ICTn rooli ilmastonmuutoksen hillinnässä

Jouni Keronen, CEO, Climate Leadership Coalition

9.1.2020

To mitigate the climate change…   … we need to do many changes!

De/recarbonising industry

Prices, taxes and financing

New materials, active buildings

Activating citizens

New energy, storages

Sustainable forestry and land use

New "fuels" for transport
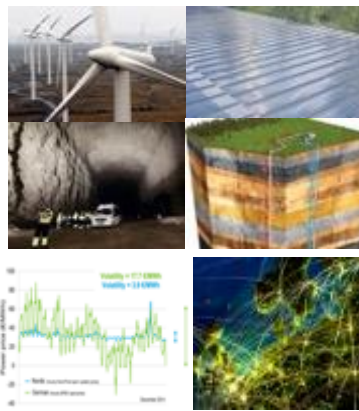
New market mechanisms, smart grid

ICT, IoT everywhere

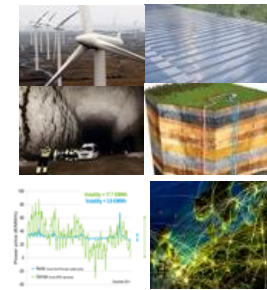### New agriculture, also C sinks
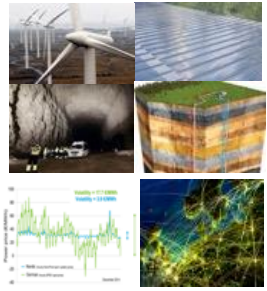
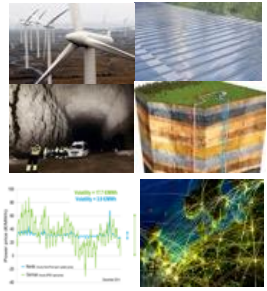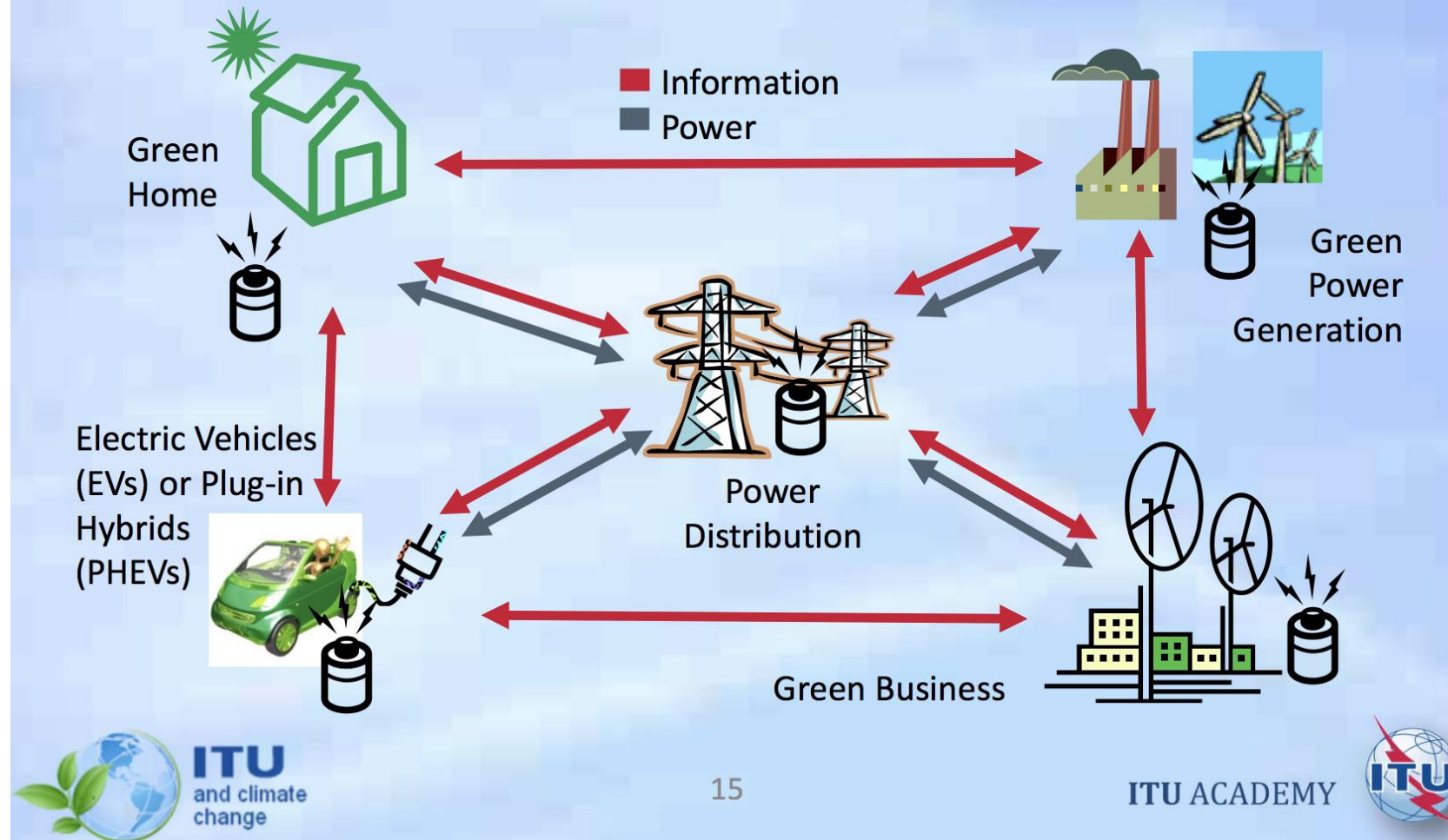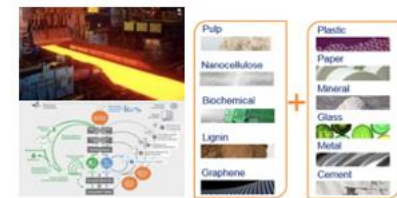# Energy – production, storages, smart grid, market mechanisms

Smart Energy

- A 'smart grid' is a set of software and hardware tools that enable generators to route power more efficiently, reducing the need for excess capacity and allowing two-way, real time information exchange with their customers for real time demand side management (DSM).

