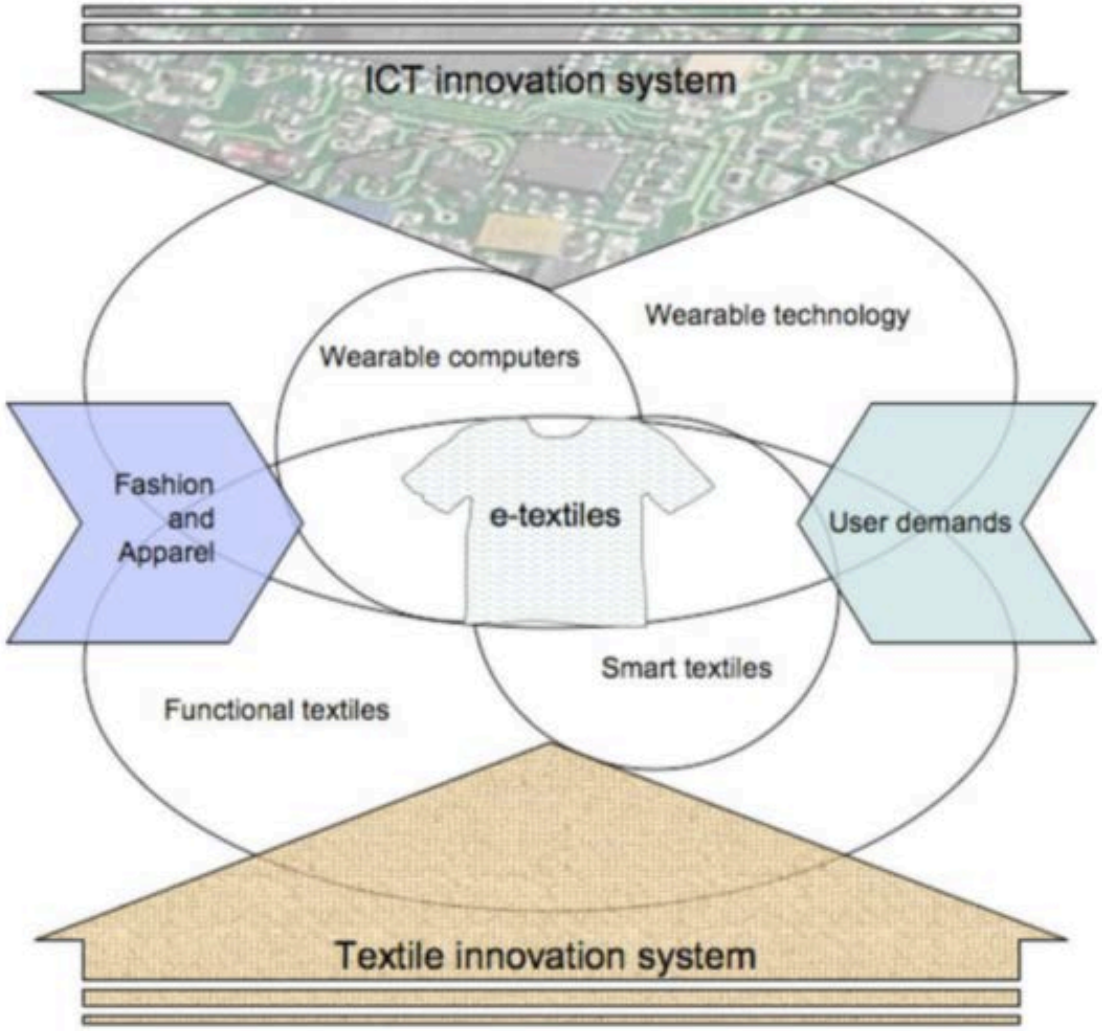
Environmental Impacts of digital technologies – Life Cycle Assessments important



