

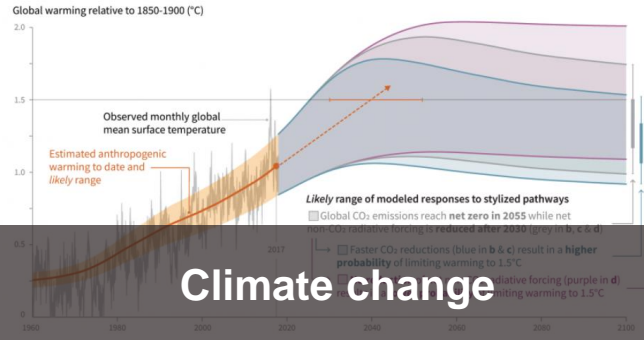
The road to the renewable circular economy

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Challenges

a) Observed global temperature change and modeled responses to stylized anthropogenic emission and forcing pathways

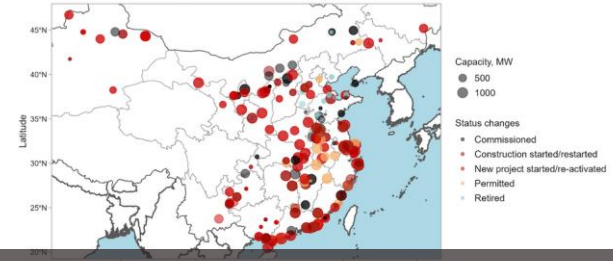


More than 42,100 species
are threatened with extinction

That is still 28% of all assessed species.

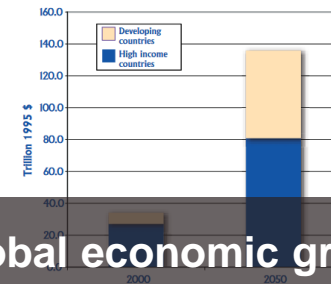


New coal power projects and retirements in China 2022



Heterogeneous transformation stages

Figure 1.2 Historical and projected GDP



Global economic growth

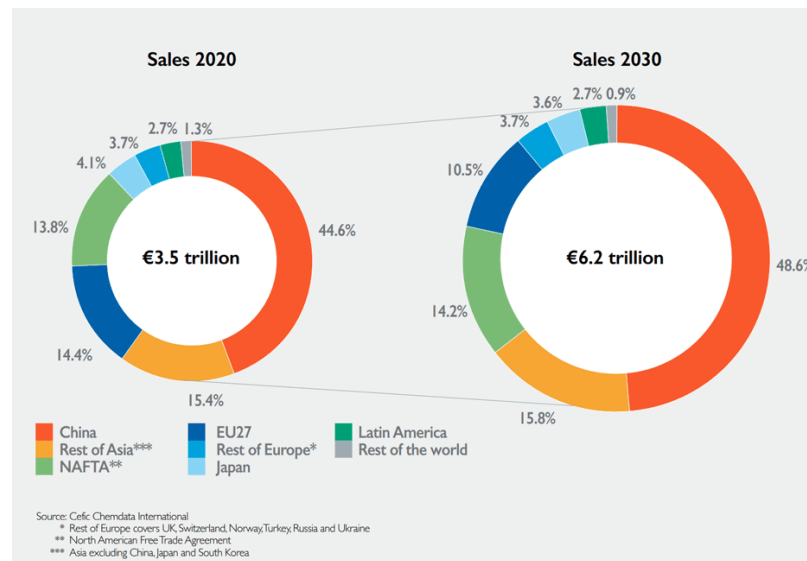
Chemical market growth indicates volume demands – we need to think big to move the needle



World chemical sales (2020, €3,471 billion)