- Demand control (electricity) by load shifting via smart meters and appliances
  - Reduces peak demand saving hot standby power stations
  - E.g. temporary turn off, for refrigerator, dishwasher etc. (future electric vehicle charging)
  - Requires communication to meters and appliances

More in Session 9.

ITU and climate change

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The Simplified "Smart Grid": Tomorrow
Full Bi-directional Flow of Energy & Information

Information
Power

Green Home

Green Power Generation

Electric Vehicles (EVs) or Plug-in Hybrids (PHEVs)

Power Distribution

Green Business

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Industry – circularity, new materials

Industry – circularity, new materials

Materials use increase

	2011	2060
Metals	8Gt	20Gt
Fossil fuels	14Gt	24Gt
Biomass	20Gt	37Gt
Non-metallic minerals	37Gt	86Gt

79Gt (2011) → 167Gt (2060)

Pie chart (2017):
- Metals 10%
- Fossil fuels 17%
- Biomass 24%
- Non-metallic minerals 49%

32% Share of sand, gravel and crushed rock in total materials use
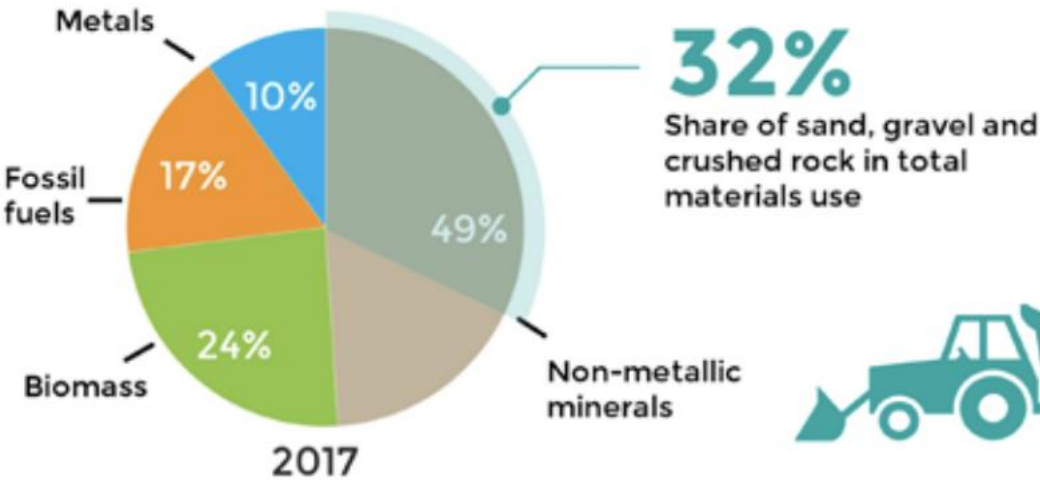
Construction materials use stabilises in China after 2025
- 2011: 18Gt
- 2025: 24Gt
- 2060: 23Gt

Circular economy is not possible without thorough use of ICT

CIRCULAR ECONOMY - *an industrial system that is restorative by design*
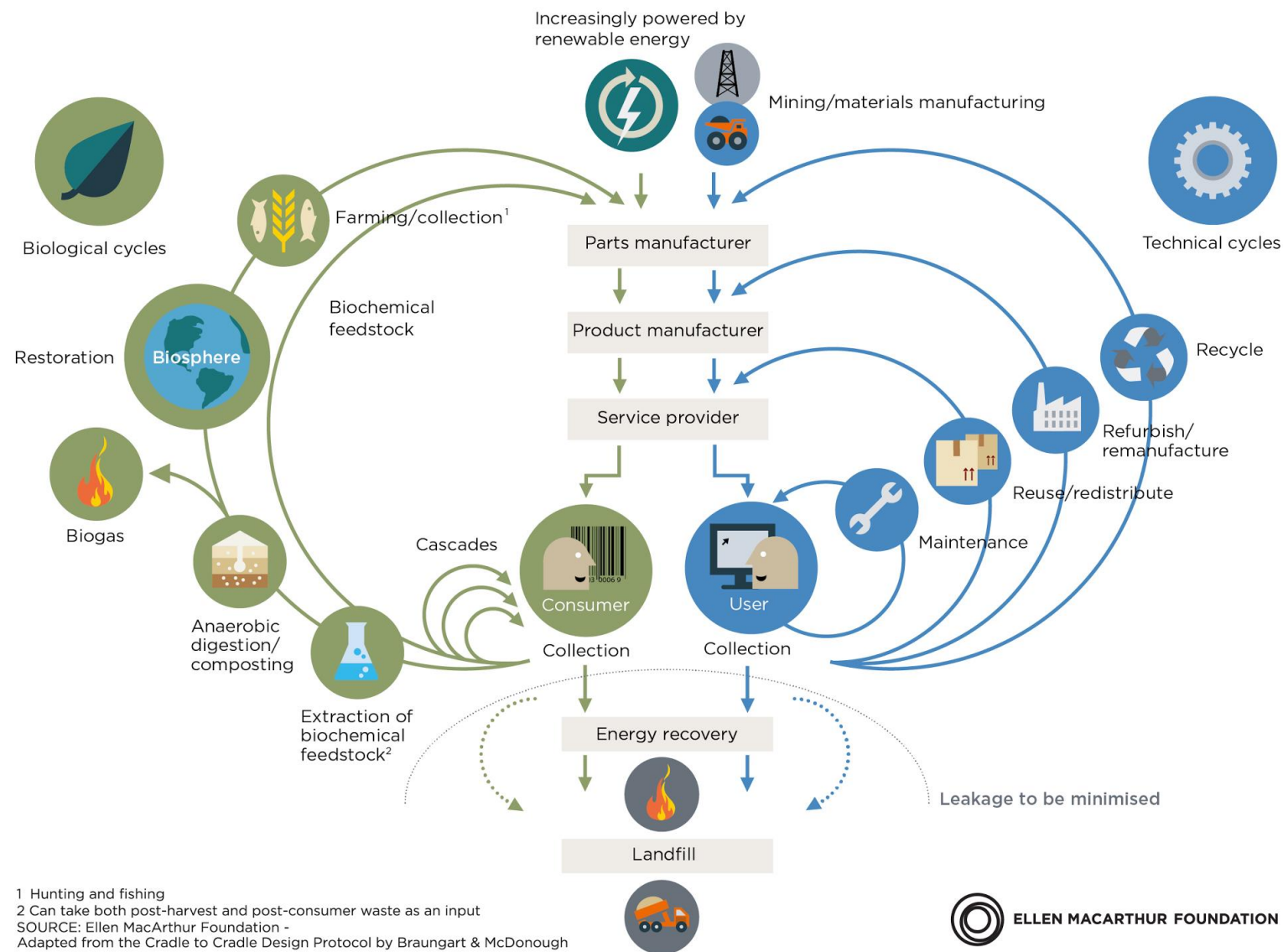
Transport – biofuels, electrification, synthetic fuel, sharing