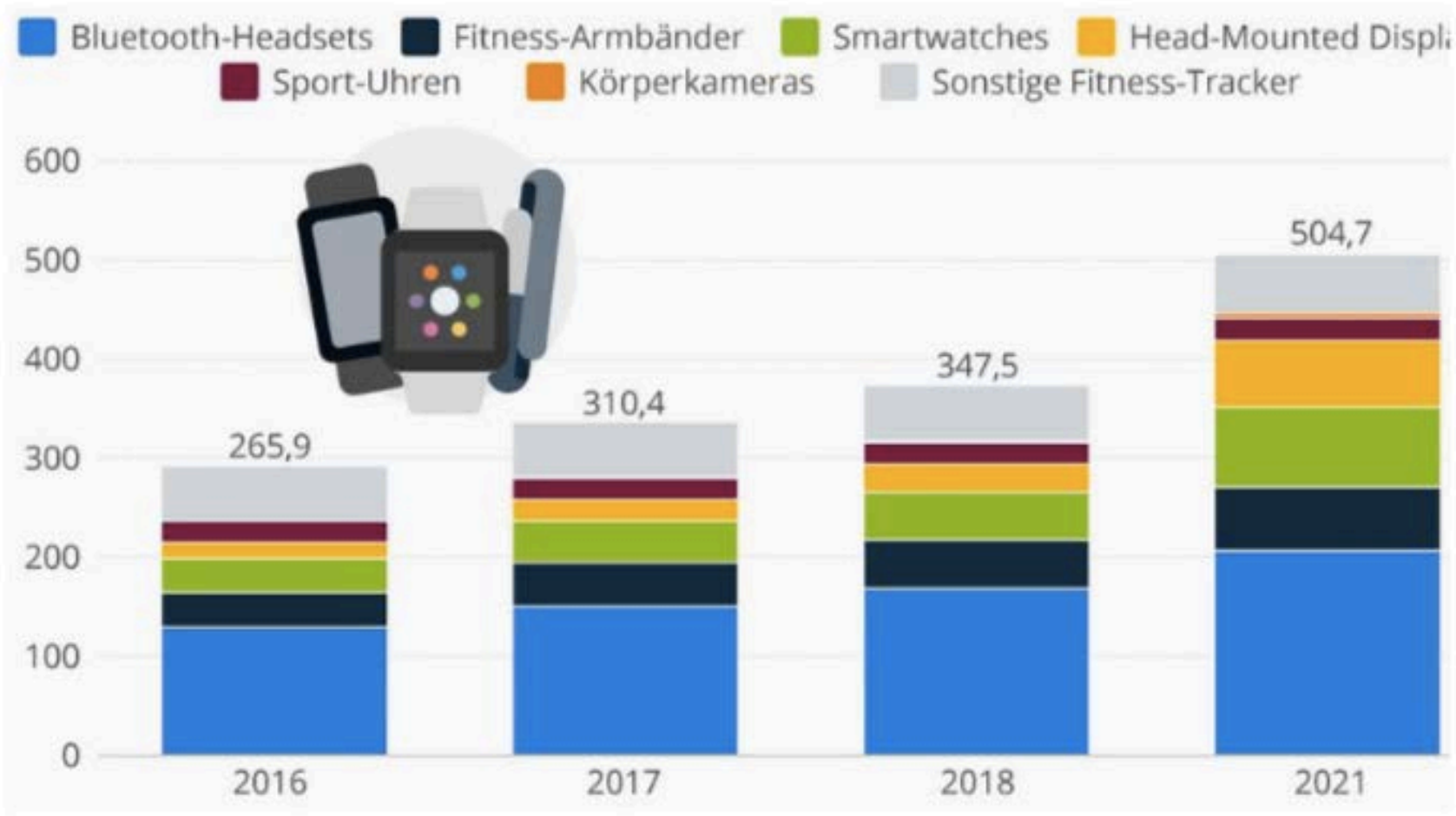
Source: EPA

However, where does „digitalization“ start and end?



Quelle: (Köhler 2013a)

Digital Hybrids for Consumption 4.0



Quelle: (Brandt 2017)

Orders of Impact – Hard to Measure

- **1st Order Impact:** the resource use of developing new infrastructure (hardware) & energy
- **2nd Order Impact:** efficiency and consumption effects through differently organized processes
- **3rd Order Impact:** consumption and lifestyle effects through digitally amended systems

Orders of Intervention – Systemic Approach

- **1st Order Intervention:** standards and regulations to ensure circularity and efficiency by design
- **2nd Order Intervention:** mission investments and regional innovation systems to close the loop and maximize sharing
- **3rd Order Intervention:** repurpose economies to regenerative and inclusive value creation and distribution

