# Mobilizing consumer demand for sustainable investments

Potential role of demand-side policies to stimulate investments in more sustainable products and strengthen European heavy industry

**September 2025**

# Report objectives

## Explore the role of demand-side policies to stimulate sustainable investments in European heavy industry

Report objective is underpinned by the following questions:

- **Why is additional demand creation necessary** in the European heavy industry?
- **What could be a conceptual architecture of demand mandates**, specifically what principles could be followed and what choices can be made in each sector?
- **How could the mandates be implemented in the chemicals, steel, fertilizers and refining sectors:**
  - Which **markets and products** can be good candidates?
  - Which parties could be potential **mandate holders?**
  - What could be the **mandated metrics?**
  - What **compliance mechanisms** could be used?
  - How could **access and origin requirements** be controlled?

## Provide a starting point in a broader dialogue about strengthening EU industry and strategic autonomy

This report explores **a specific potential policy instrument** – demand-side mandates aimed at chemicals, steel, fertilizer and refining sectors. Such potential mandates would necessarily form **part of a broader regulatory landscape** and would need to be considered in the context of other instruments. This consideration falls outside the scope of this report.

This report **does not include specific policy design recommendations**. Rather, it reflects the views of **stakeholders** from across the energy system who were **involved in this research**, as well as results of **quantitative and qualitative analysis.**

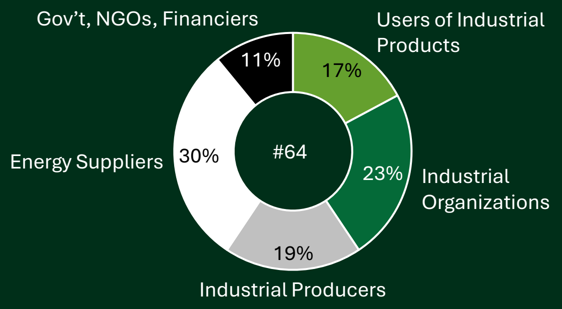
While providing insights and answers, the report might raise more questions. The authors' ambition is that it is a **starting point for a broader dialogue** on strategies and policies required to **strengthen European industry and increase its strategic autonomy.**

This report is the outcome of a 10-week part of a broader study on the role and design of demand-side policies and thus provides initial views on the potential role and design of demand-side mandates in the focus sectors.
Subsequent phases may provide further depth and breadth of analysis.

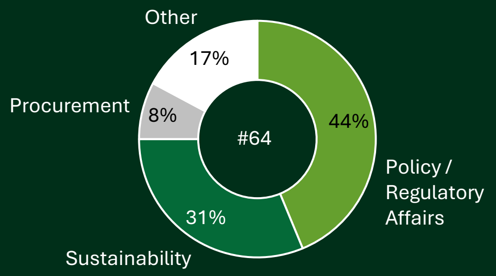
The report has been prepared principally from information supplied by and obtained from discussions with representatives of the sponsoring organizations (VNCI, Vemobin, VNO-NCW, NVDE, Mestsoffen Nederland, Gasunie, Invest-NL, Energie Nederland), pursuant to the scope of the work agreed with NVDE. Hence, in preparing this report, we have relied upon and assumed, without verification, the accuracy and completeness of all information available from public sources or which was provided to us by or on behalf of the sponsoring organizations or which was otherwise analyzed by us. Deloitte accepts no responsibility for the accuracy and completeness of any information provided to us or obtained from public sources.

**01.** Stakeholders involved in the research

**Types of organisations**



**Stakeholder roles**



Stakeholders were involved in this study as an expert panel and through in-depth interviews. All engagements with stakeholders were conducted in a manner that respects competition law boundaries.

# Executive summary

**Heavy industry** – spanning sectors such as steel, chemicals, refining, and fertilizers – **is critical to the European prosperity and strategic autonomy**. These sectors supply essential inputs to the economy – from construction and manufacturing components to food and medicines, among many others – supporting tens of millions of high-quality jobs across the EU. At the same time, they **account for a significant share of the EU's greenhouse gas emissions**.

**EU heavy industry is under increasing pressure, especially from high energy and feedstock prices, costs of $CO_2$ emissions, and low-cost imports**. These pressures have already led to widespread plant closures and a relocation of production abroad. **While EU producers have reduced emissions, these gains are offset by growing emissions from imports – a phenomenon known as "carbon offshoring."** As free allowances under the EU Emissions Trading System (ETS) are phased out, costs for EU producers and competition from imports are likely to rise further, especially considering that the Carbon Border Adjustment Mechanism (CBAM) remains vulnerable to circumvention.

While conventional production faces strong import competition, the **transition to sustainable alternatives is not economically viable yet**. **The cost gap between conventional and sustainable production is substantial and unlikely to close through market forces or technological advances alone.** It is also well beyond what public subsidies or industry profits can support. Without alternative funding mechanisms, sustainable investments are not likely to be made, while the EU risks continued deindustrialization and growing dependence on higher-emission imports.

Yet **if the additional costs were passed through to end consumers, retail prices would increase only modestly - typically less than 1%.** This is because materials like steel, plastics, and fertilizers represent a small fraction of the cost of finished products. Modest price increases could enable significant emissions reductions without major impact on affordability.

Given these considerations, **stakeholders involved in this study call for a broader policy shift – combining supply-side support and an improved CBAM with targeted demand-side mandates.** These mandates would require increasing shares of sustainable materials in selected products, giving producers the certainty needed to invest at scale. Examples in other sectors show that clear demand signals can accelerate sustainable investments.

