Opportunities for the chemical industry in the context of Circular Economy

MAVESZ Chemical Industry Conference on Environment Protection & Safety

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cefic

Responsible Care®
OUR COMMITMENT TO SUSTAINABILITY

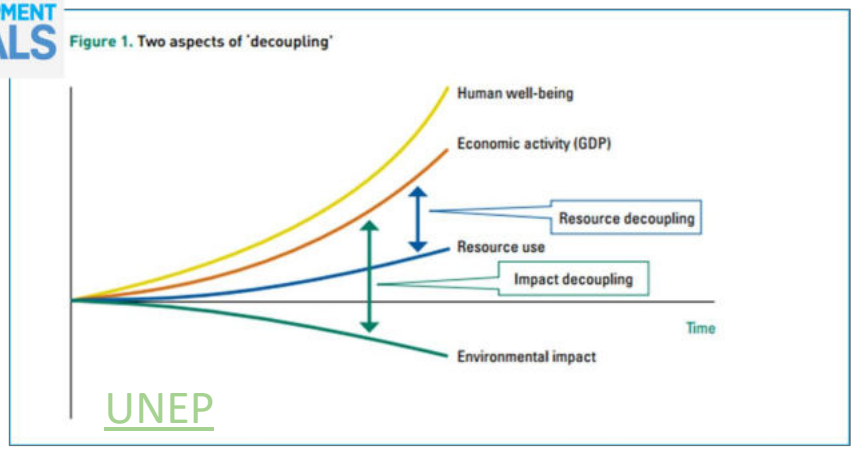
Outline of the presentation

- World we live in
- What it is about?
- Opportunities for the chemical industry

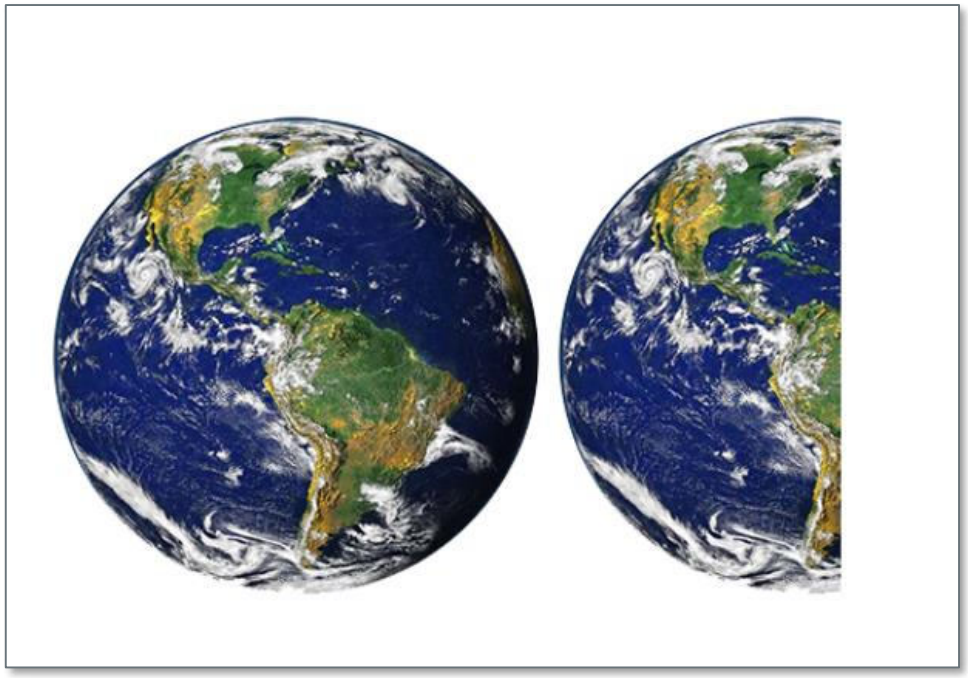
World we live in

The world is changing fast

SDG 12 – Responsible consumption and production



Ecological footprint

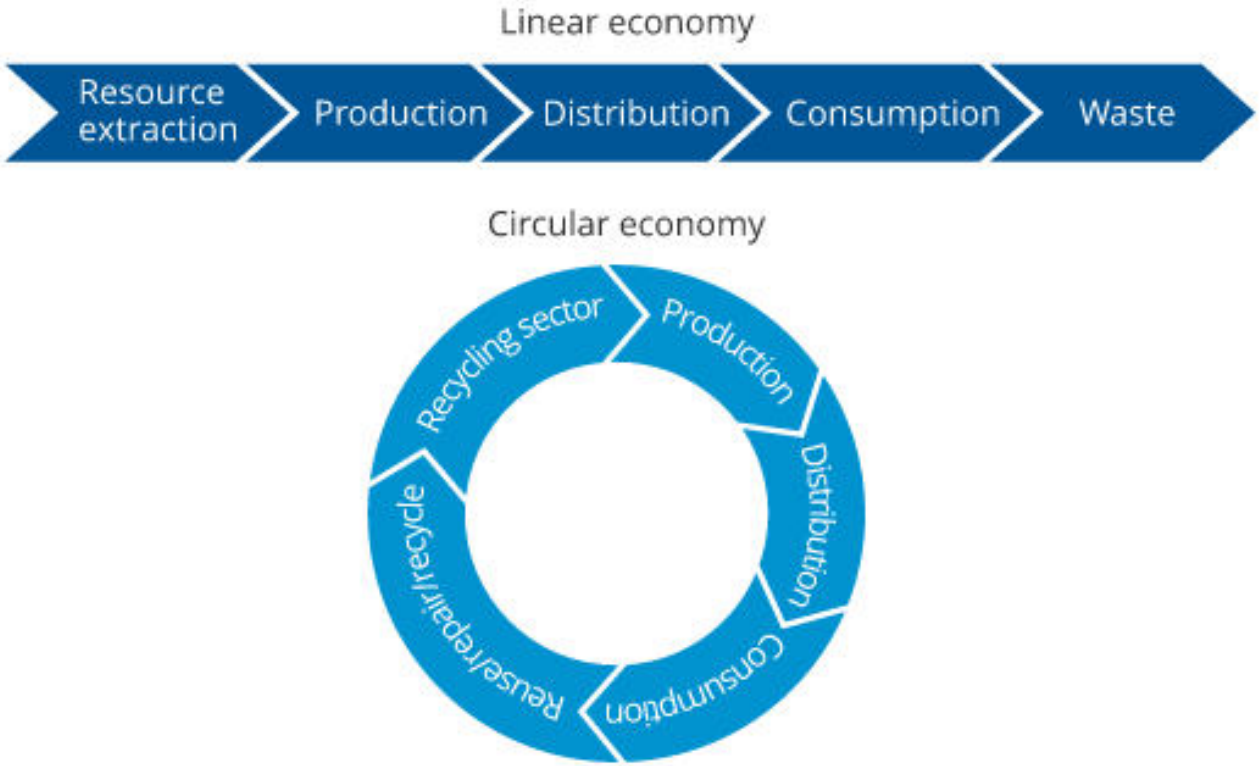


"Today humanity uses the equivalent of 1.7 Earths to provide the resources we use and absorb our waste."