Take-Aways

- The digital revolution changes the socio-ecological-technical composition of systems
- The digital revolution does NOT in itself change the purpose that systems are built to deliver on
- **Any sustainability revolution is negotiated and guided through pre-technological decisions and processes!**

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Towards Our Common Digital Future

Mapping possible transformation pathways

- **Elitist Consumption Control** (‚Radical Radicalism‘)
  - Libertarian and totalitarian accounts of destroying the former role model of a world order of democratic welfare states
  - Digitalization as means for radical disruption

- **Rebounding off the Cliff** (‚Incremental Radicalism‘)
  - Road of unintended side-effects towards irreversible social and ecological tipping points
  - Digitalization accelerates given trends

- **Web of Life and Technology** (‚Radical Incrementalism‘)
  - Reshaping socio-technical forms of delivering on key system functions (e.g. social security, welfare & economic stability, nature conservation)
  - Digitalization as means for sustainability transformation

Selected proposals for a European way

- *Reinvigorating* the European progress model – tech for sustainable development
  - 2030Agenda implementation that leaves no one behind & respects human rights
  - Horizon Europe with strong elements of knowledge transfer and RRI
  - Mainstream sustainability KPIs into economic strategies and reporting & into Multiannual Financial Framework

- *Recoupling* economic with natural processes – digital-biological circular economy
  - Producers: value chain monitoring and reporting - refuse, reduce, reuse, recycle
  - Consumers: footprint measuring and accounting; prosumption
  - Citizens: platforms for better information sharing and watchdogging
  - Finance: ensure non-financial risk reporting against all environmental concerns
  - States: adaptive policies; redesign global competition standards & rules

Selected proposals for a European way

- *Reclaiming* common goods and welfare – public infrastructures of the future
  - Open standards, open formats, open interfaces
  - Public authority of technical standards, common accessibility, interoperabilty
  - Public-law ICT infrastructure
  - Digital commons, open knowledge

- *Resetting* cognitive frameworks for action - smart data revolution
  - Earth System observation and identification of dynamic patterns
  - Mapping tipping point patterns in local environmental events
  - Citizen science as early warning system and engagement tool
  - ‚Consciousness-data' platforms for environmental and social feedback loops

Recently published

WBGU

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Thank you for your attention

All publications freely available (print + digital) at **www.wbgu.de**

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‘Transformation‘ in system thinking

A system is viewed as a combination

of elements or parts, feedback or connections and a purpose influencing what it is set out to achieve - the “grammar” of the development trajectory.