Smart Logistics

- Smart logistics: Through a host of efficiencies in transport and storage, smart logistics in Europe could deliver fuel, electricity and heating savings of 225 MtCO2e. The global emissions savings from smart logistics in 2020 would reach 1.52 GtCO2e, with energy savings worth US$441.7 billion

- Avoid unnecessary journeys by using
  - GPS for locating and directing delivery vehicles
  - 'always turn right rule' (Verizon)
  - Mobile phone to (or PDA) to inform of 'next call'
  - Mobile phone to 'ring ahead'

- Smart traffic control
  - Lights send out status signals to warn drivers they need to stop

- Smart parking
  - Vehicles directed to an empty space
  - No touring around to find a slot

www.smart2020.org

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Smart Transport

- Smart transportation management systems.
  - collect information about mobility patterns:
    - enabling city managers to check the existing infrastructure is being best used,
    - improves the level of citizens' lifestyle in the transportation of goods, services and people.

- In addition, ICT can help to reduce overall need for transportation and travel by offering virtual alternatives to physical movements.

Source: ITU-T FG-SSC "Overview of Smart Sustainable Cities and the Role of ICTs"

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Transport: Travel Avoidance using ICT

- Teleworking
  - Up to 260 MtCO2e savings each year. For example, in US, if up to 30 million people could work from home, emissions could be reduced 75-100 MtCO2e in 2030, comparable to likely reductions from other measures such as fuel efficient vehicles.
  - Delivers less benefit if your home's heating and cooling is less efficient than at a central office.

- Tele- and videoconferencing
  - Conducting meetings online or on the phone instead of face-to-face could also reduce emissions.
  - Previous conservative estimates have suggested that tele- and videoconferencing could replace between 5 and 20% of global business travel.
  - Advanced videoconferencing applications in the early stage of adoption could have a very significant impact in transport sector reduction.

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Buildings and constructiom – storing carbon sequestration, efficient and active in energy