Source: footprintnetwork.org

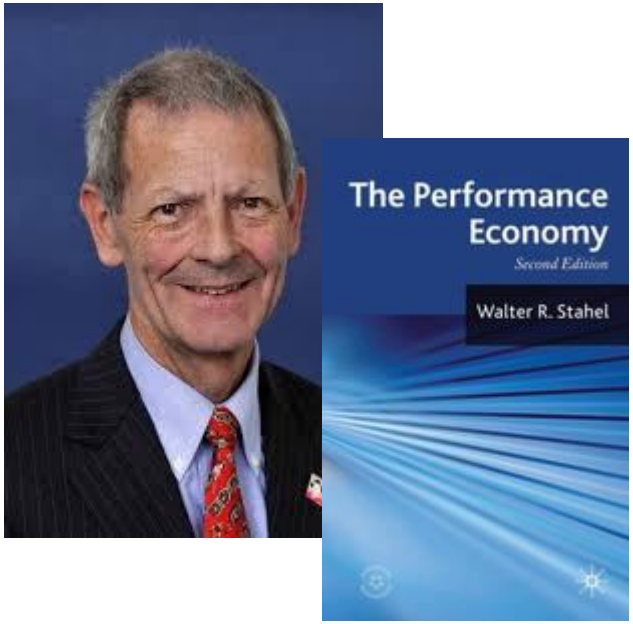
What is it all about?

Simply stated….



Concept with many mothers and fathers

Performance economy – 1970s – Walter Stahel



Cradle-to-cradle –Braungart and McDonough, 2002

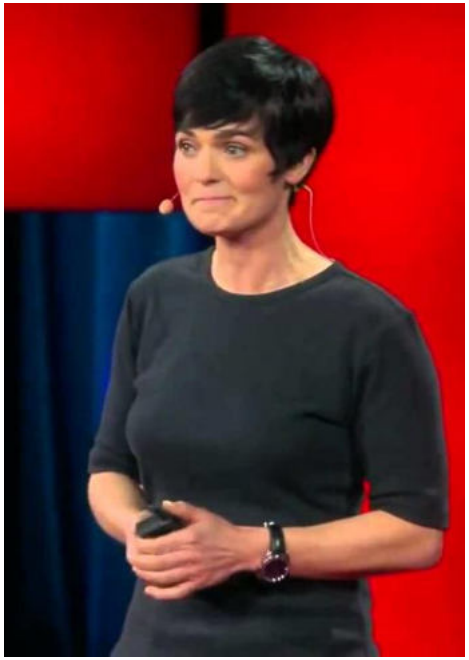
"Eliminate the concept of waste —not reduce, minimize, or avoid waste— but eliminate the very concept, by design."

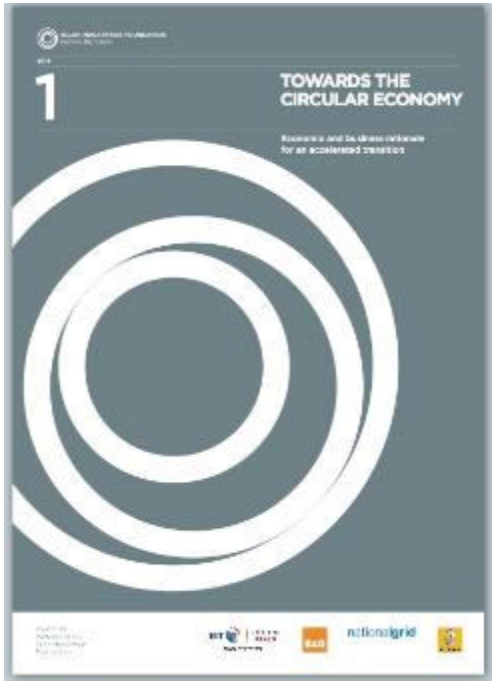
cradletocradle®

European Resource Efficiency Platform

link, 2013

Then came Dame Ellen McArthur….

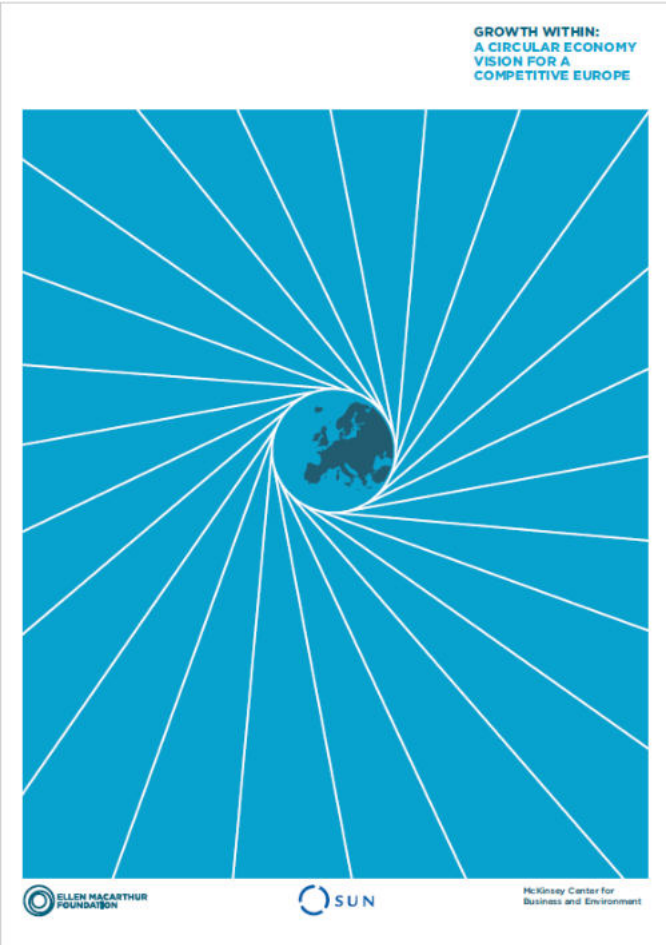




2012

“ I decided to focus on the greatest challenge I’d ever come across—the future of the global economy. I changed my life and I set out to change everything.”