Analysis of the dynamics behind development pathways

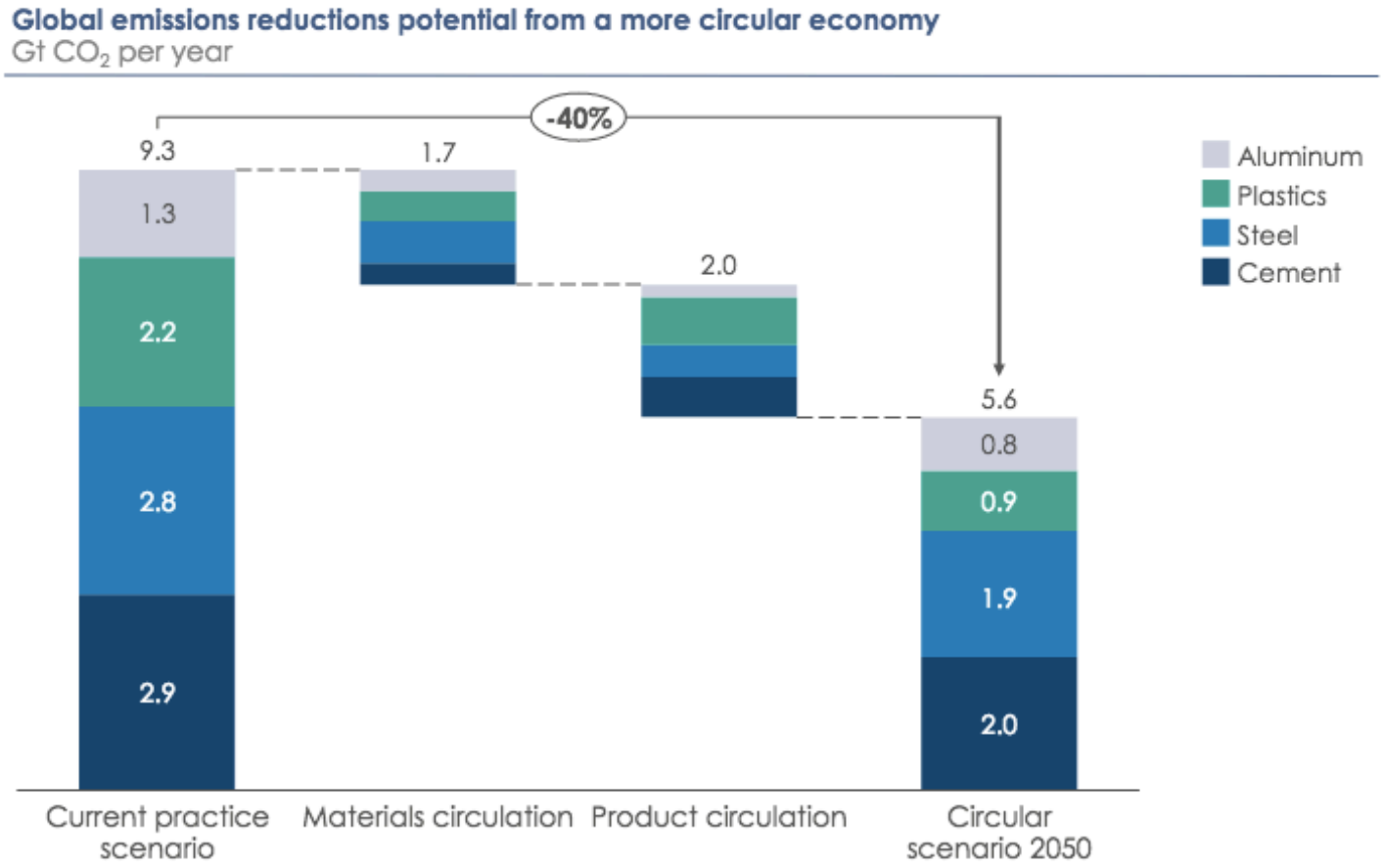
emphasises relationships rather than technological-economic facts when describing root causes of system behaviour and the perpetuation of (undesirable) trends

Transformational change will usually involve a ‘repurposing‘

that alters not only which outcome is delivered (new Key Performance Indicators) but also the processes through which it is delivered.

Circularity for a 1,5-degree world

A more circular economy can cut emissions from the harder-to-abate sectors in industry by 40% by 2050