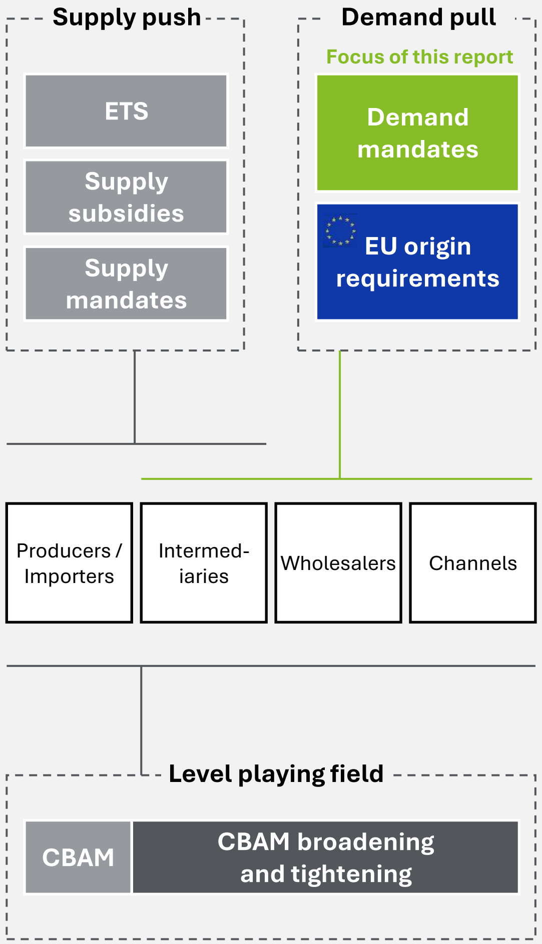
**Demand-side mandates should be guided by the principles of scale, effectiveness, feasibility, and competitiveness**, and should be developed in cooperation with stakeholders from across the value chain. These principles inform key design choices: **selecting large, homogenous end-markets with limited import circumvention risk; placing obligations on companies close to end-users, which account for a large share of the product volume; and using metrics and compliance mechanisms that balance environmental ambition with practicality.** Origin requirements, such as mandating a share of sustainable inputs to come from the EU, can support local investment, if they can be implemented in alignment with trade rules.

**This study offers tangible proposals for the design choices which could be made in each of the four sectors.** While these are preliminary and the work is still ongoing, it demonstrates that designing such mandates is feasible and can be made both practical and effective.

To move forward, stakeholders propose the **creation of a legal and institutional framework to support these mandates, possibly under the Industrial Decarbonisation Accelerator Act**. A working program could be established to coordinate policy development, engage stakeholders, and conduct impact assessments. This program would define key elements such as targeted markets and products, mandate holders, metrics, compliance mechanisms, and EU-origin requirements.

**Several existing or proposed EU policies could provide a foundation for implementation, helping to accelerate sustainable transformation.**

**02.** Conceptual summary of this report



**Supply push**

- ETS
- Supply subsidies
- Supply mandates

**Demand pull**

Focus of this report

- Demand mandates
- EU origin requirements

Producers / Importers

Intermed-iaries

Wholesalers

Channels

**Level playing field**

- CBAM
- CBAM broadening and tightening

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# **Why** additional demand creation is necessary

# Heavy industry – including chemicals, steel, refining and fertilizers – produces essential components of the modern economy and represents major share of EU economy

**03.** Heavy industry role in the modern economy, incl. direct employment and Gross Value Add (GVA) in EU (2023)[1]

EU Σ = 217 million direct jobs / € 14,285 billion direct GVA

Focus of this report

| Heavy industry | | Light industry | | | | | **Transport** (incl. warehouse and courier services) | **Agriculture,** forestry and fishing | **Power and utilities**[3] | **Other** (services[4], wholesale and retail) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Construction | Machinery, equipment production | Food and beverage production | Vehicles production | Other manufacturing | | | | |
| EU jobs / GVA: | **4.0M** / € 413B | **14.5M**/€ 780B | **9.1M**/ € 678B | **4.7M**/ € 259B | **3.1M**/ € 315B | **9.2M**/ € 560B | **11.4M**/ €720B | **9.0M**/ € 270B | **3.3**/ € 514B | **149.2**/ €9,776B |
| **Chemicals** (excl. fertilizers) | **1.1M**<br>€ 132B | Window frames, cables, paints,... | Coatings, plastic components,... | Bottles, food packaging,... | Interior plastics, tires, batteries,... | Lab equipment, medicines, clothes, toys, cosmetics, | Package adhesives, methanol fuel[3],... | Crop protection, fishing nets... | Air filters, fuel cell membranes,... | Broad direct and indirect use of products developed by heavy industry and with its input |
| **Steel** | **0.3M**<br>€ 26B | Steel rods, house frames, rails, road signs ... | Construction equipment (yellow goods), electronics,... | Steel cans,... | Car body, engine,... | Domestic appliances, lab equipment,... | Storage racks,... | Tractors, ploughs, harvesters,... | Transmission towers, wind turbines, solar panels... | |
| Feedstock<br>**Refining** | **0.1M**<br>€62B | Asphalt (bitumen) | Lubricants, hydraulic liquids,... | | Brake fluids | | Road, aviation and shipping fuels,... | Tractor fuels, lubricants,... | Transformer liquids,... | |
| **Fertilizers** | **0.1M**<br>€3.3B | | | Fertilizers, carbon for sparkling drinks,... | | | Catalytic fluids ("AdBlue"), marine fuel[5],... | Fertilizers | Ammonia in flue gas treatment,... | |
| Other heavy industry[2] | **2.4M**<br>€ 190B | | Aluminium components,... | Glass bottles, aluminium cans,... | Vehicle windows, aluminium body parts... | Wood furniture, | Paper packaging,... | | | |

🟦 Heavy industry sectors in scope of this report ⬛ Other sectors 🟩 Example heavy industry products used in the broader economy[6]

Heavy industry encompasses several sectors that transform raw materials in large-scale facilities into essential components of the modern economy.

**Chemicals and steel** form the backbone of nearly all manufacturing and, by extension, most aspects of everyday life and business.

**Refining** plays a dual role: supplying critical feedstocks to the chemical industry and supporting transportation – both now and into the foreseeable future.

**Fertilizers**, particularly those based on ammonia, remain vital to modern agriculture, enabling the sustenance of a significant share of the global population.