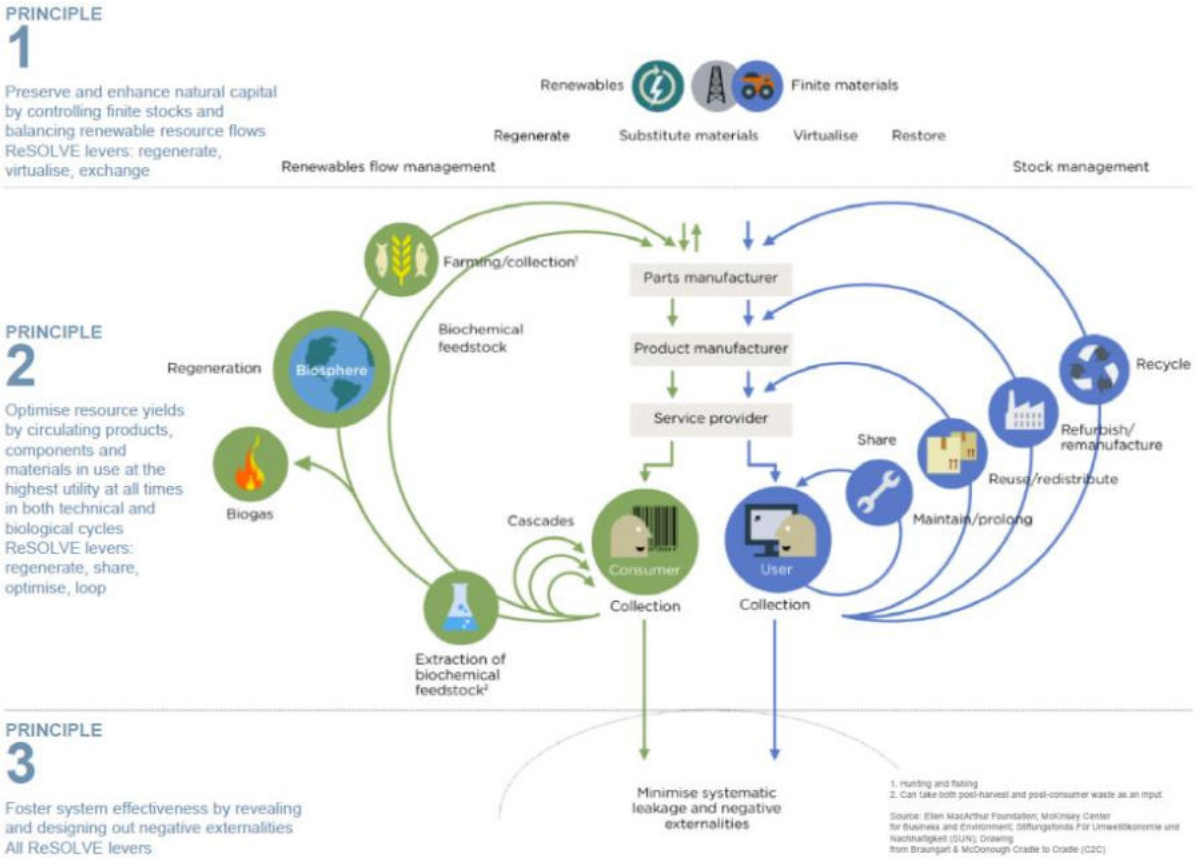
Circular economy according to the EllenMcArthur Foundation



"A circular economy is one that is restorative by design, and which ***aims to keep products, components and materials at their highest utility and value at all times****, distinguishing between technical and biological cycles.*

It is an economy that provides multiple value creation mechanisms which are decoupled from the consumption of finite resources".

