



Capturing the potential of the Circular Economy transition in energy-intensive industries

EU Green Week - TE3C WEBINAR

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30 June 2025

Joint
Research
Centre

Joint Research Centre (JRC)

- The Joint Research Centre (JRC) is the **European Commission's science and knowledge service** which employs scientists to carry out research to provide independent scientific advice and **support to European Union (EU) policy**.
- Around **30%** of all EU legislation contains work from the JRC

JRC sites

Headquarters in **Brussels**
and research facilities located
in **5 Member States**:

- Belgium (Geel)
- Germany (Karlsruhe)
- Italy (Ispra)
- The Netherlands (Petten)
- Spain (Seville)

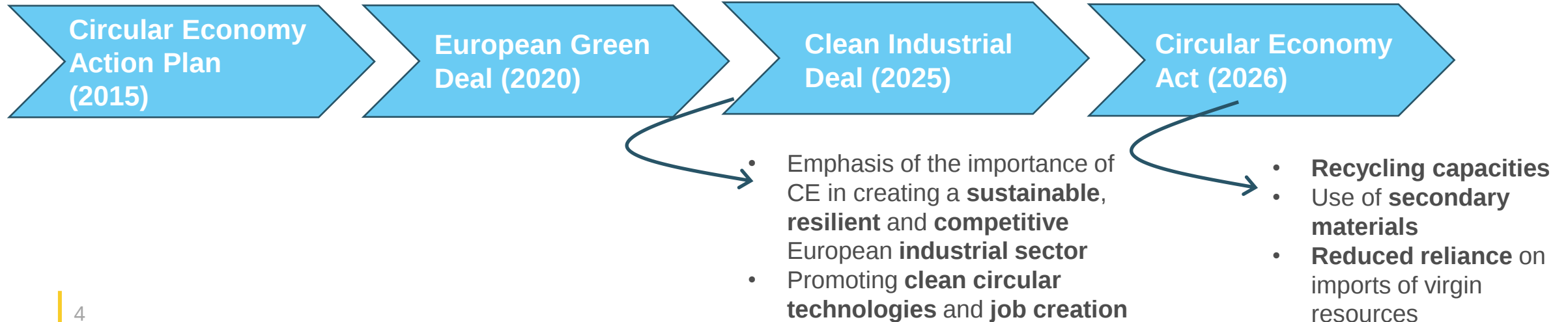


Joint Research Centre

- The JRC plays a key role at multiple stages of the EU policy cycle. It contributes to the overall objective of [Horizon Europe](#).
- We work closely with research and policy organizations in Member States, EU institutions and agencies, and scientific partners in Europe and internationally, including the UN.
- Core strengths:
 - **Anticipation** - to provide the scientific underpinning for future policy initiatives.
 - **Integration** – to enhance our ability to build links between the different scientific and policy areas inside the Commission and beyond.
 - **Impact** – to assist policymakers to track and assess the impact of their policies.

Circular Economy: an enabler for the green transition

- A *Circular Economy (CE)* is an economic system that **maintains** the **value** of products, materials, and resources in the economy for as long as possible while **minimizing waste** generation.
- CE allows for decoupling economic growth from environmental degradation.
- CE reduces the need for resources and energy.
- CE has been a key **focus** of **EU policy**-making



Research purpose

Assessing the contribution of Circular Economy to the EU sustainable transition

Research questions

What are the **potentials** of the CE that policies need to unlock to deliver on the EU sustainable transition?

Objective

Develop **analytical tools** & **assess** the impact of CE on the material flows, environment and socio-economic dimension

Case studies

- **4** energy-intensive sectors (cement, steel, aluminium, plastics) → 44% of GHGs of EU manufacturing
- Covering **past**, **present** and **possible** future CE policies in EU27

Research design (1/2)

Scenarios assessed

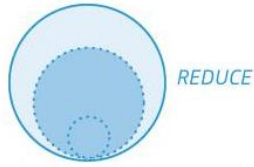
We investigate **4 scenarios** for 4 energy-intensive material sectors:

- 1) **Status Quo** (2020): ~ Today
- 2) **Baseline** (2050): Continuation of historic material trajectory but decarbonisation of energy
- 3) **Compliance** (2050): Assumes achievement of 2030 & 2050 CEAP policy targets
- 4) **Ambitious** (2050): Assumes achieving higher circularity by implementing ambitious '*CE levers*'

*A **circular economy lever** is a specific intervention (based on one or more circular economy policies), applied in the context of a specific material and sector, to decrease virgin material input (**Reduce**), increase material durability (**Reuse**) and enhance material recirculation (**Recover**).*

Narrowing resource flows

Minimizing the input of material, thereby narrowing inputs flows in production process.