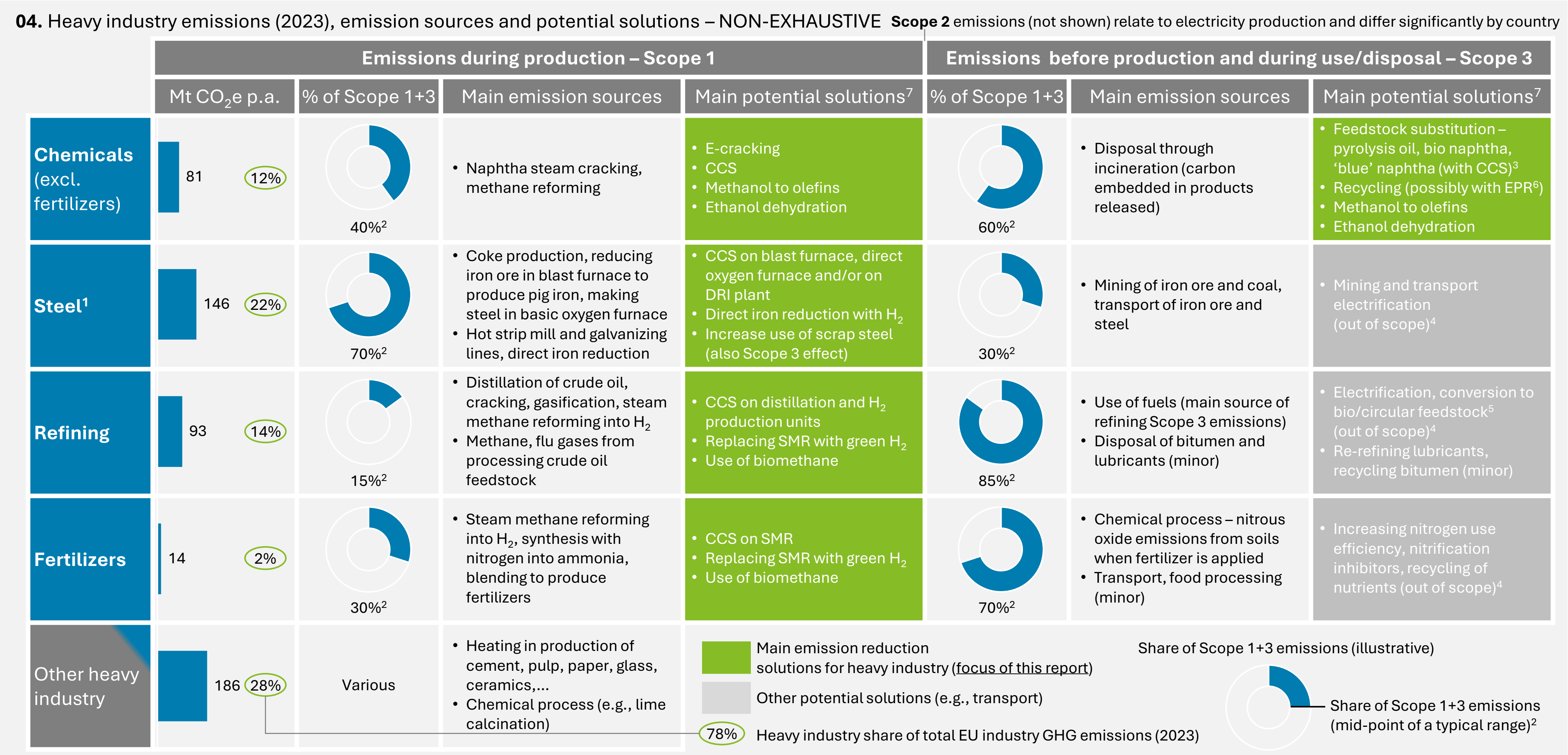
In the EU, **approximately 4 million people are directly employed in heavy industry.** Indirectly, sectors that use its outputs support around 65 million jobs.

1) Jobs total for 2023, GVA for 2022, except steel for 2023. Detailed breakdown of heavy industry jobs for 2023 not available. Assumed same split as in 2022, scaled to 2023 total; 2) Other heavy industry includes paper and pulp, non-ferrous metals (e.g., aluminium), and non-metallic mineral products (e.g., glass, cement, ceramics). These sectors are included for completeness, but are not in scope of this report; 3) Power and utilities includes electricity and heat production, water supply, and mining (mainly coal); 4) Other services includes among others public administration, healthcare, defence, IT, financial, real estate, food, entertainment; 5) Methanol and ammonia are considered candidates as future maritime fuels; 6) Example product allocation to sectors is illustrative, some products might fit with multiple sectors (e.g., tractors belong to both agriculture and machinery production)

Source: Eurostat (GVA, EU jobs for all sectors, except steel); Eurofer (GVA, EU jobs for steel sector); Fertilizers Europe; Cefic; stakeholder interviews; Deloitte analysis

# Heavy industry is emissions-intensive, but technically feasible solutions exist to reduce both direct (Scope 1) and indirect (primarily Scope 3) emissions

**04.** Heavy industry emissions (2023), emission sources and potential solutions – NON-EXHAUSTIVE **Scope 2** emissions (not shown) relate to electricity production and differ significantly by country