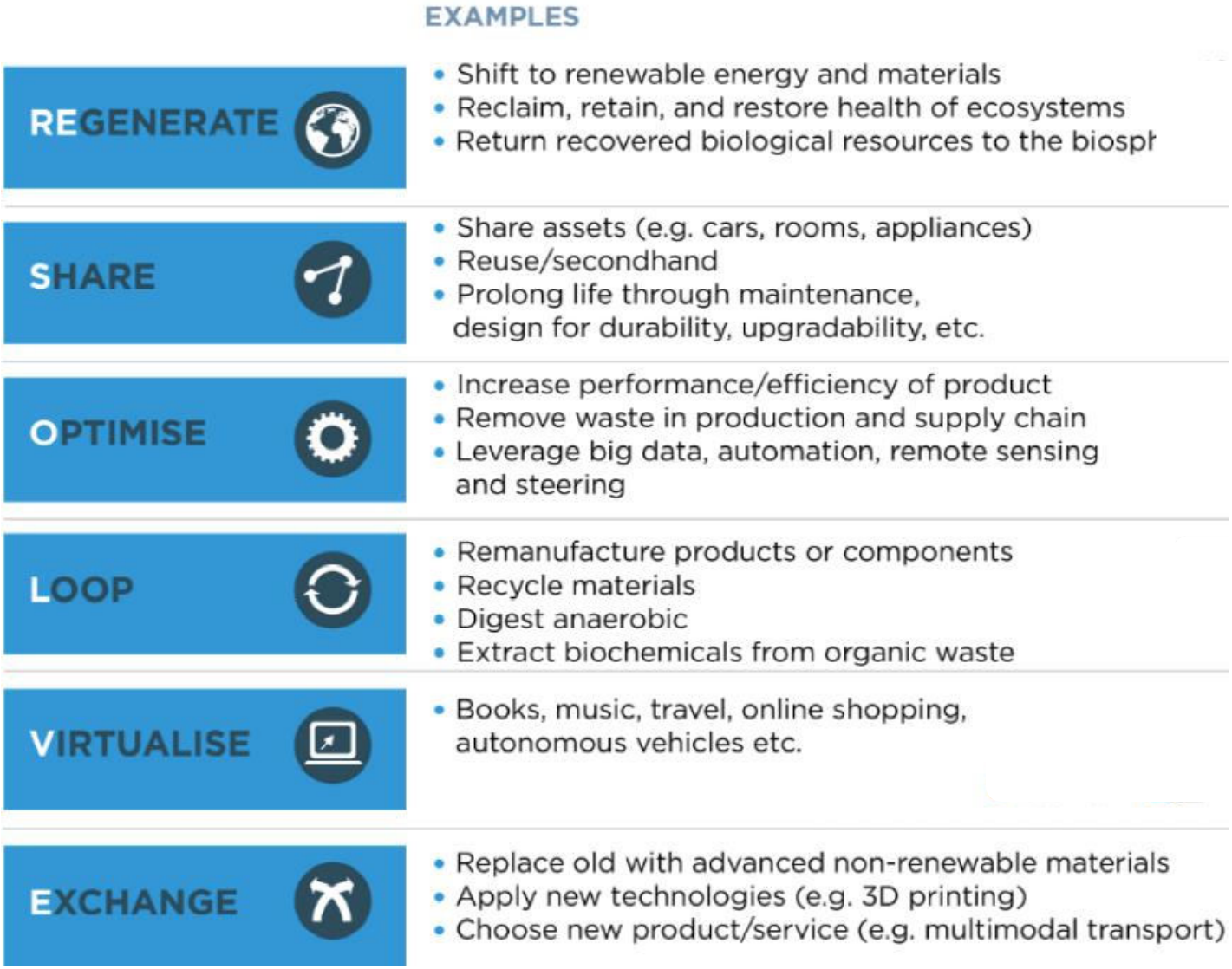
Three principles



1. Preserve and enhance natural capital
2. Optimise resource yields
3. Foster system effectiveness

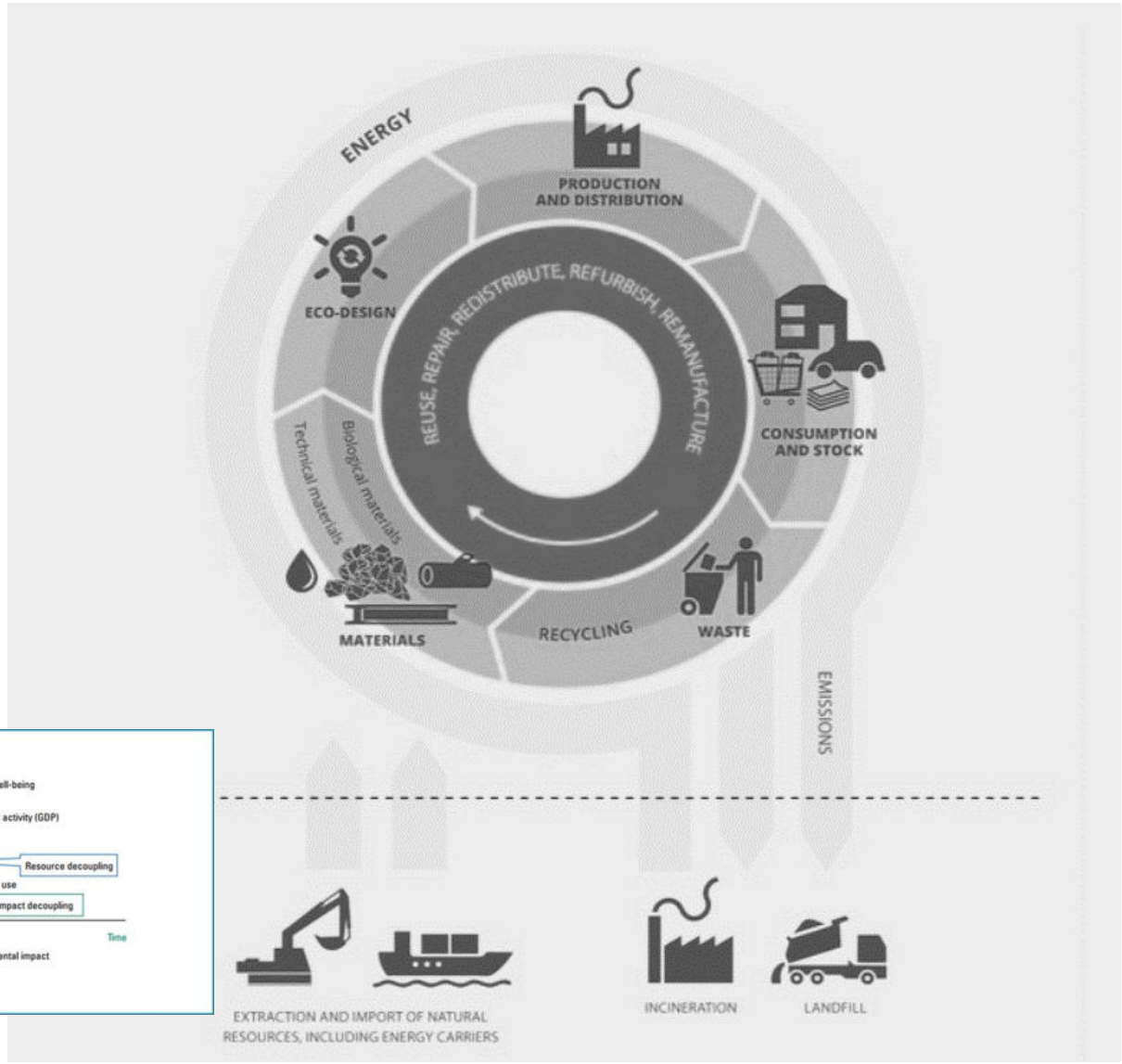
Source: Growth Within; EllenMcArthur foundation, SUN, McKinsey Center for Business and Environment

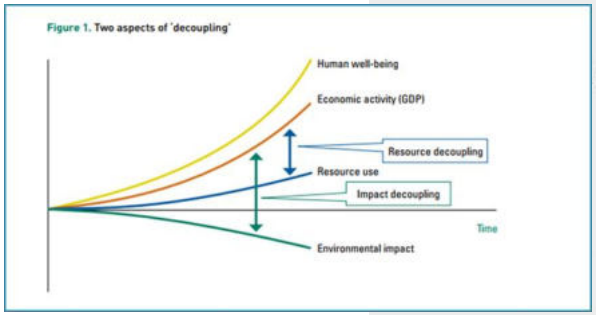
Six business actions



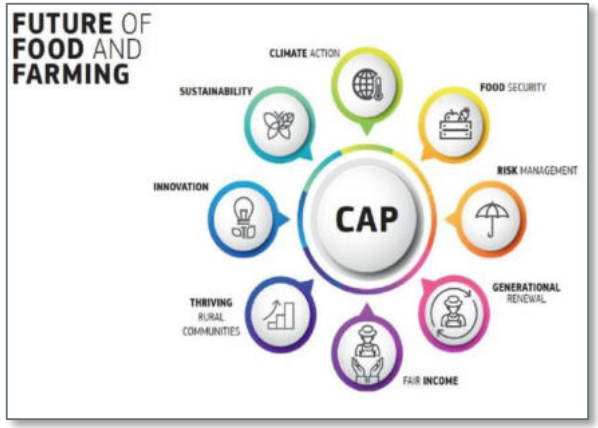
Source: Growth Within; EllenMcArthur foundation, SUN, McKinsey Center for Business and Environment

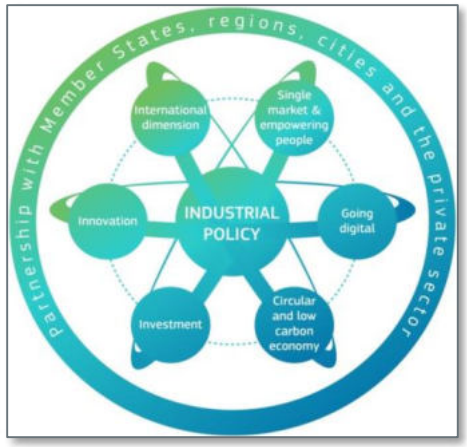
Looked at it in a different way





Mainstreaming in EU policy





What does it mean for the chemical industry?