CIRCULARITY CLUSTERS Reduce, reuse and recover

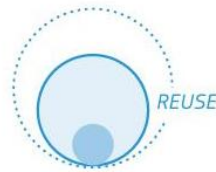
Closing resources flows

Using secondary material to substitute virgin material in new products, thereby closing resource flows.



Slowing resource flows

Extending the lifetime of products and components, thereby slowing down the flow of resources.



Cluster of levers

Reduce levers

Reuse levers

Recover levers

Key feature

Narrowing resource loops

Slowing resource loops

Closing resource loops

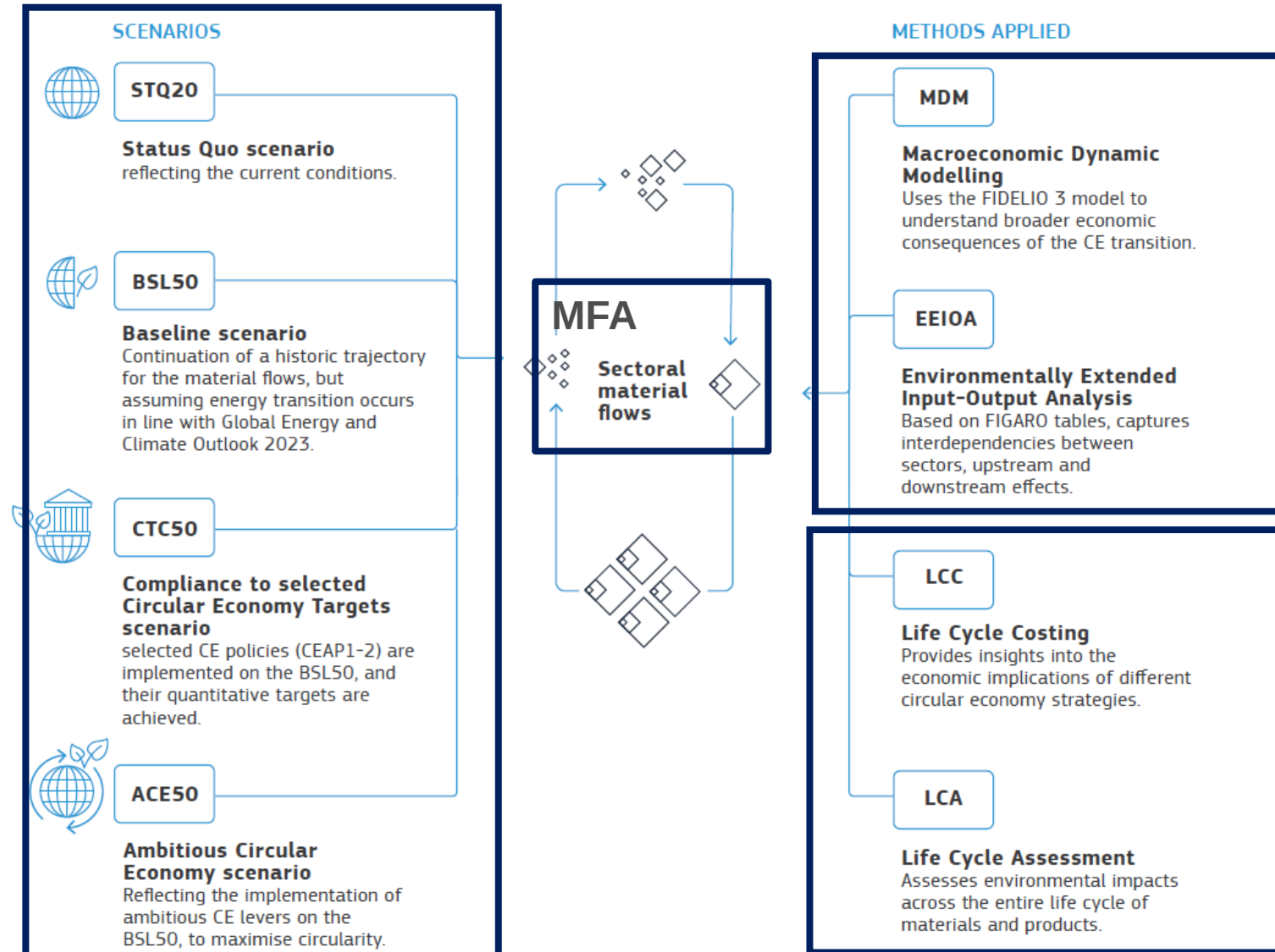
Example

Reducing use of concrete in buildings