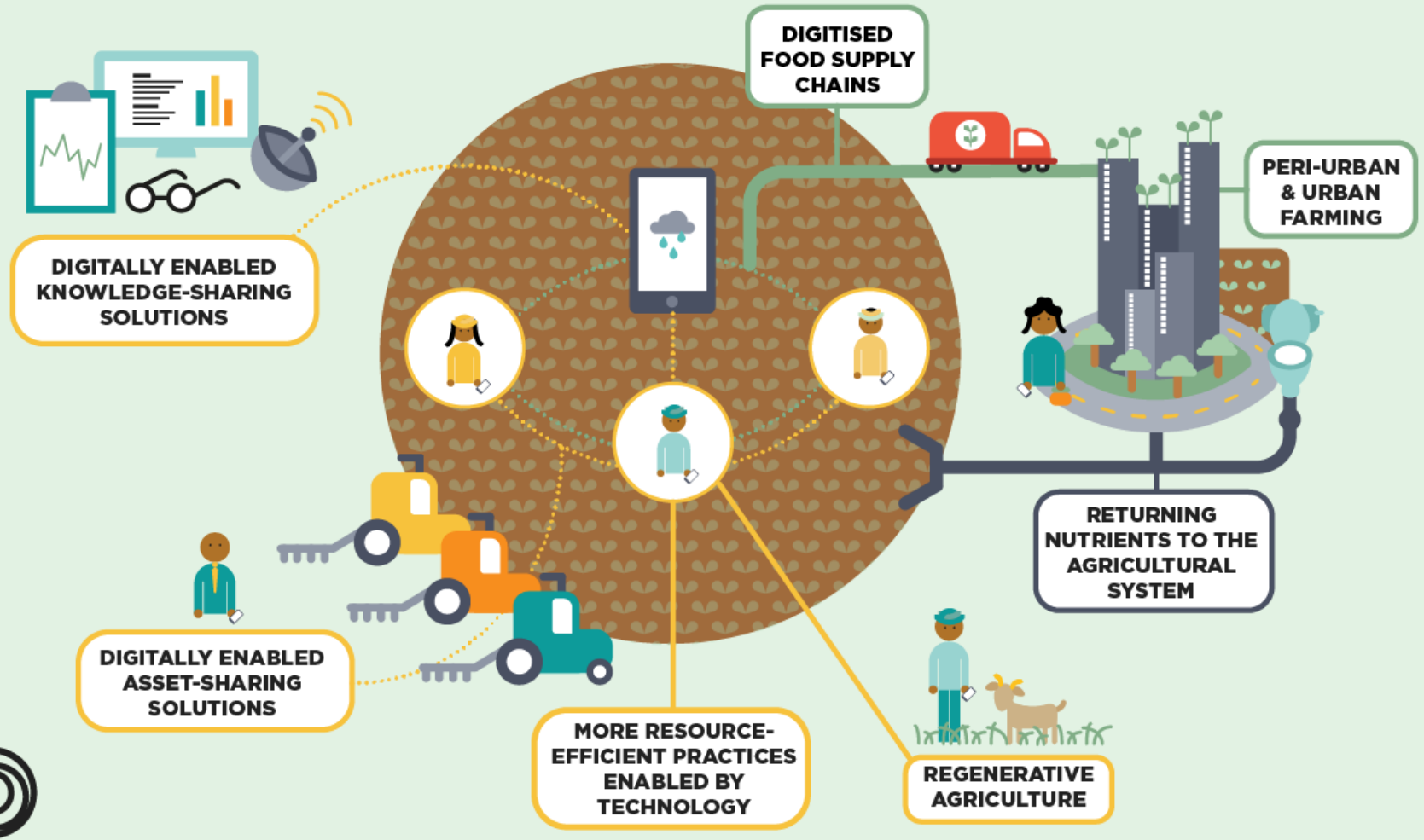
Source: Material Economics analysis for the Energy Transitions Commission (2018)

Energy Transiion Commission: Mission Possible Report

EVIDENCE AND INFLUENCE MICRO-MAGAZINE

Tactical Technology Cooperative

WHAT DOES THE CIRCULAR ECONOMY MEAN FOR FOOD AND AGRICULTURE IN INDIA?