CHEMISTRY

Powering the Circular Economy

The European chemical industry's sustainable solutions ensure the continuous circulation of valuable resources in our economy:

- **Reducing the environmental impact** by turning waste into resource
- **Meeting society's needs** for high-performance products with reduced environmental footprint
- **Ensuring economic benefits** and providing for companies' continuous investments in **innovation**

FROM WASTE TO RESOURCES
Phase

The chemical industry's **innovative techniques** enable the recycling of more and more materials.

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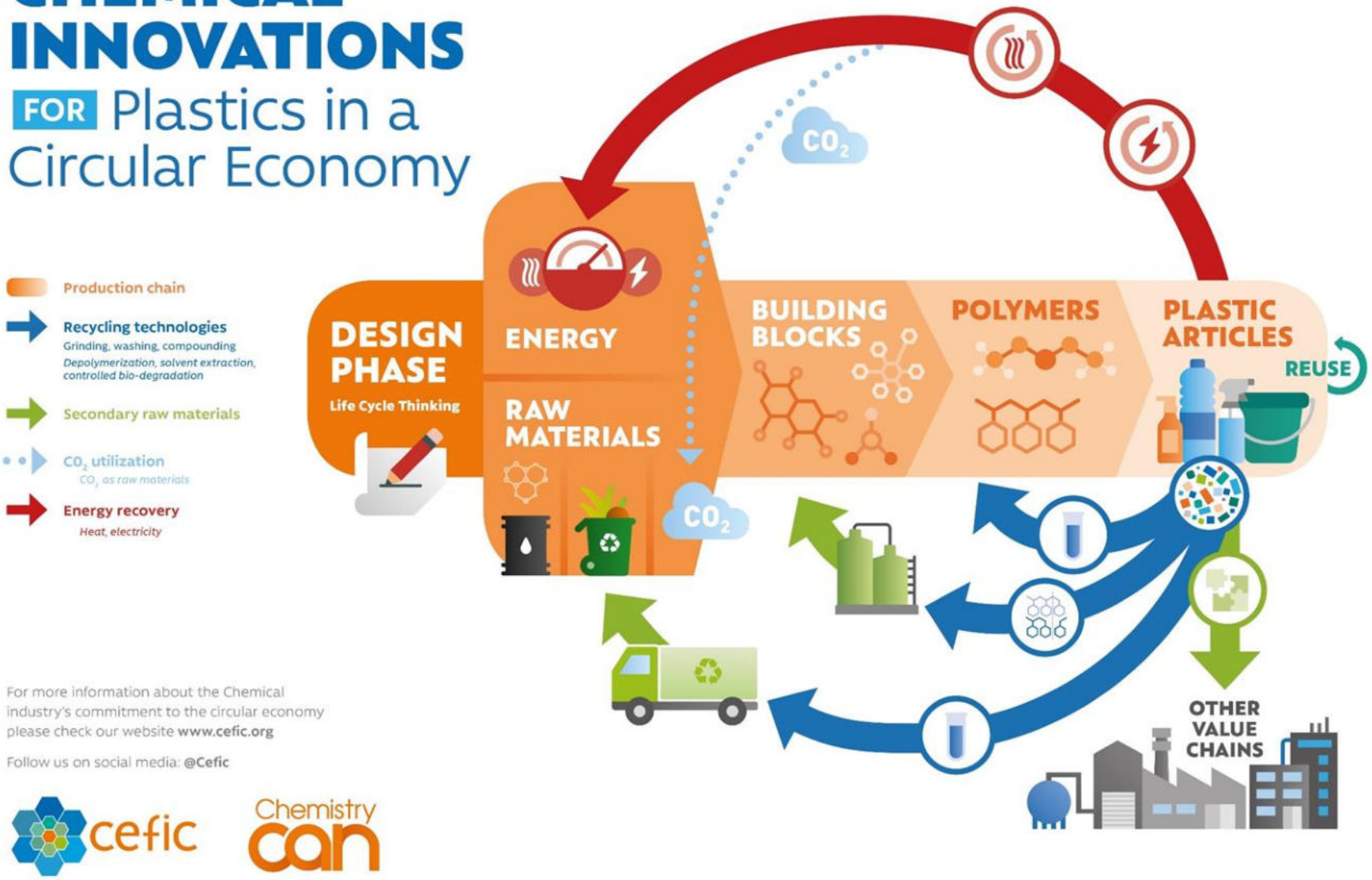
CHEMICAL INNOVATIONS FOR Plastics in a Circular Economy



For more information about the Chemical industry's commitment to the circular economy please check our website **www.cefic.org**