Extend lifetime of cars

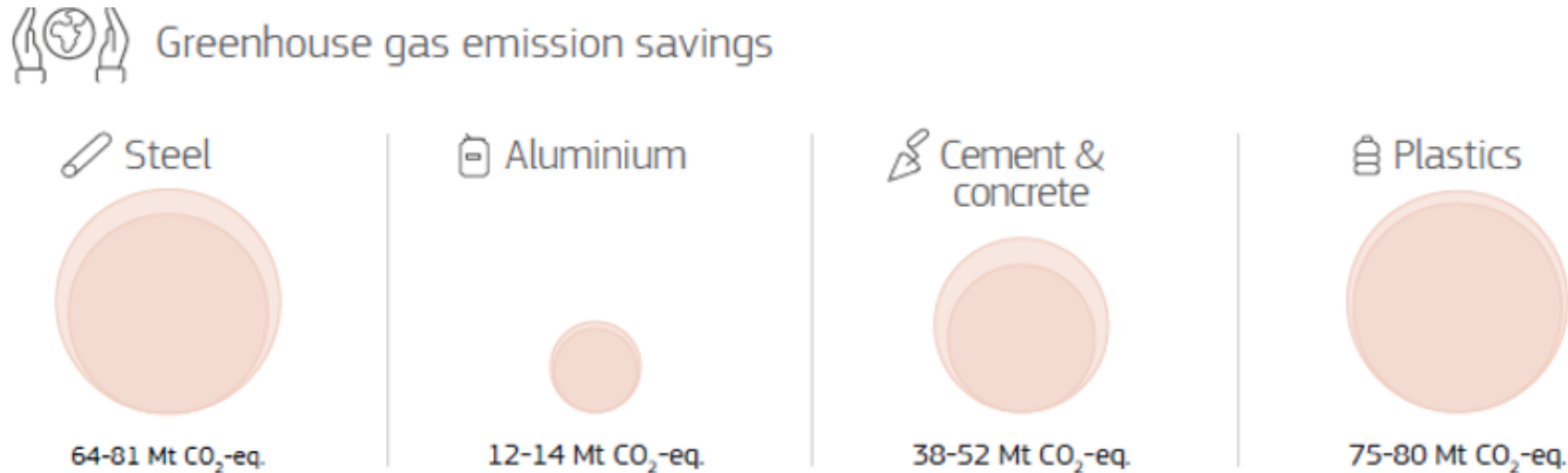
Improve high quality recycling

Research design (2/2)



- GHG
- Resource dependency
- Trade effects
- GDP
- Employment

Effects of CE: GHG emissions savings



GHG savings from ***Ambitious*** scenario relative to ***Baseline***

TOTAL ~ 200 Mt CO₂-eq. savings

Observed decoupling of decrease of emissions and economic growth

Zoom in on effects of CE on GHG

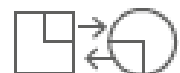
Climate change mitigation (i.e. decrease in GHGs emission) relative to Baseline:

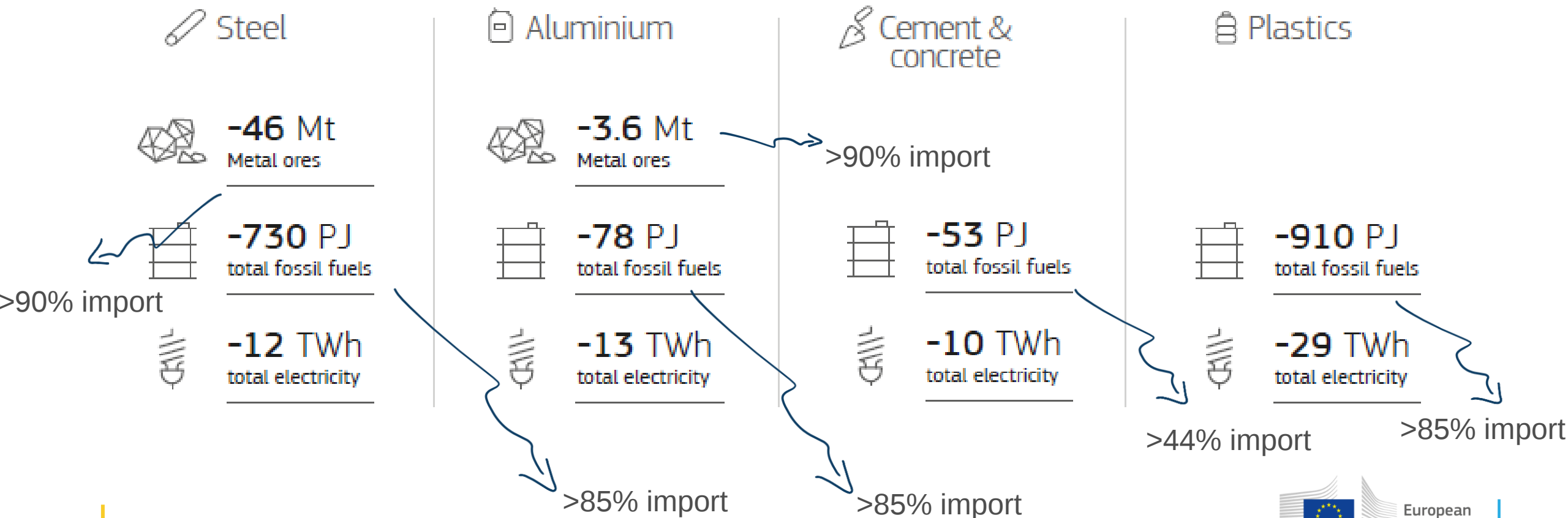
	Compliance scenario	Circular Scenario
Cement & concrete	-	-37%
Aluminium	-3%	-14%
Steel	-0.3%	-49%
Plastic	-12%	-45%

	Reduce	Reuse	Recover
Cement & Concrete	-27%	-8%	-3%
Aluminium	-1%	-11%	-6%
Steel	-21%	-10%	-22%
Plastic	-18%	-9%	-29%

'Circularity' is the combined effect of Reduce, Reuse, Recover

Effects of CE: EU resource dependency

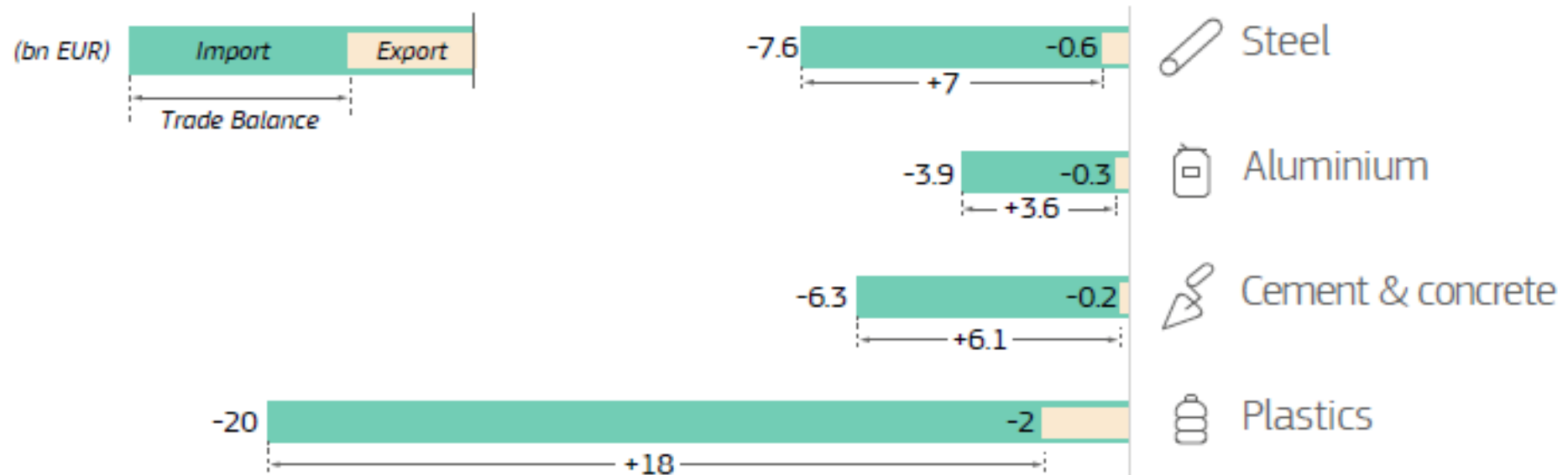
 Foreign raw material and energy dependency



Effects of CE: Trade balance

(\$↔€) Trade dependency

Absolute change in **import**, **export** and resulting change in trade balance (bn EUR)