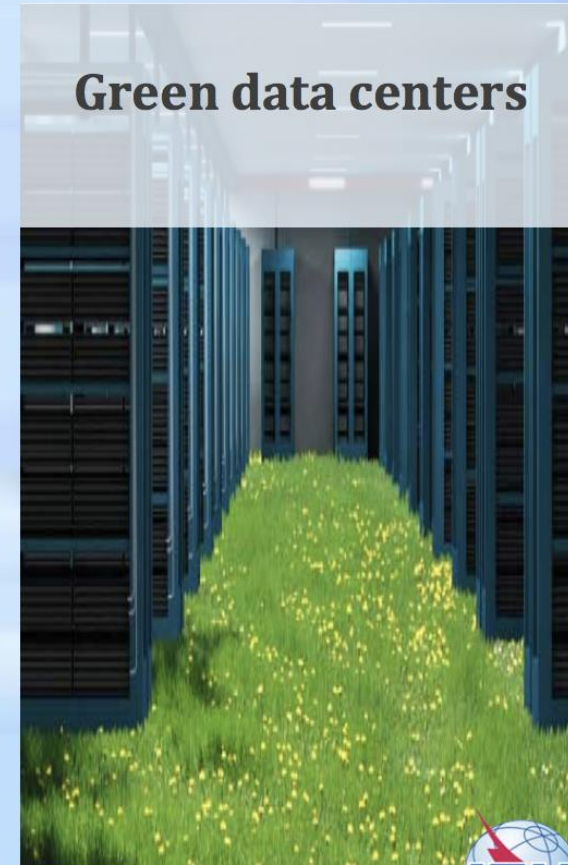# Integrated Building Management System
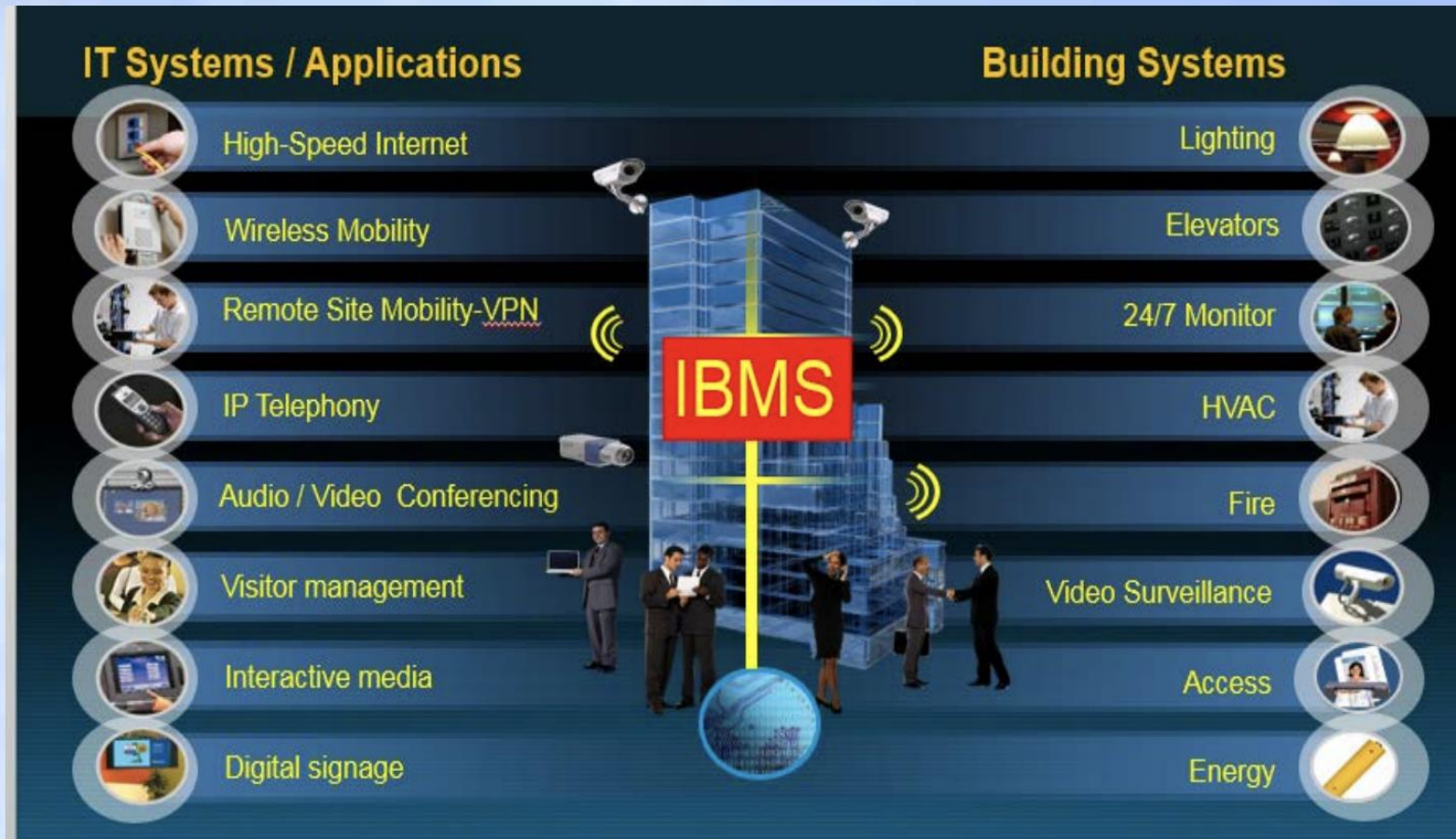
Source: ITU-T FG-SSC "Intelligent sustainable buildings for smart sustainable cities"

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ITU-T Recommendations

Standards are vital to shape Smart Sustainable Cities

Tackling e-waste

Methodology on ICTs in cities

Green data centers

ITU and climate change

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Agriculture – carbon sequestration, new diets and ways to produce foods

Smart Agriculture (Example)

Control of watering and fertilisers using satellite imaging and Global Positioning Systems

- "In the past a complete field would receive the same treatment, whereas precision farming makes it possible to split up the crop into sub-field management areas. Today it is even possible to conduct spatial analysis of the crop in blocks as small as 20m by 20m. This allows local soil or climate conditions to be taken into consideration and encourages more efficient fertiliser application".
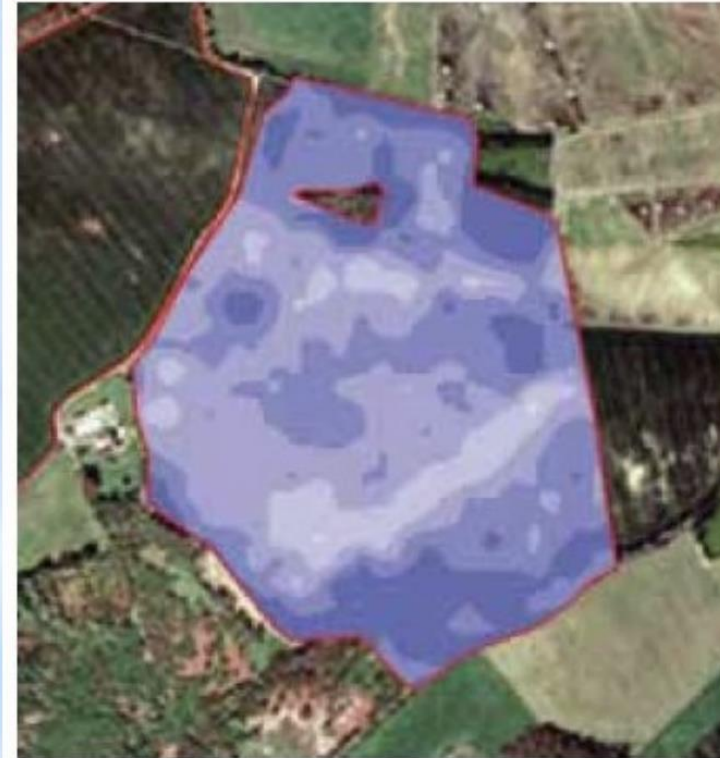
A nitrogen management map for winter wheat.

www.geoconnexion.com/uploads/precisionfarming_intv9i5.pdf

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Smart Agriculture

- Agriculture sector emitted 10.6 GtCO2e in 2008
  - over 21% of world's total GHG emissions.

- Smart Agriculture could:
  - boost crop yields by 30%,
  - avoid 20% of food waste,
  - deliver economic benefits worth $1.9 trillion worldwide,
  - reduce water needs by 250 trillion litres,
  - save 2.0 Gt CO_2e.

Source: GeSI: SMARTer2030 ICT Solutions for 21st Century Challenges, 2015

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Forests – new materials, carbon sequestration, energy

Smart Forestry

Satellite monitoring of forests.