World chemical sales, 2020-2030



Source: European Chemical Industry Council, 2022

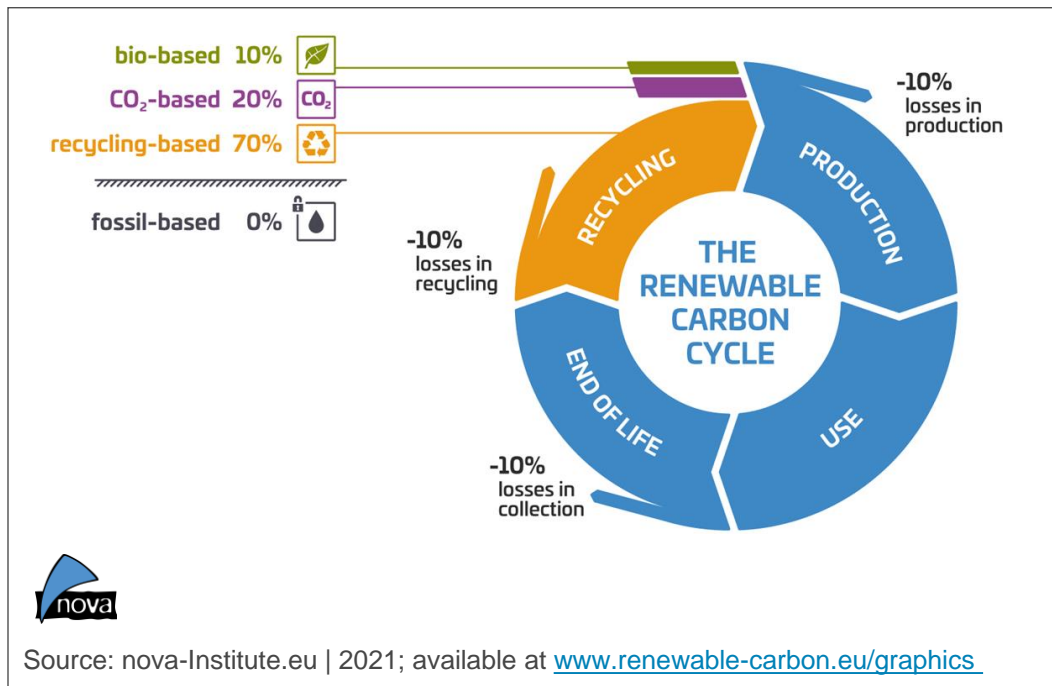
Solution triad

Sufficiency

Comprehensive circular economy

Defossilization of material flows

A holistic approach to a new, sustainable circular economy



Beyond this Goals for action

- 1 Product Design
- 2 Focusing the use of materials
- 3 Process optimization (Scope 1+2)
- 4 Technological innovation
- 5 Maximize material preservation at end-of-life

UPM LEUNA BIOREFINERY

- UPM Leuna Biorefinery under construction
- First of its kind industrial scale wood-to-chemicals biorefinery in the world
- Feedstock: regionally sourced, sustainable wood converted from energy to material use, sawmilling residues
- Products to replace fossil oil based chemicals in plastics, rubber and industrial liquids end uses – valorization possibilities through combination with UPM Naphta

Large volume renewable chemicals will have an impact in transforming the economy



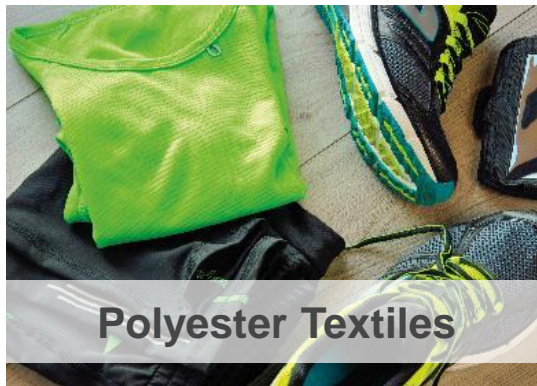
Bio-Monoethylene Glycol (Bio-MEG)



- 1 “Drop-in” chemical
- 2 Approx. 60% CO₂ reduction
- 3 Market demand: **30 Million tons/a**



PET Packaging



Polyester Textiles



Coolants

Large volume renewable chemicals will have an impact in transforming the economy



Renewable Functional Filler (RFF)



- 1 New product alternative for carbon black
- 2 Approx. 90% CO₂ reduction
- 3 Market demand: **14 Million tons/a**



- 20wt% RFF
- 30% lower CO₂
- 10% weight reduction

STANDARD PROFIL



Made with UPM BioMotion™ RFF

IVG colbachini spa

IVG DI ANET: "sustainable advantage"




Made with UPM BioMotion™ RFF

nora
by Interface®



Polypropylene containing 40% RFF

- 40wt% RFF
- 50% lower CO₂
- 9% weight reduction



- 4wt% RFF
- black colouring
- NIR sortable

PP HDPE

Bioeconomy can only be scaled with agriculture and forestry focused on sustainability and yields



- **Biomass selection** is critical for **sustainability** and **acceptance of biogenic carbons**
- General **criteria** include:
 - Regionality
 - No competition with food cultivation
 - Maximum material yield
 - Additional CO₂ effect
 - Long-term carbon sequestration
 - Biodiversity neutral

Prerequisites for market success

- 1 Binding category term
- 2 Binding criteria for sustainability assessment
- 3 Cross-sectoral cooperation
- 4 Broad visibility of renewable material solutions (consumer-facing).
- 5 Acceptance of incremental improvements

UPM **BIOFORE**
BEYOND FOSSILS