| | Emissions during production – Scope 1 | | | | Emissions before production and during use/disposal – Scope 3 | | |
|---|---|---|---|---|---|---|---|
| | Mt $CO_2$e p.a. | % of Scope 1+3 | Main emission sources | Main potential solutions[7] | % of Scope 1+3 | Main emission sources | Main potential solutions[7] |
| **Chemicals** (excl. fertilizers) | 81<br>12% | 40%[2] | - Naphtha steam cracking, methane reforming | 🟩<br>- E-cracking<br>- CCS<br>- Methanol to olefins<br>- Ethanol dehydration | 60%[2] | - Disposal through incineration (carbon embedded in products released) | 🟩<br>- Feedstock substitution – pyrolysis oil, bio naphtha, 'blue' naphtha (with CCS)[3]<br>- Recycling (possibly with EPR[6])<br>- Methanol to olefins<br>- Ethanol dehydration |
| **Steel[1]** | 146<br>22% | 70%[2] | - Coke production, reducing iron ore in blast furnace to produce pig iron, making steel in basic oxygen furnace<br>- Hot strip mill and galvanizing lines, direct iron reduction | 🟩<br>- CCS on blast furnace, direct oxygen furnace and/or on DRI plant<br>- Direct iron reduction with $H_2$<br>- Increase use of scrap steel (also Scope 3 effect) | 30%[2] | - Mining of iron ore and coal, transport of iron ore and steel | ⬜<br>- Mining and transport electrification (out of scope)[4] |
| **Refining** | 93<br>14% | 15%[2] | - Distillation of crude oil, cracking, gasification, steam methane reforming into $H_2$<br>- Methane, flu gases from processing crude oil feedstock | 🟩<br>- CCS on distillation and $H_2$ production units<br>- Replacing SMR with green $H_2$<br>- Use of biomethane | 85%[2] | - Use of fuels (main source of refining Scope 3 emissions)<br>- Disposal of bitumen and lubricants (minor) | ⬜<br>- Electrification, conversion to bio/circular feedstock[5] (out of scope)[4]<br>- Re-refining lubricants, recycling bitumen (minor) |
| **Fertilizers** | 14<br>2% | 30%[2] | - Steam methane reforming into $H_2$, synthesis with nitrogen into ammonia, blending to produce fertilizers | 🟩<br>- CCS on SMR<br>- Replacing SMR with green $H_2$<br>- Use of biomethane | 70%[2] | - Chemical process – nitrous oxide emissions from soils when fertilizer is applied<br>- Transport, food processing (minor) | ⬜<br>- Increasing nitrogen use efficiency, nitrification inhibitors, recycling of nutrients (out of scope)[4] |
| Other heavy industry | 186<br>28% | Various | - Heating in production of cement, pulp, paper, glass, ceramics,...<br>- Chemical process (e.g., lime calcination) | | | | |

🟩 Main emission reduction solutions for heavy industry (focus of this report)

⬜ Other potential solutions (e.g., transport)

78% Heavy industry share of total EU industry GHG emissions (2023)

Share of Scope 1+3 emissions (illustrative)

Share of Scope 1+3 emissions (mid-point of a typical range)[2]

**Heavy industry accounts for around 80% of the EU's total industrial direct greenhouse gas (GHG) emissions – so-called "Scope 1"** – primarily from fossil fuel use for heat.

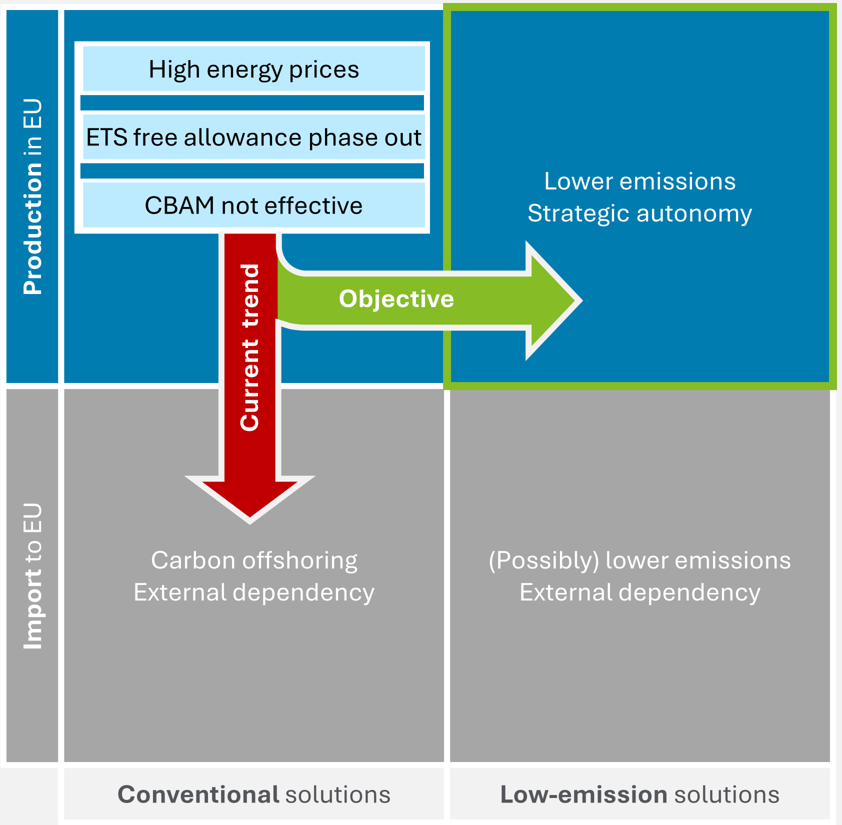
In chemicals, refining, and fertilizers, **"Scope 3" emissions, especially those from product use, also form a significant share of the total.** In refining and fertilizers, these emissions mostly relate to choices made by downstream users (e.g., transport firms, farmers). In chemicals, Scope 3 emissions relate to both feedstock choices made by producers as well as disposal choices made downstream.

