Circular Economy
in the 4th Industrial Revolution
The circular economy concept

Adapted from the Ellen MacArthur Foundation’s original illustration
The circular economy is an environmental opportunity for businesses. Materials such as steel, aluminum, plastic, cement, glass, wood, primary crops, and cattle are key components of the circular economy. According to WBCSD’s Circular Economy: Environmental Priorities for Business, 20% of global GHG emissions, 95% of water use, and 88% of land use are addressed by recycling and reducing waste. Furthermore, 34% of these materials are used for shelter, while 33% are used for food. This highlights the potential for businesses to contribute to environmental sustainability by adopting circular economy practices.
The circular economy business models

CIRCULAR SUPPLIES: Use renewable energy, bio-based or fully recyclable input material to replace toxic and single-lifecycle inputs

PRODUCT AS A SERVICE: Offer product access and retain ownership to internalize benefits of circular resource productivity

RESTORE & RE-PROCESS

MANUFACTURE & REMANUFACTURE

SELL & RESELL

USE & SHARE

PRODUCT LIFE-EXTENSION: Extend working lifecycle of products and components by reselling, repairing, remanufacturing and upgrading

SHARING PLATFORM: Enable increased utilization rate of products by making possible shared use/access/ownership

DIGITAL

BIOLOGICAL

PHYSICAL

RESOURCE RECOVERY: Recover materials, resources and energy from disposed products or by-products

Taken from WBCSD’s CEO Guide to the Circular Economy
The circular economy business models

- **DIGITAL TECHNOLOGIES** such as Internet of Things (IoT), big data, blockchain, and RFID help companies track resources and monitor utilization and waste capacity.

- **PHYSICAL TECHNOLOGIES** such as 3D printing, robotics, energy storage and harvesting, modular design technology and nanotechnology help companies reduce production and material costs and reduce environmental impact.

- **BIOLOGICAL TECHNOLOGIES** such as bio-energy, bio-based materials, biocatalysts, hydroponics and aeroponics help companies move away from fossil-based energy sources.

*Taken from WBCSD’s CEO Guide to the Circular Economy*
4IR & CE in practice: digital technologies

IoT

EFFIFUEL
Ecosystem of vehicle sensors to provide recommendations and training in eco-driving techniques

RFID

E ON I D™
The industry’s first RFID tag in the form of a thread that can integrate with textiles to power recycling
4IR & CE in practice: physical technologies

3D printing

Ollie
3D printed care, of which 80% of materials are made from a single material

Robotics

Daisy
Disassemble 9 iPhone versions, at rates up to 200 iPhones per hour
4IR & CE in practice: biological technologies

Bio-based energy

Memthane Technology
Turns 98% of wastewater organics into biogas, providing 10% of the Mars NL plant energy annually

Biomaterials

Biomass Balance Approach
Replacement of fossil fuel inputs with biomass by-products
4IR & CE in practice: policy implications

- Policies should incentivize and adapt to new business models that
- Collaborate with business to establish effective policies that incentivize right actions
- Collaborate across departments to establish multi-dimensional policies
- Assess how local communities will be impacted economically, environmentally & socially
- Assume policies will need to evolve over time due to unforeseen outcomes (+ and -)