Follow us on social media: **@Cefic**

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Chemistry can

CHEMICALS MAKING CARPETS FULLY RECYCLABLE

LOOP

Success factors: *Strong partnerships*

Source and read more

WASTE-TO-CHEMICALS

SUCCESS FACTORS: *Partnerships to bundle expertise*

Source and more information

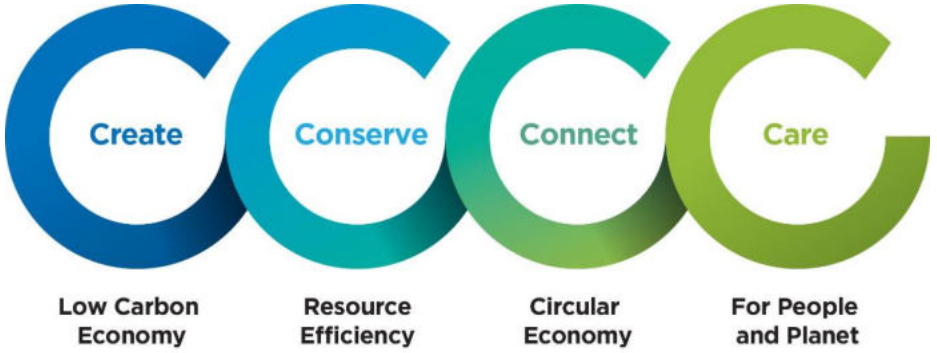
Many more examples

The Cefic Sustainability Charter

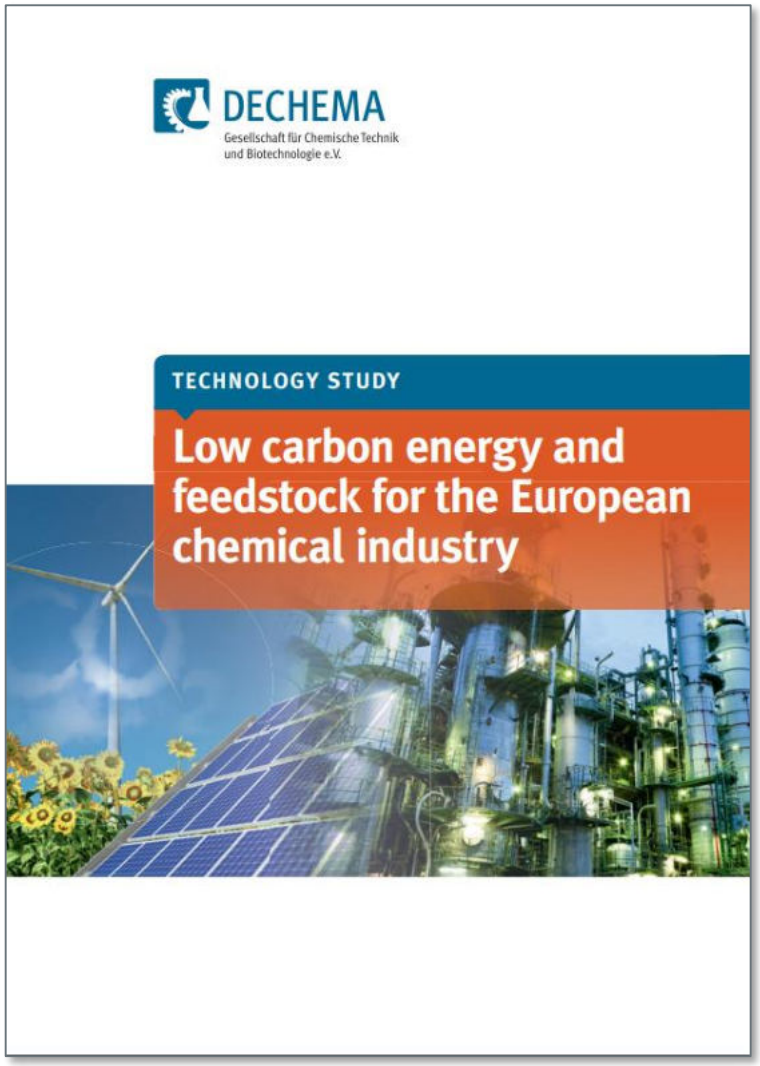
as of July 2016

https://chemistrycan.com/

- **Enabling role of the European chemical industry for a sustainable society**
- **Supporting role for Cefic**
- **Roadmap to progress in Sustainable Development:**



Start dialogue with stakeholders



Impact and opportunity focus

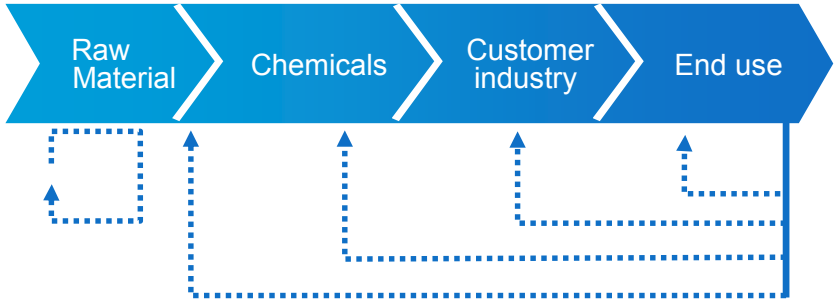
Purpose

- Impact of the Circular Economy on the European chemical industry – beyond schemes of better waste recovery to start a meaningful debate

Circularity has two aspects: Circulating molecules and enabling circularity in downstream end uses

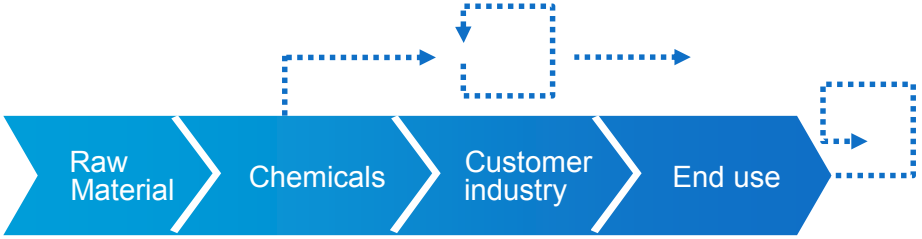
Approaches towards a more circular economy for the chemical industry

(A) CIRCULATING MOLECULES



Maximizing utility of existing molecules
e.g., reusing/recycling molecules such as PET bottles

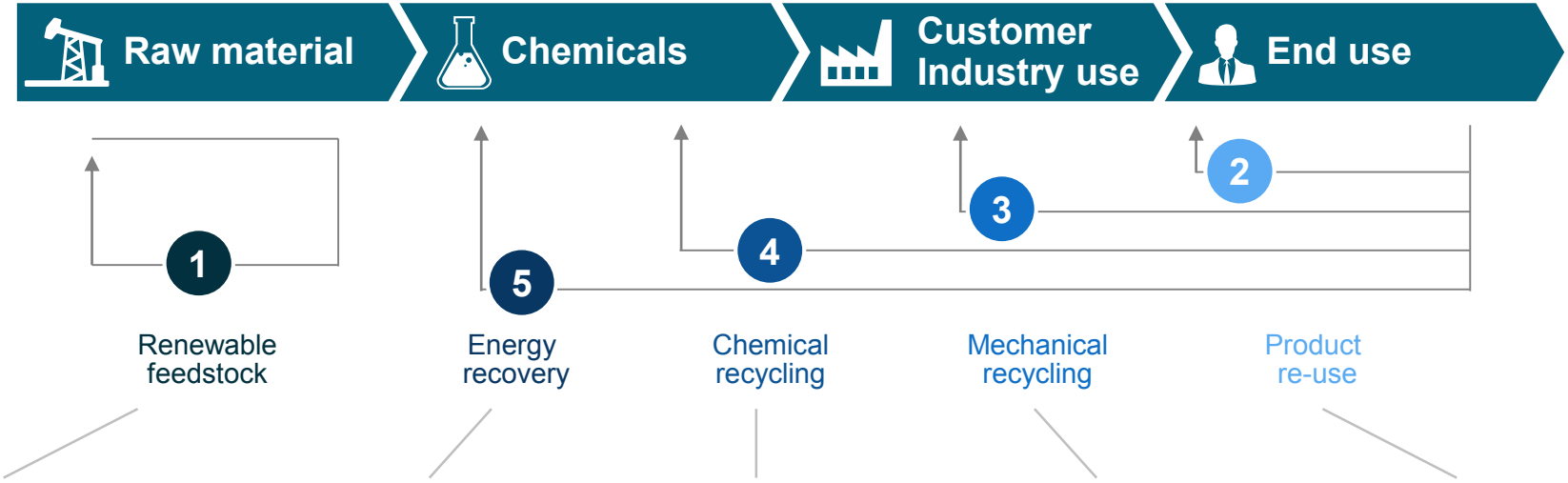
(B) ENABLING CIRCULARITY



Enabling maximum utility in end usage
e.g. higher durability of goods, sharing cars, decreasing energy need by passive houses

Circular advantage requires development of business models free of the constraints of linear thinking

New business model opportunities along the 5 archetypal chemical loops



Circular Supplies: Provide bio-based material to replace single-lifecycle inputs

Carbon capture and utilization: Develop technology and services, innovate chemical synthesis routes, catalysts, etc.