> **My scope 3 is someone else's scope 1**, so we need holistic solutions.
>
> Infrastructure company

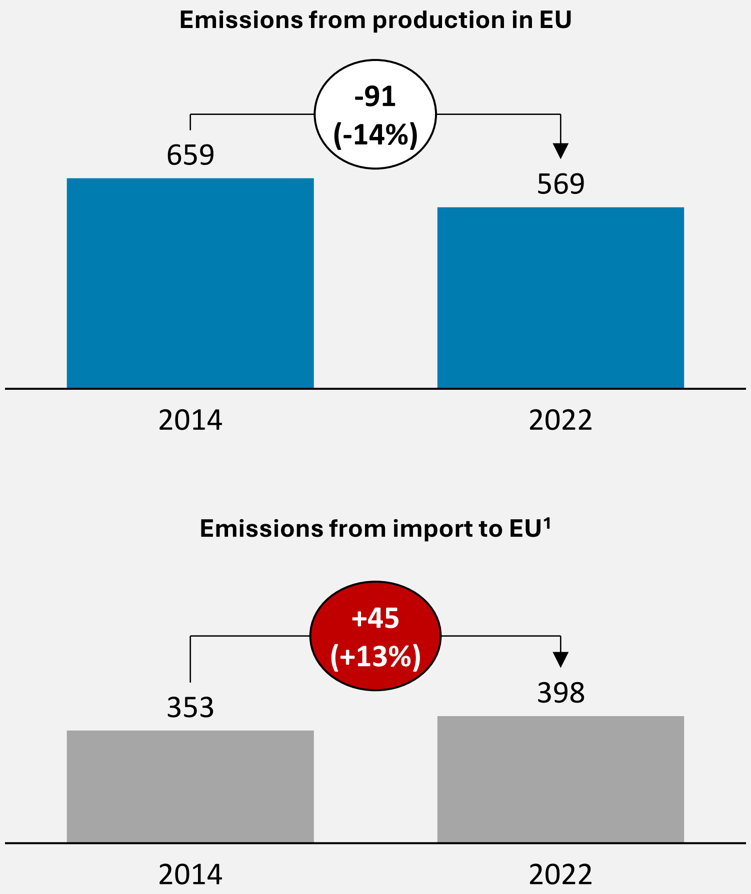
1) Steel includes 123 Mt of direct emissions and 23Mt related to power production in steel plants; 2) Share of Scope 1 and 3 emissions in each sector varies significantly based on region, plant and products. Figures shown represent mid points of commonly estimated ranges (Scope 1 and 3 respectively): Chemicals (excl. fertilizers): 30%-50% and 50%-70%, Steel 60%-80% and 20%-40%, Refining 10%-15% and 80%-90%, Fertilizers 20%-40% and 60%-80%; 3) Naphtha production represents Scope 1 for Refining and Scope 3 for Chemicals; 4) Solutions out of scope for this report, but for which a similar approach to demand creation can be used; 5) Fossil refineries can be transformed to produce circular/biobased feedstock for the chemicals industry; 6) Some product groups (e.g., disposable plastic, electronics) have Extended Producer Responsibility (EPR) meaning that the producer or importer are held responsible for end-of-life product management; 7) In all sectors, energy efficiency (e.g., through better process management) is also an important lever to reduce emissions. Source: Eurostat; Cefic; EEA; GHG Protocol; Tata Steel NL; stakeholder interviews; Deloitte analysis

# Adoption of low-emission solutions in heavy industry has been limited, as EU companies have instead faced pressures that pushed production out of the region

**05.** Current challenges in EU heavy industry – ILLUSTRATIVE



**06.** $CO_2$ emissions from EU production and from imports (Mt $CO_2$)



Historically, the EU's **manufacturing base has been a contributor to region's economic prosperity and strategic autonomy.**

However, over the past decade, high energy prices (and increasingly $CO_2$ levies) – combined with limited demand for sustainable products and limited import protection mechanisms – have **negatively impacted the competitiveness of EU industry**. This was further exacerbated by targeted stimulation of industrial production outside the EU, for example in China.

These trends have prompted a shift to industrial production abroad. As a result, while EU heavy industry has reduced emissions by 14% since 2014, **emissions embedded in imports have increased – offsetting roughly half of the domestic gains through equivalent emissions abroad.** Accounting for additional emissions from imported finished goods, such as vehicles and machinery, would increase this figure further.

The European Commission has acknowledged this growing "carbon offshoring" trend in key reports, including the Draghi Report and the Clean Industrial Deal.

The EU now aims to curb these emissions while reinforcing industrial resilience and accelerating green technology – pursuing **lower emissions with greater strategic autonomy.**

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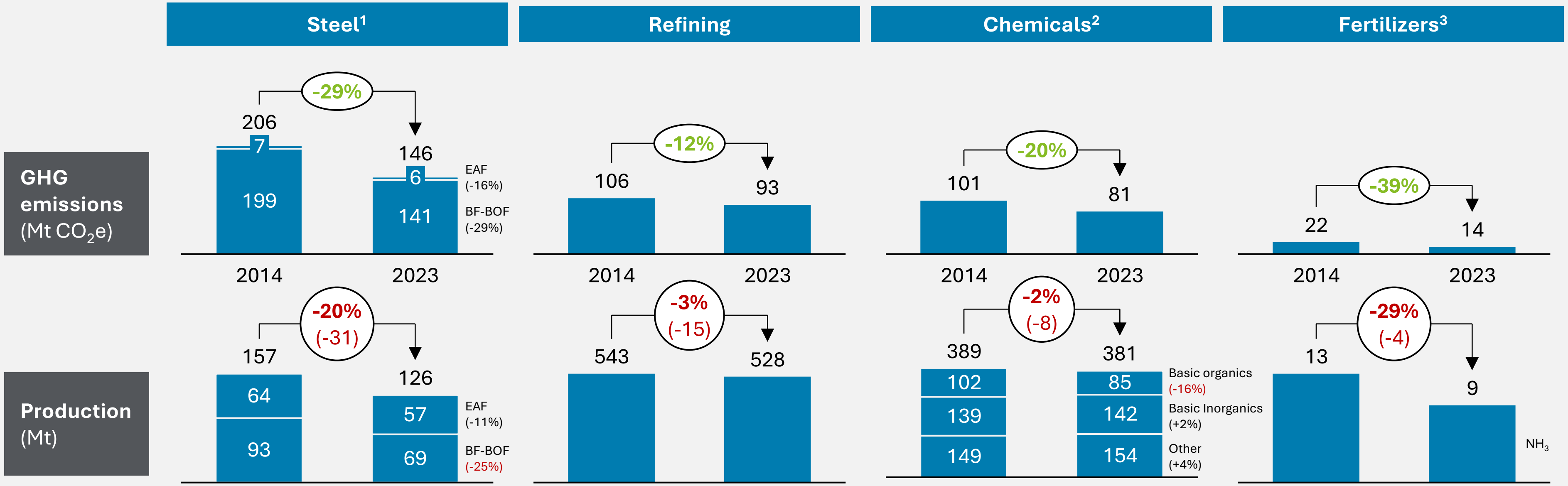
[1] Emissions from imports based on Full International and Global Accounts for Research in Input-Output Analysis (FIGARO). These are estimated based on import volumes and standard emission factors for selected countries