- Forests are stores of carbon and can be either sinks or sources depending upon environmental circumstances. Mature forests alternate between being net sinks and net sources of carbon dioxide [1].

- Deforestation accounts for about 20 per cent of man-made greenhouse gas emissions, more than those produced by the entire transport sector.

- Copenhagen "Accord (2009) specifies need to recognize reduced emissions from deforestation and forest degradation (REDD+) through immediate establishment of mechanism to enable mobilization of financial resources from developed countries".

[1] http://en.wikipedia.org/wiki/Deforestation
[2] www.unep.org/yearbook/2010/

NASA photo of deforestation in Tierras Bajas project, Bolivia, from ISS in April 2001 [2]

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Citizens – climate friendly choices – energy, transport, food, circularity
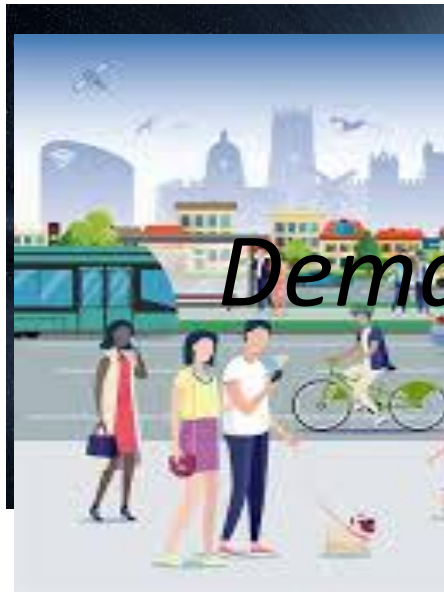
Empowering consumers: Digitalisation is central

- *Sustainable business practices and consumer awareness and behaviour are essential ingredients of fair and circular practice. Traceability, transparency and visibility of value chains and production processes are key steps, for gaining a better understanding of the social, environmental and health risks.*

- *Empowering consumer is, for example, essential for the transformation of the food and textile systems. Consumers are well informed about what their food contains, how the cloth they are wearing were produced, whether the goods are genuine and respect workers' rights.*

From Quantity Driven Profits to the Consumer's Needs

We do not need light bulbs   …   We need light

We do not need chairs   …   We need to sit

We do not need cars   …   We need mobility

We do not need refrigerators   …   We need chilled and healthy food

We do not need CDs   …   We want to listen to the music

We do not need pesticides   …   We want healthy plants

Dematerialisation, Rethinking Ownership, From Efficiency to Sufficiency

Janez Potocnic, Co-Chair of International Resource Panel, Chairman of The Forum for the Future of Agriculture, former Commissioner of Science and Research and Environment for the European Commission at Sitra on 25 November, 2019.

Economics – carbon prices, finance

Traditional Grid

- Generation
- System operator
- Substation
- Substation
- Industrial customer
- Commercial customer
- Residential customer

Smart Grid (end state)

- Transmission control centre
- Generation
- Distribution control centre
- Energy service provider
- Energy storage
- Substation
- Electric vehicles
- Substation
- High-temperature superconductor
- Storage
- Industrial customer
- Commercial customer
- Residential customer

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Monitoring and modelling climate change, support in adaptation