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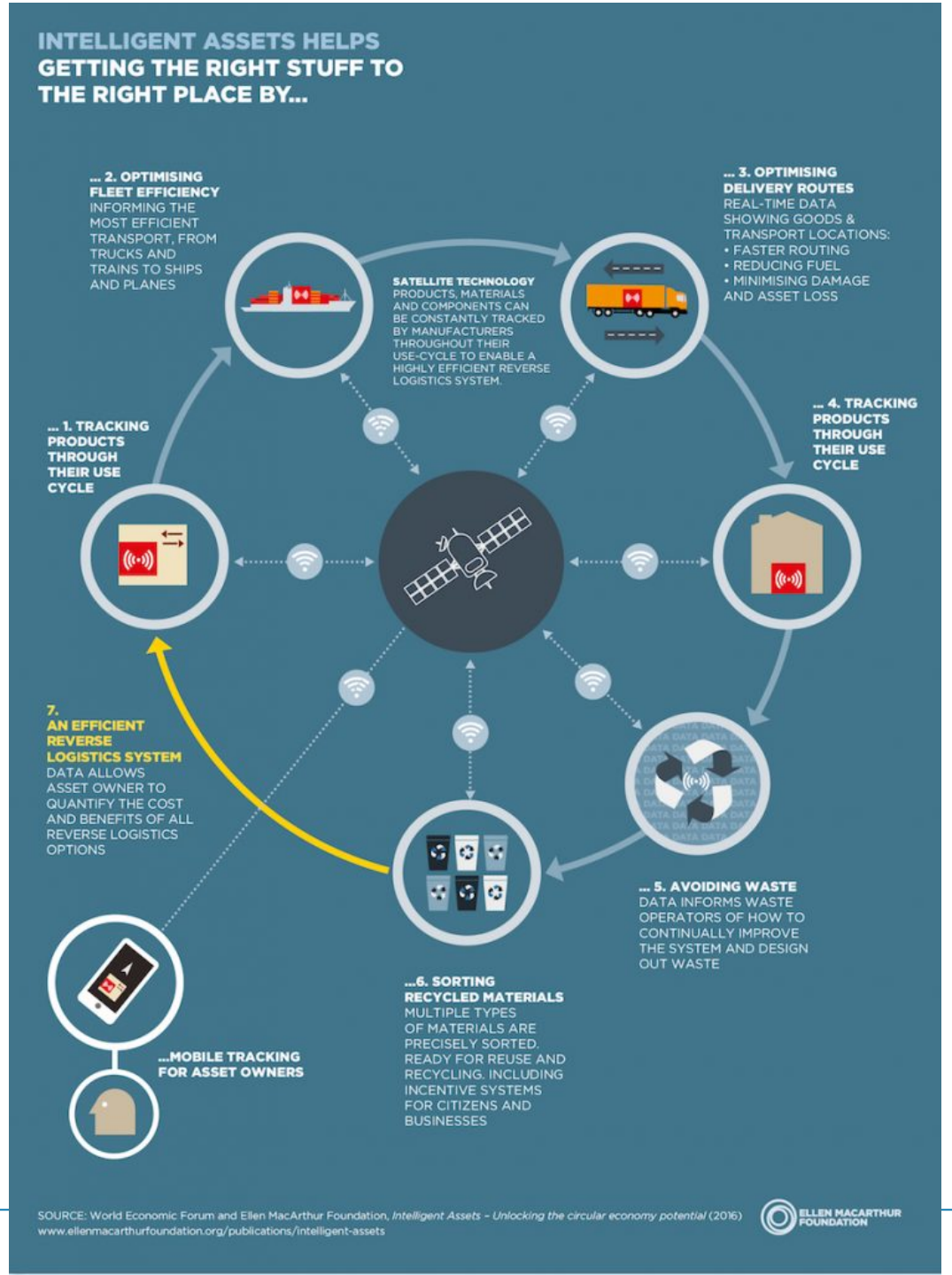
INTELLIGENT ASSETS HELPS
GETTING THE RIGHT STUFF TO THE RIGHT PLACE BY...
... 2. OPTIMISING FLEET EFFICIENCY
INFORMING THE MOST EFFICIENT TRANSPORT, FROM TRUCKS AND TRAINS TO SHIPS AND PLANES
... 3. OPTIMISING DELIVERY ROUTES
REAL-TIME DATA SHOWING GOODS & TRANSPORT LOCATIONS:
• FASTER ROUTING
• REDUCING FUEL
• MINIMISING DAMAGE AND ASSET LOSS
SATELLITE TECHNOLOGY
PRODUCTS, MATERIALS AND COMPONENTS CAN BE CONSTANTLY TRACKED BY MANUFACTURERS THROUGHOUT THEIR USE-CYCLE TO ENABLE A HIGHLY EFFICIENT REVERSE LOGISTICS SYSTEM.
... 1. TRACKING PRODUCTS THROUGH THEIR USE CYCLE
... 4. TRACKING PRODUCTS THROUGH THEIR USE CYCLE
7. AN EFFICIENT REVERSE LOGISTICS SYSTEM
DATA ALLOWS ASSET OWNER TO QUANTIFY THE COST AND BENEFITS OF ALL REVERSE LOGISTICS OPTIONS
... 5. AVOIDING WASTE
DATA INFORMS WASTE OPERATORS OF HOW TO CONTINUALLY IMPROVE THE SYSTEM AND DESIGN OUT WASTE
...6. SORTING RECYCLED MATERIALS
MULTIPLE TYPES OF MATERIALS ARE PRECISELY SORTED, READY FOR REUSE AND RECYCLING, INCLUDING INCENTIVE SYSTEMS FOR CITIZENS AND BUSINESSES
...MOBILE TRACKING FOR ASSET OWNERS
SOURCE: World Economic Forum and Ellen MacArthur Foundation, Intelligent Assets – Unlocking the circular economy potential (2016)
www.ellenmacarthurfoundation.org/publications/intelligent-assets
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