Rebuild chemical precursors: Develop technology and services, participate in reverse infrastructure models

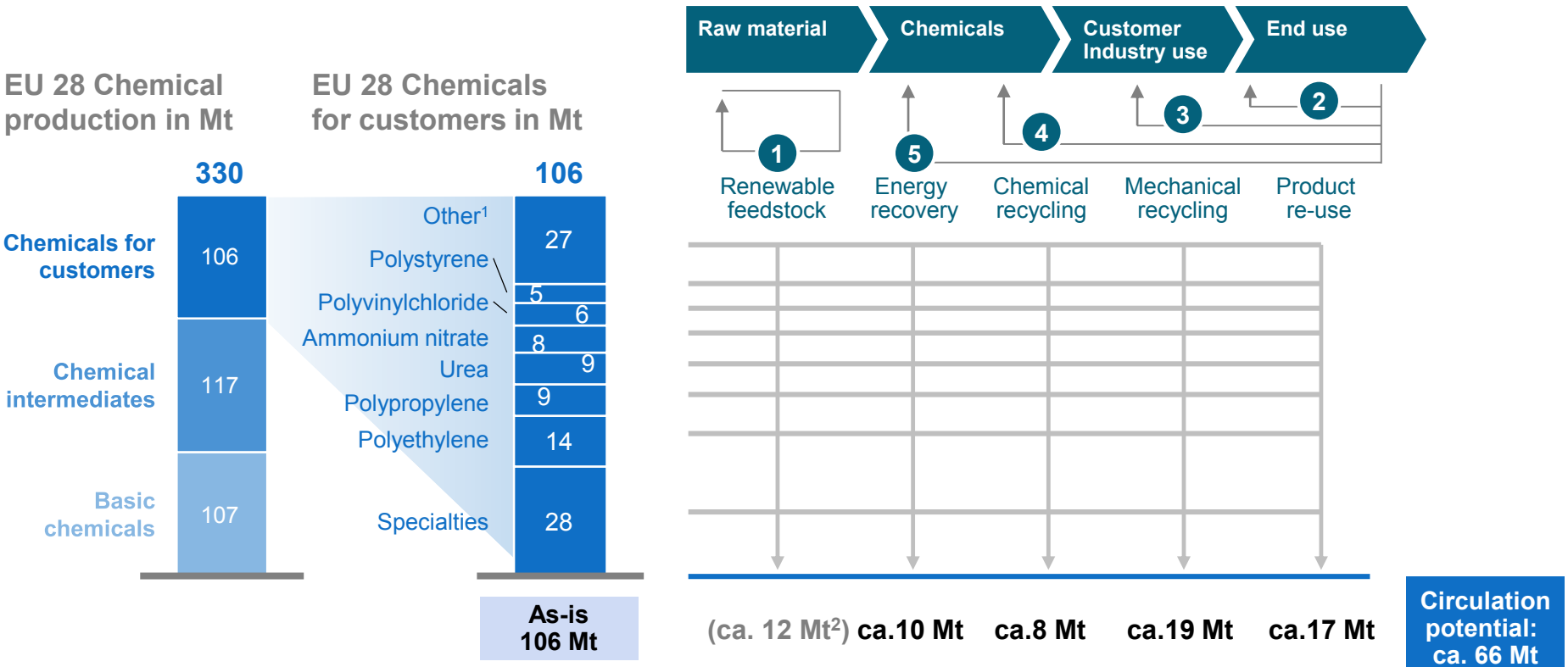
Keep molecules intact for reuse: Develop compatibi-lizers, separation techniques; invent product-as-a-service models

Extend end product lifecycles by repairing, upgrading and reselling

Enable increased product utilization by making possible shared use/ access/ ownership

Each conceivable circulating loop reduces the demand for new molecules

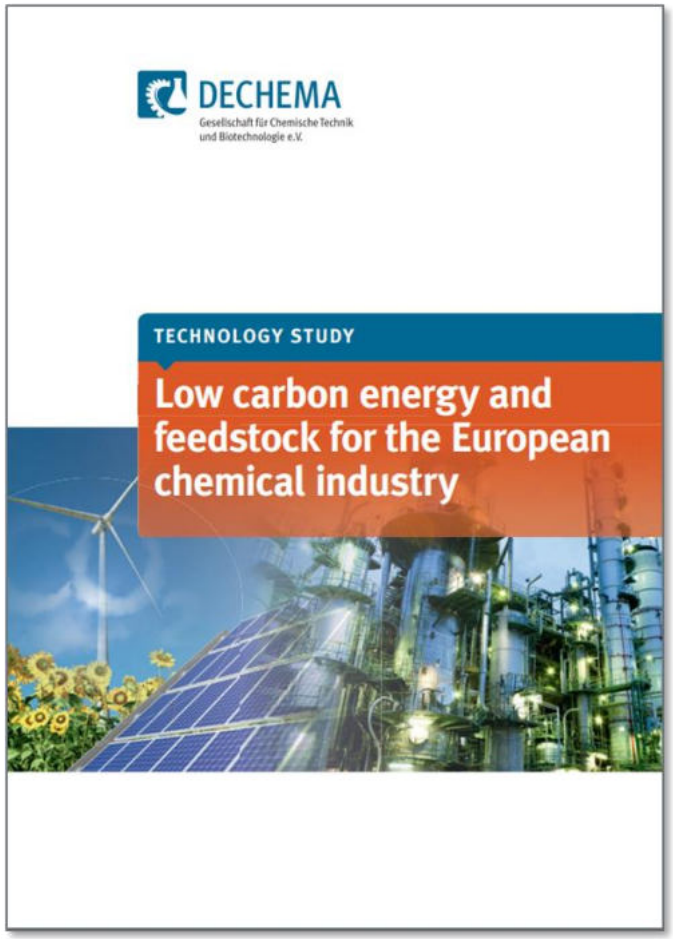
Out of 106 Mt chemicals delivered to customers, up to 60% can be circulated



1. 44 further products assessed, some with limited loop potential, e.g., non-recoverable materials such as nano particles, coatings, solvents 2. Loop 1 is fed with biomass rather than from chemicals for customers. Assuming that, after consideration of loops 2-5, ca. 50% of remaining feedstock need can be substituted from biomass

Source: Accenture research

Dechema – Technology focus



Purpose

- To provide quantitative data as input to the discussion on the future of the European chemical industry and the transition towards a carbon neutral society.
  - Promising low carbon technologies
  - Potential impact on CO_2 reduction
  - Technological and financial limitations and barriers

Study scope

- What does it intail for the chemical industry to be carbon-neutral by 2050?