Radiocommunications and Climate monitoring

- Satellite observations of the Earth's atmosphere and surface
- Space-borne sensing (passive and active)
- Sea surface temperature (SST) is now also measured by passive microwave instruments.
- Meteorological radars are used to sense the conditions of the atmosphere for routine forecasting, severe weather detection, wind and precipitation detection, precipitation estimates, detection of aircraft icing conditions and avoidance of severe weather for navigation
- Mobile wireless systems, sensors, actuators, IoTs
- Submarine communications networks to monitor climate changes and disaster warning
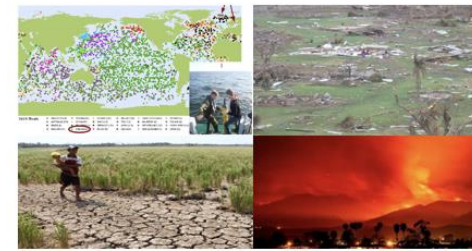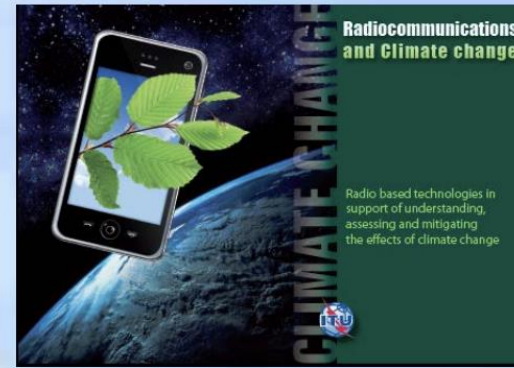
Source: ITU Brochure "Radiocommunications and Climate Change": www.itu.int/pub/R-GEN-CLC-2012
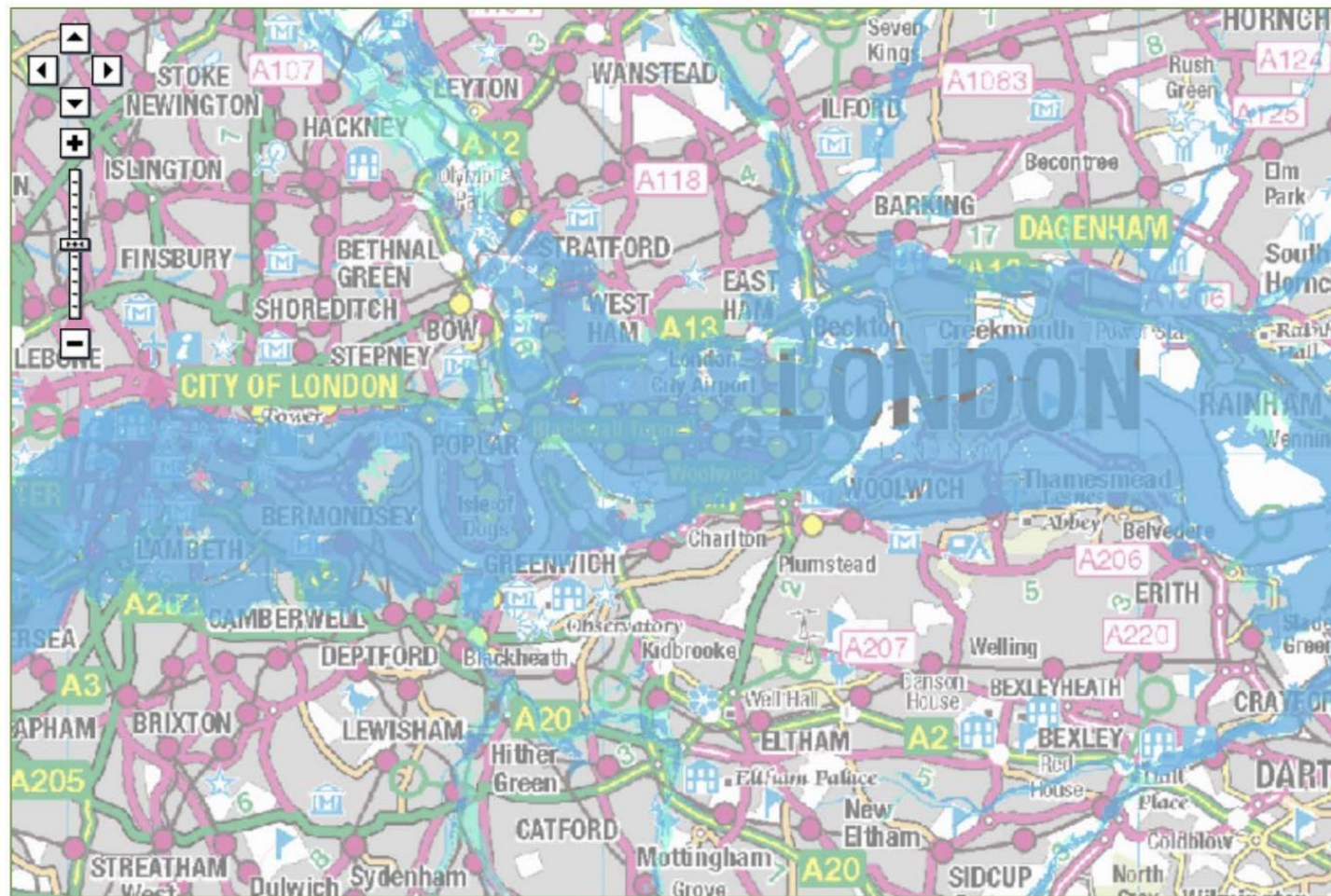
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Check Flood Risk Zones

www.environment-agency.gov.uk/floodrisk

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ICT – enabler of everything, energy use, circularity

ICT – huge efficiency improvement in materials

Figure 5.2. The energy and material benefits of accessing services via a multipurpose smartphone (left) over owning an array of single-purpose goods (right)

Left (smartphone):
- 5 Watts Power
- 2.5 Watts Stand-by energy use
- 75 kWh Embodied energy
- 0.1 kg Weight

Right (single-purpose goods):
- 449 Watts Power
- 72 Watts Stand-by energy use
- 1,706 kWh Embodied energy
- 26 kg Weight

https://www.unenvironment.org/resources/emissions-gap-report-2019
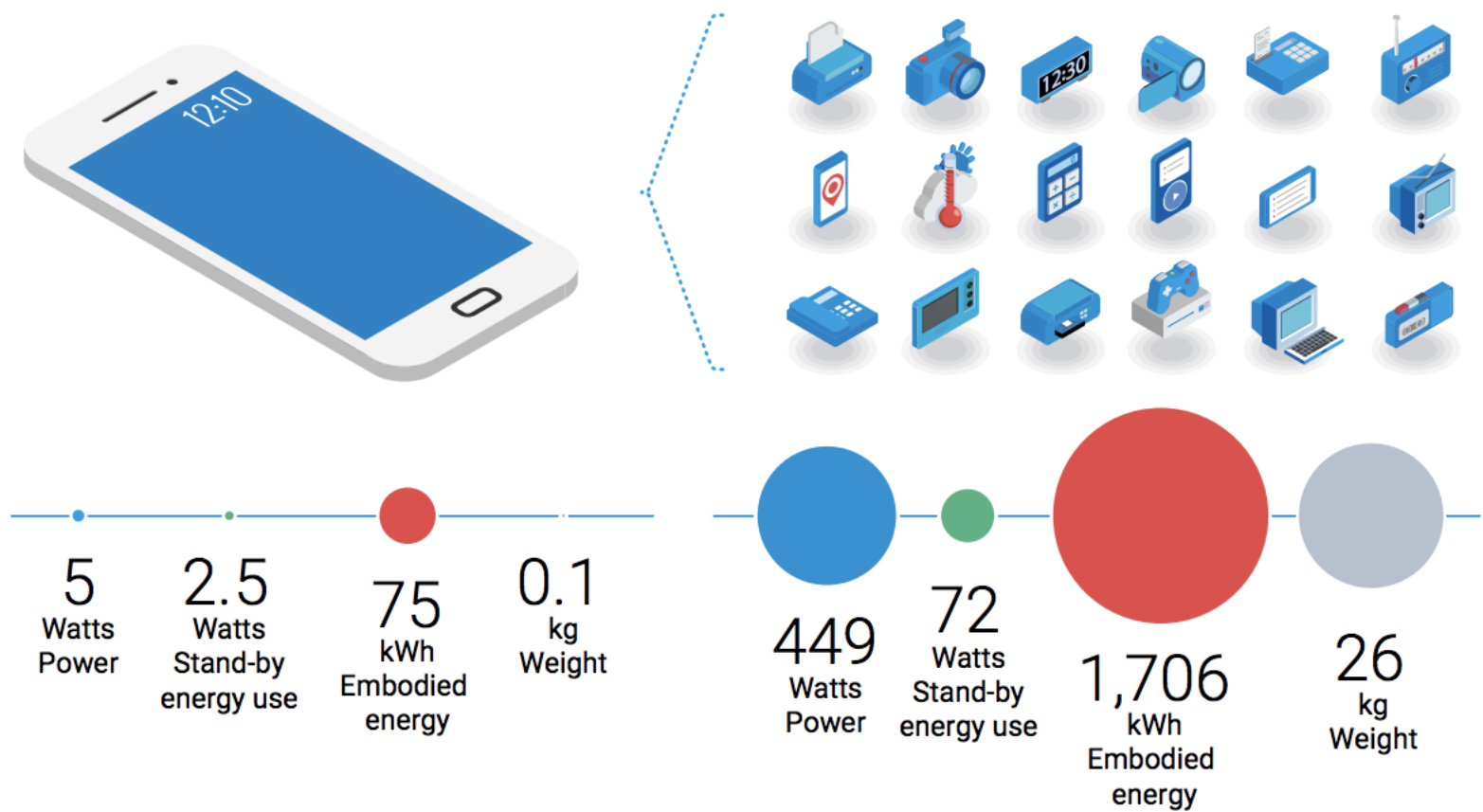
Energy footprint of ICT