Source: Eurostat; stakeholder interviews; Deloitte analysis

# Specifically, in the four sectors, EU production has declined by 3% - 29% over the past decade, and was largely replaced by imports

**07.** EU GHG Scope 1 emissions, production and net import by sector (2014 – 2023)



| | | | | | | | NH$_3$ | Fert. | NH$_3$ | Fert. |
|---|---|---|---|---|---|---|---|---|---|---|
| Import | 20 | 25 | 287 | 287 | 73 | 81 | 3 | 7 | 2 | 9 |
| Export | 29 | 16 | 291 | 299 | 81 | 71 | ~0 | 7 | ~0 | 6 |
| **Net import** | **-9** | **9 (+18)** | **-4** | **-12 (-8)** | **-8** | **10 (+18)** | **3** | **~0** | **2 (+1)** | **3 (+3)** |

EU has turned from net exporter to net importer of steel. Two thirds of the steel production decline can be explained by lower exports and increased imports of steel, the rest by increased imports of steel-containing goods (assuming relatively stable true steel use)

Despite pressures on EU production, EU remains a net exporter of refined products (e.g., to West Africa) due to historical overcapacity, ongoing electrification of transport and a decline in EU chemicals sector (user of naphtha)

EU has turned from net exporter to net importer of chemicals due to increased net import of basis organics and a change from net exporter to net importer of polymers (especially plastics). EU remains a net exporter of specialty chemicals (e.g., paints and inks)

Large share of the decline in local production of ammonia in the EU over the last decade has been replaced by imports

EU GHG **emissions in the four focus heavy industry sectors declined** by 12%-39% over the past decade. While efficiency improvements contributed to the decline, **part of the reduction stemmed from lower production volumes as plants shut down or scaled back operations due to economic pressures.** This trend was especially pronounced in the most energy- and carbon-intensive subsectors, such as BF-BOF steelmaking and basic organics in chemicals.

In steel, chemicals, and fertilizers, **domestic production was largely replaced by imports**, including both basic materials (shown) as well as final products (not shown). In refining, import was lower due to ongoing transport electrification.

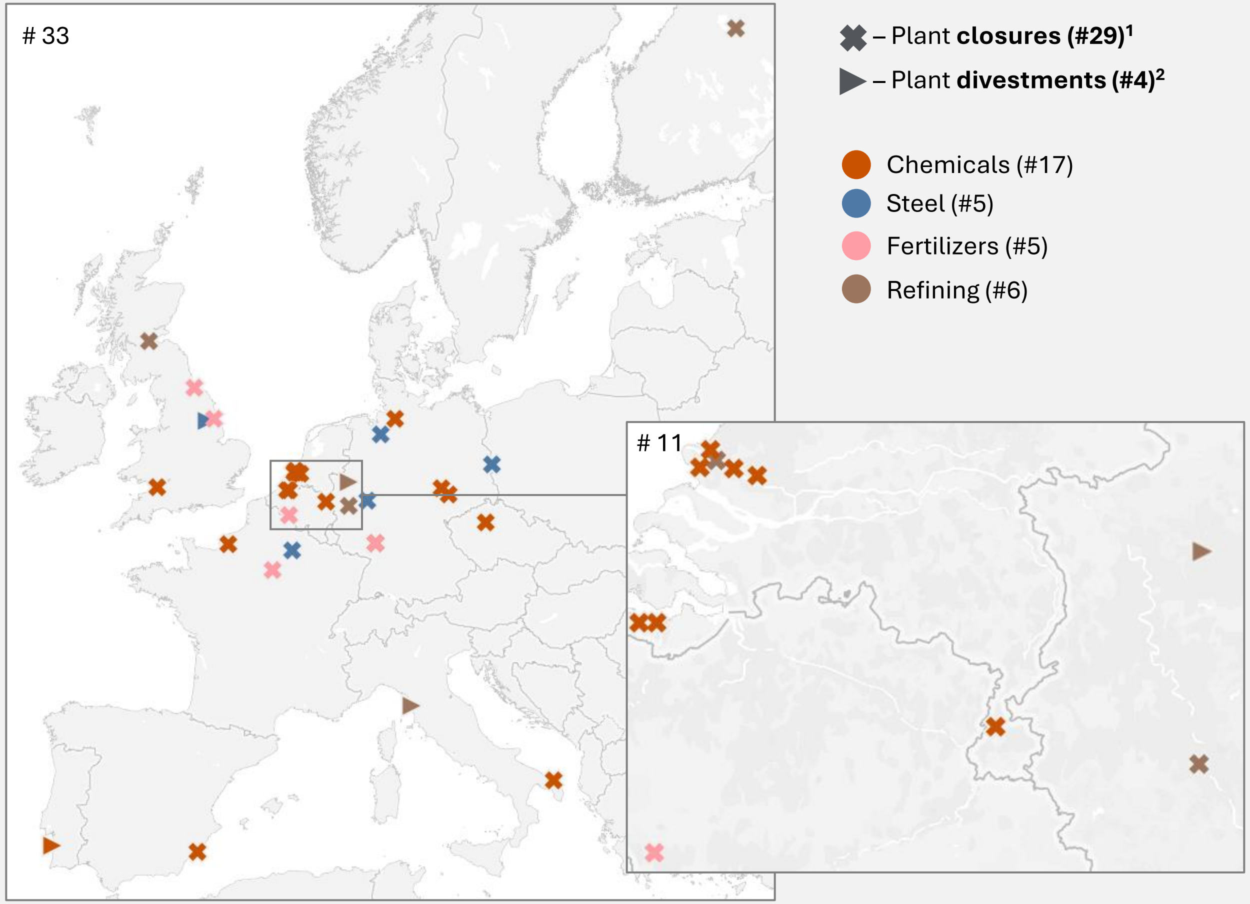
As there is no indication that consumption of end products materially decreased in the period, much of the heavy industry **emissions reduction achieved in the EU was likely offset by increases abroad.** Given that many imports come from countries with looser emissions standards, total global emissions linked to EU consumption may have in fact risen.