Low-carbon chemical production

Methanol	Ethylene
Propylene	BTX
Ammonia (urea)	Chlorine

accounting for ⅔ of the sector‘s GHG emissions

+ Low-carbon fuels production and use

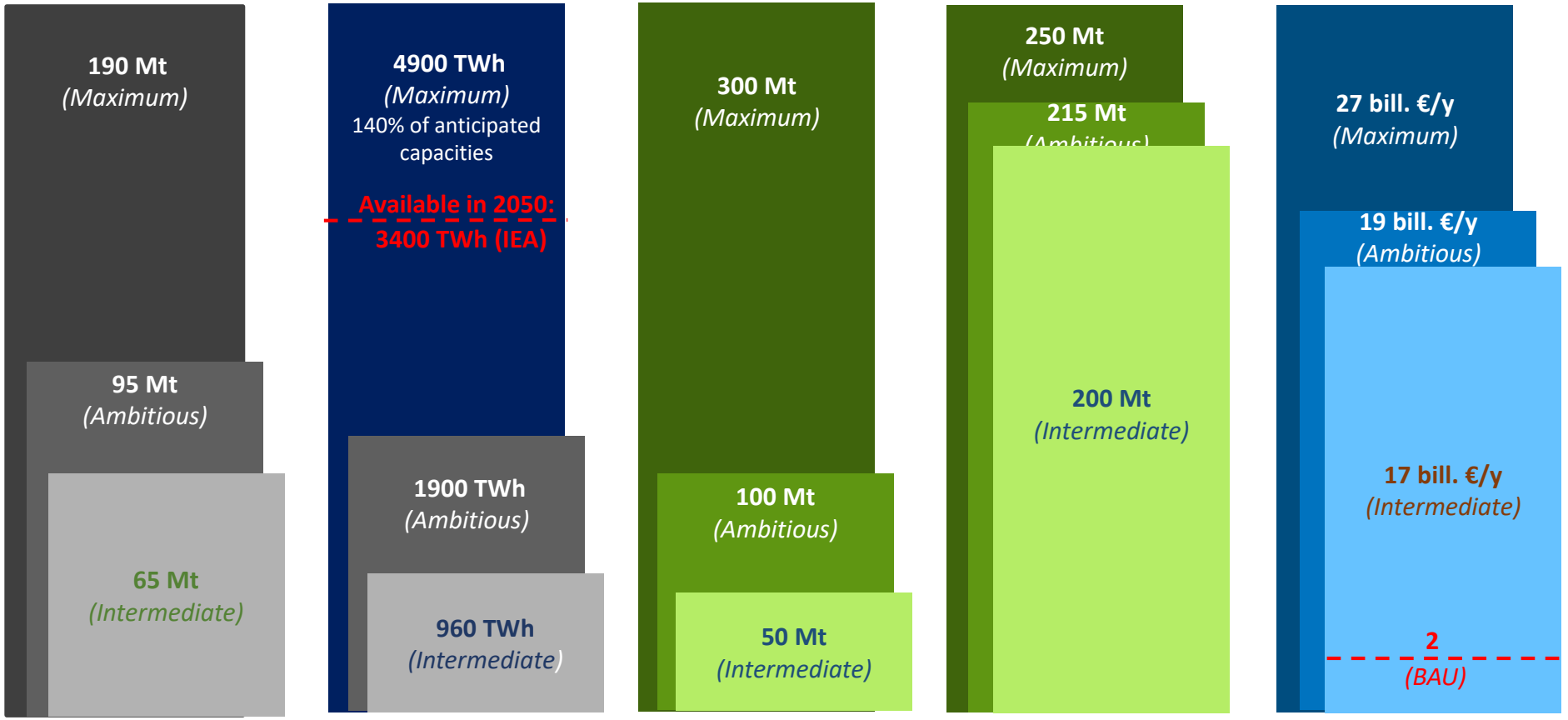
Methanol, bioethanol, synfuels

Not included: Impact of chemical products on GHG savings in other sectors

DECHEMA

Scenarios

- **Business as Usual**; low limit scenario assuming required extension of existing capacities, but no implementation of new technology options and no further advancement of efficiency measures
- **Intermediate**; continuous efficiency improvements of 1% annually and slow starting, but steadily increasing deployment of breakthrough technologies; assumptions: policy measures to support emission reduction and pathways become sufficiently competitive, no early replacement of old plants
- **Ambitious**; consequent implementation of technology options, fuel sector fully supports transition to carbon-neutral fuels; assumptions: minimum time for R&D, pilot or demonstration activities, commercial deployment without delays; full policy support and no economic constraints as hurdle; old plants are replaced early, decommissioning of depreciated plants.
- **Maximum scenario**; full carbon neutrality of the chemical industry and fuel sector by 2050 via a mix of the described technologies



Avoided CO_2 (Mt)

Low-carbon power Demand (TWh)

Alternative Feedstock Demand (Mt)

CO_2 (Mt) Biomass (Mt)

Investment Requirements (bill. €/y)

DECHEMA

Key messages

Challenges

- Access to cheap and abundant low C energy as prerequisite
- Biomass availability (*focus the use of biomass feedstock on highly functionalised chemical components with high biomass utilisation efficiencies)*
- Large investments
- Production cost not competitive

Priorties

- Initiate ambitious R&I programmes, priority topics are e.g. efficient hydrogen generation and better valorization of biomass
- Engage in public-private partnerships to enable deployment and risk sharing
- Intensify the dialogue between public and private stakeholders, facilitate more (cross-sectorial) collaboration models and strong policy support

Overall conclusion

Moving towards a circular economy is a long term journey. To realise the full potential of the innovations the chemical industry can bring in a circular economy, we need:

- A coordinated policy approach along the life cycle of products and across value chains.
- An abundant amount of low-carbon power at a competitive price
- We thus need an enabling framework for investment and innovation
- Widespread collaboration between different stakeholders, and across different value chains
- Leadership

Chemistry can