- The energy footprint of ICT is still growing due to wider use of ICTs in a range of economic sectors, even if the energy consumption of individual devices is reducing.

- Large installations of ICT for the implementation of e.g. Smart Grids and e-services will further increase emissions.
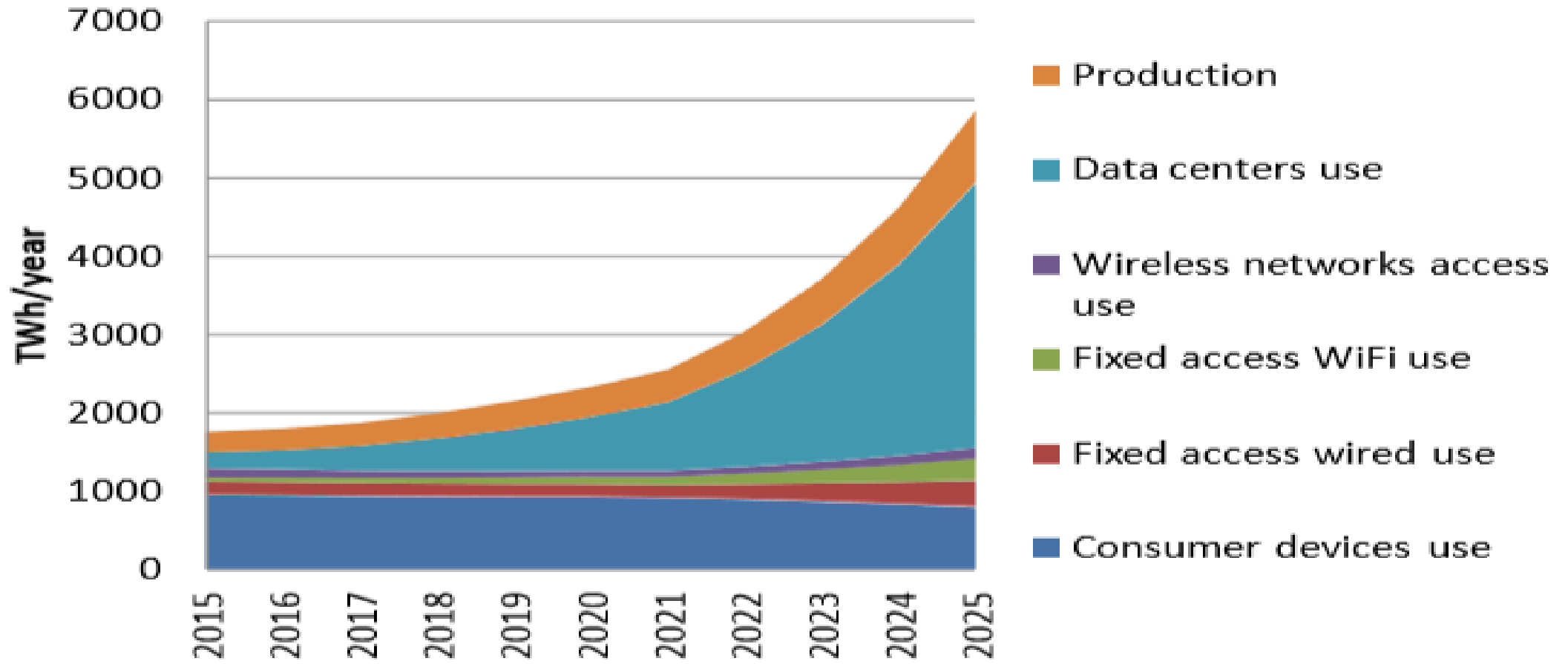