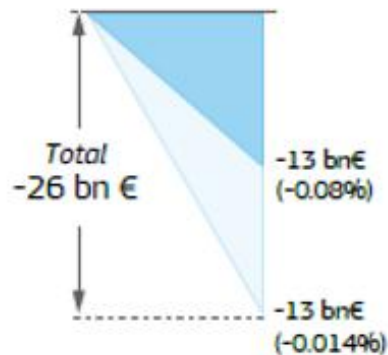


TOTAL ~ 35 billion EUR trade balance increase for the EU

Effect of CE: GDP



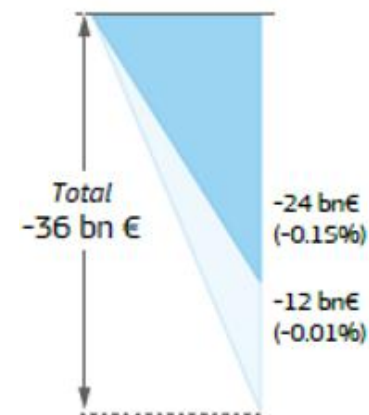
Absolute change
in GDP in EU & RoW



Absolute change
in GDP in EU & RoW



Absolute change
in GDP in EU & RoW



Absolute change
in GDP in EU & RoW



Decrease in GDP due to the attainment of ambitious
CE scenario compared to the Baseline

TOTAL ~ 80 billion EUR for the EU

Effect of CE: Employment

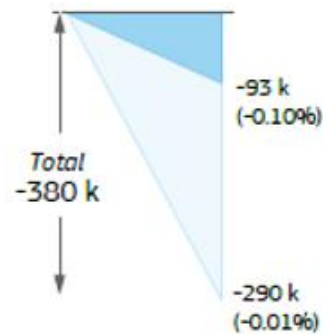


Employment



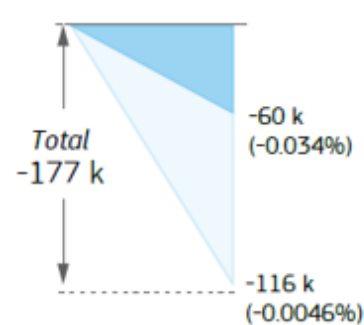
Steel

Absolute change in
employment in EU & RoW



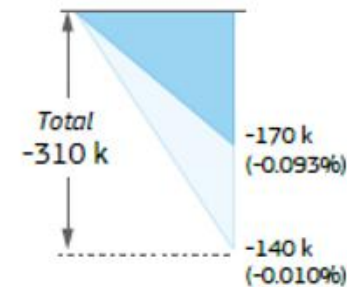
Aluminium

Absolute change in
employment in EU & RoW



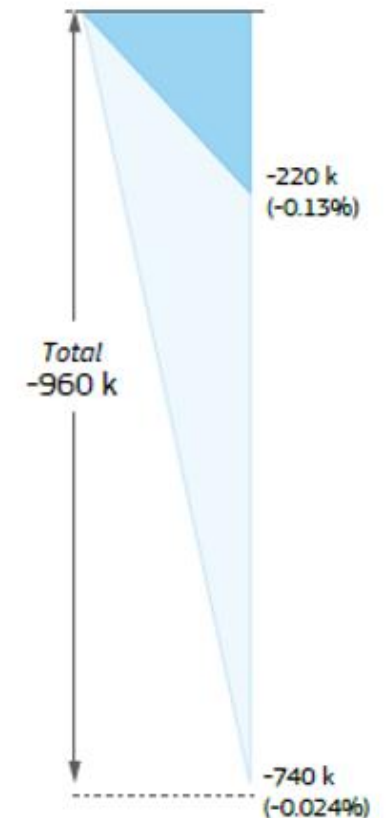
Cement & concrete

Absolute change in
employment in EU & RoW



Plastics

Absolute change in
employment in EU & RoW



Decrease in Employment due to the attainment of ambitious CE scenario compared to the Baseline.

LIMITATION: Shift to services has been strongly simplified.

TOTAL ~ 540 k jobs for the EU

Take home messages

CE **decreases EU dependency** on import of fossil and mineral resources, **increases** EU trade balance, and **reduces GHG** globally.

Current & Past EU CE policies (targets) are **not enough** to capture the full potential of CE.

Cement & concrete requires measures to unlock the potential of **reuse & reduce**. For **metals & plastics**, while reuse/reduce are again important, (high-quality) **recycling** represents a low hanging fruit.

Trade-offs may arise in employment and Value Added, which call for **further research** to better understand the implications of CE on the **‘Service’ sectors** (beyond waste management services) and **‘R&D’ sector**.

Thank you

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