1) Steel emissions include power production in steel plants. Steel production includes crude steel, import and export include finished steel products (e.g., HRC); 2) Chemicals excluding fertilizers; 3) Fertilizers production is ammonia. Fertilizers import and export includes ammonia, ammonia-based fertilizers and non-fertilizer ammonia products

Source: Eurostat; Eurofer; Fertilizers Europe; Cefic; Deloitte analysis

# This shift has meant closure of many industrial plants across the EU

**08.** European heavy industry plant closures and scale-downs in the last three years – EXAMPLES



Over the past three years, **almost 30 heavy industry plants have announced closures across Europe, with another few currently up for sale as owners seek to divest**. In nearly all cases, companies cite a **lack of profitability driven by high energy costs, carbon taxes, and competition from much cheaper imports** as the main reasons for exiting Europe.

**The chemicals sector has been relatively hardest hit**, accounting for over half of the closures. In addition to **steep natural gas and feedstock prices**, these companies face growing **competition from newer production sites abroad** (mainly in the Middle East, US and China) that use alternative technologies and feedstocks – such as ethane instead of naphtha. In the context of high costs, as well as – often cited – regulatory uncertainty, many firms indicate that investments in more efficient technologies in the EU are unlikely in the foreseeable future.

**Similar concerns are echoed in the steel, fertilizer, and refining** sectors, where plant closures and divestments have also been announced. Beyond cost pressures, companies report a **sharp decline in demand due to Europe's broader economic slowdown and growing replacement of downstream production with imports**. For example, rising vehicle imports from China reduce domestic car manufacturing, which in turn lowers demand for European steel.

Next to urgency regarding (existing) industrial assets, substantial investments are already being made into sustainable production. **Success of these first movers will likely be instrumental for further investments,** and demand creation could contribute to this.

While the European Commission and several Member States acknowledge the mounting pressures on European industry, **concrete policy responses remain mostly under development.**

> Our **gas bill in Europe is $ 100M higher** than at our comparable plants in the US
>
> Chemical company CEO

> The EU's decarbonization goals are (...) creating **additional short-term costs for European industry**
>
> Draghi Report

> Faced with high energy costs and fierce global competition, **European industries need urgent support**
>
> EU Clean Industrial Deal

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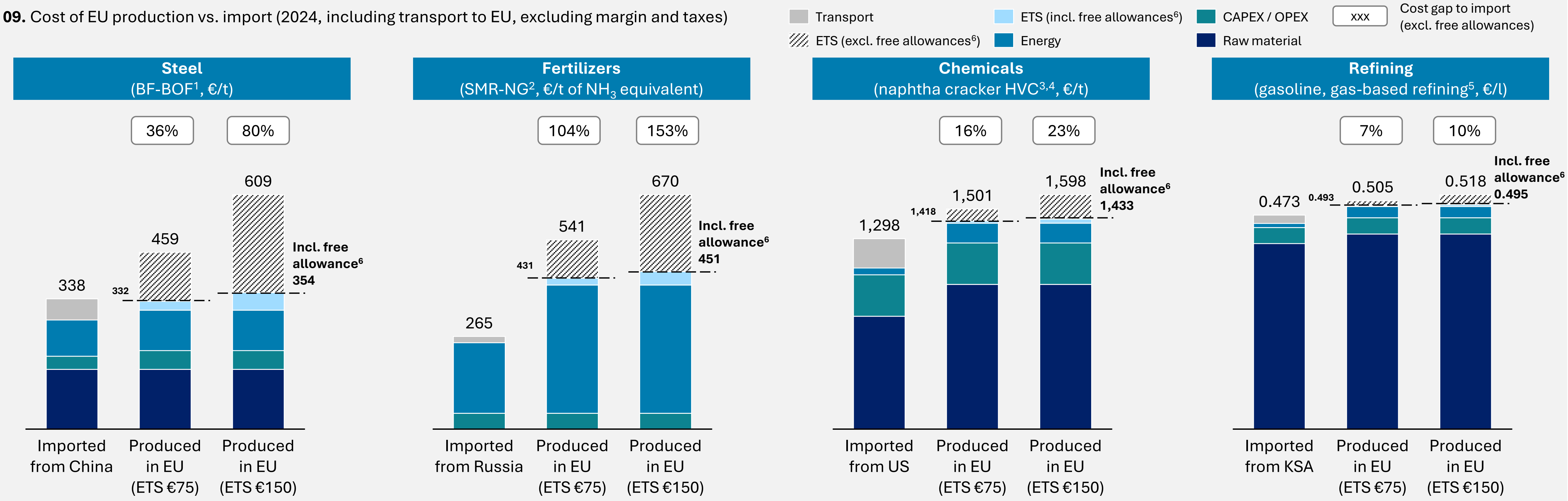
1) Closures include one plant that was mothballed (production stopped) but where final closure has not yet been announced and one plant where legal proceedings regarding closure are in progress; 2) Divestments include one government bail-out

Source: Company websites; stakeholder interviews; Deloitte analysis

# Import is a viable option, mainly due to the EU's high energy and feedstock prices

**09.** Cost of EU production vs. import (2024, including transport to EU, excluding margin and taxes)



**Heavy industry production in the EU is often more expensive than in other regions**, even after accounting for transport costs. Currently, the primary driver is the **high cost of energy** (e.g., natural gas, electricity) **and feedstocks** (e.g., naphtha, crude oil), which make up the bulk of production costs. While the size of the cost gap varies by sector, it remains large enough across the board that **importing is often more economical than producing domestically**. In some sectors, **new regulations** – most notably the green hydrogen mandate under the Renewable Energy Directive III – **is likely to increase the cost of EU production even more.**