http://dmsext.itu.int/pub/itu-t/oth/33/04/T33040000020004pdfe.pdf

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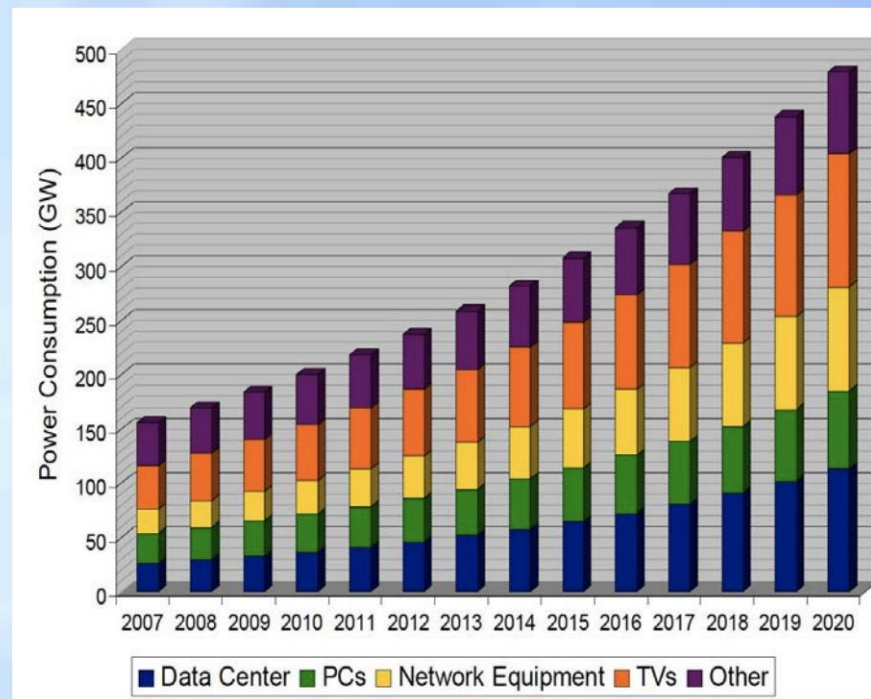
How green is the ICT
Global repartition of energy consumption by ICT sector 2015-2025

Janez Potocnic, Co-Chair of International Resource Panel, Chairman of The Forum for the Future of Agriculture, former Commissioner of Science and Research and Environment for the European Commission at Sitra on 25 November, 2019.
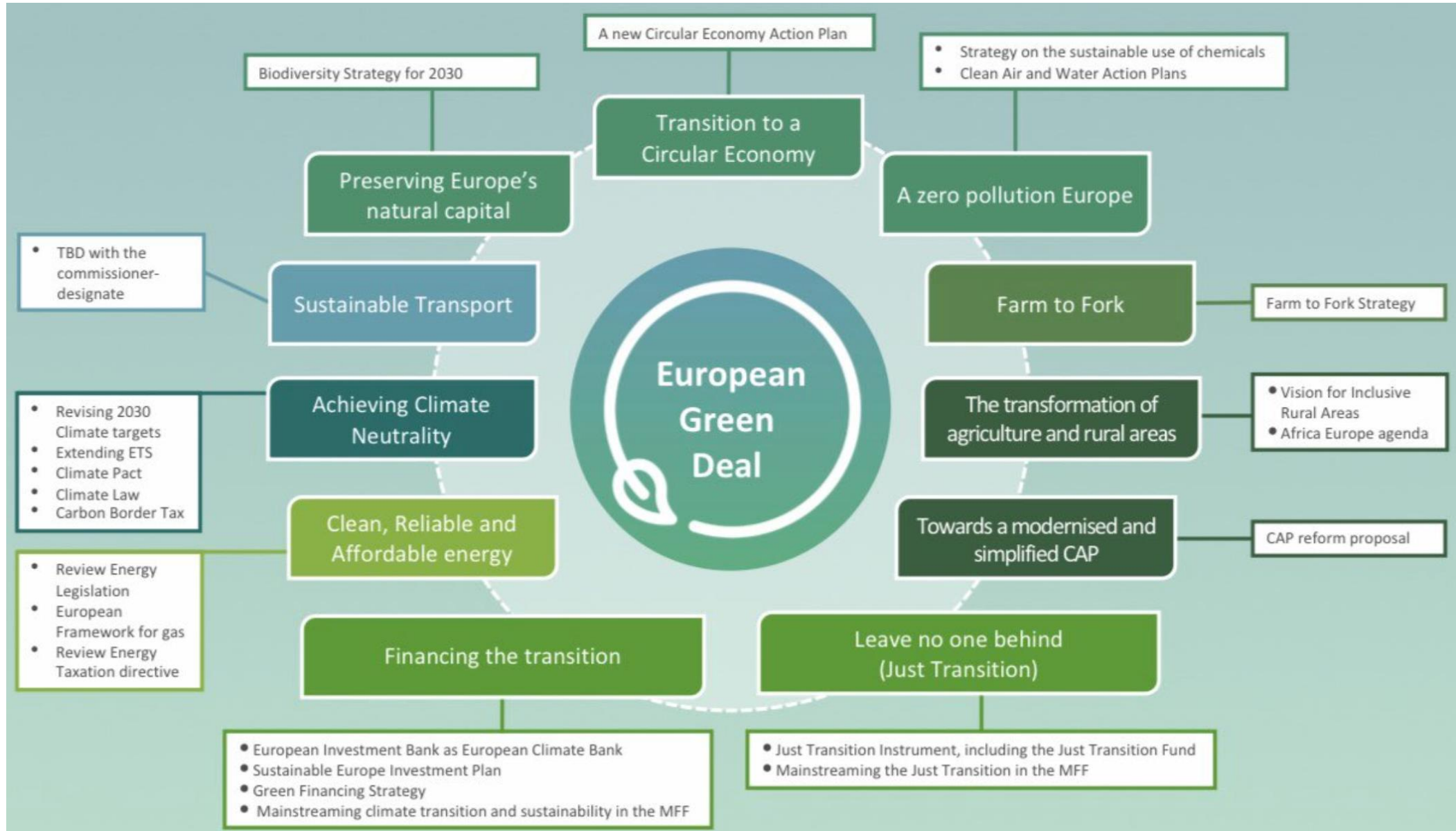
New Commission Priorities

In her speech before the European Parliament in July 2019, Ursula von der Leyen identified six priorities for her new team:

- *A European Green Deal*
- *An economy that works for people*
- *A Europe fit for the digital age*
- *Protecting our European way of life*
- *A stronger Europe in the world*
- *A new push for European democracy*

Janez Potocnic, Co-Chair of International Resource Panel, Chairman of The Forum for the Future of Agriculture, former Commissioner of Science and Research and Environment for the European Commission at Sitra on 25 November, 2019.

European Green Deal

EU's plan to transition to zero greenhouse gas emission by 2050. (Photo: European Commission)

https://euobserver.com/environment/146213

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