To date, free allowances have limited the impact of $CO_2$ costs under the EU ETS. **However, as allowance phase-out accelerates, cost gap to import is likely to further increase.**

> These are global commodity markets, so **every cent of cost difference matters**
>
> Industrial producer

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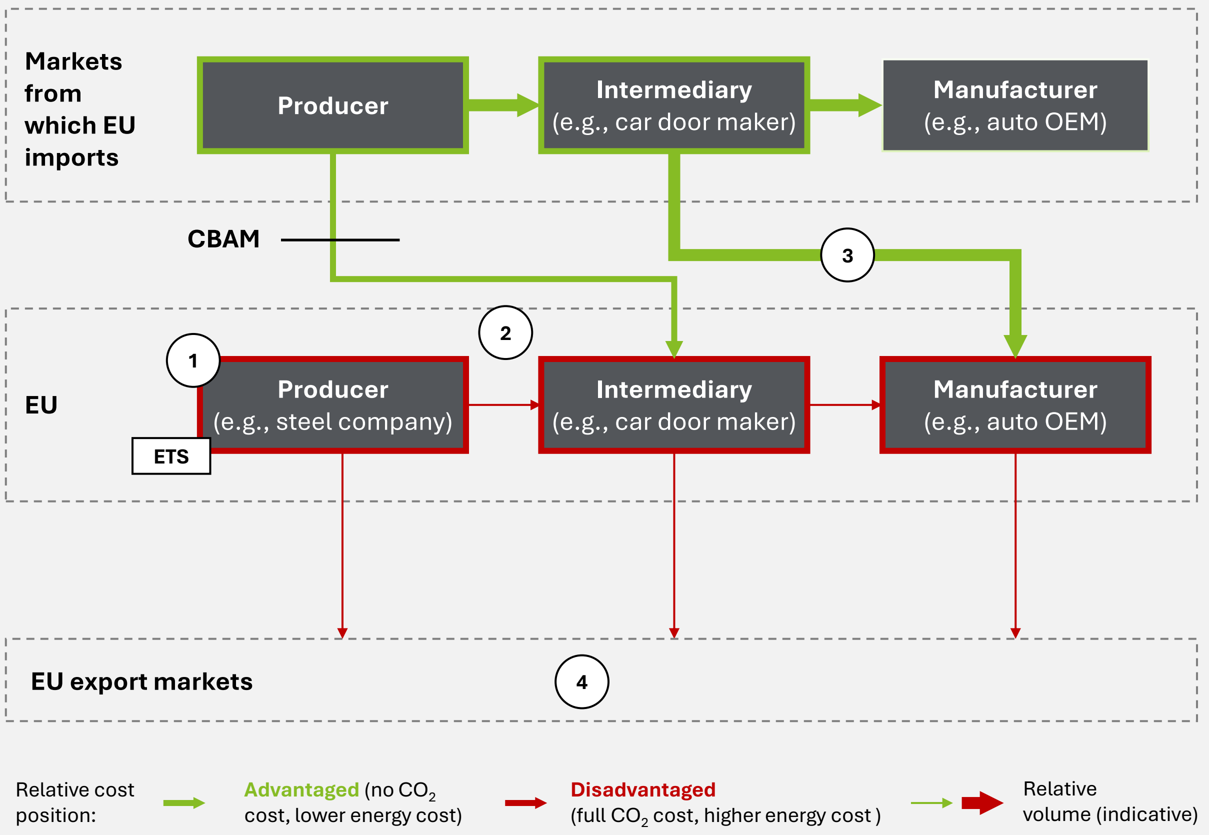
1) BF-BOF CAPEX €537/t steel capacity, OPEX 4.1% of CAPEX for BF-BOF with China 1/3 of EU, emissions 2.0t $CO_2$e/t steel BF-BOF; 2) SMR CAPEX € 750 / t $NH_3$ capacity, OPEX 2.0% of CAPEX SMR, emissions 1.72t $CO_2$e / t $NH_3$ for SMR, $N_2$ cost not included for SMR (generated as by-product); 3) High-value chemicals: ethylene, propylene and BTX (benzene, toluene and mixed xylenes); 4) CAPEX and OPEX of €283/t HVC, emissions 1.3 t $CO_2$e/t HVC; 5) Vemobin's 'Future of Refining in the Netherlands' complex refinery as reference, CAPEX €3.2/bbl, OPEX 3% of CAPEX, 63kt $H_2$ usage assumed 50-50 split between by-product distillation and product of SMR, total emissions of 30 kg $CO_2$e/bbl (1,577kt $CO_2$e/year, 308kt and 1,268kt $CO_2$e/year from SMR and distillation resp.); 6) Assuming 15% ETS shortage similar across sectors.

Source: Capital IQ; CBS; Ember; IEA; Vemobin; European Commission Joint Research Centre; Deloitte analysis

# However, as EU phases-out free allowances, EU production is likely to become even less viable, considering possibilities to circumvent CBAM

**10.** ETS and CBAM impact on competitiveness of EU production – ILLUSTRATIVE



① While EU producers are subject to the ETS cost, those outside the EU are not, and they benefit from lower energy costs. Currently, this disadvantage is **partially mitigated by allocation of free ETS allowances to EU producers.** If **free allowances are phased out by 2034** – as is currently planned – EU production is likely to become even less competitive[1].

The Carbon Border Adjustment Mechanism (CBAM) is intended to impose a $CO_2$ cost on imports of certain products[2]. However, **CBAM is vulnerable to circumvention:**

② CBAM only applies to goods sold into the EU, allowing non-EU producers to engage in **resource shuffling** – allocating the "greenest" products to the EU, without changing production processes. This lowers CBAM levy, while global emissions stay the same. Similarly, Non-EU producers can **spread** CBAM costs across their global output – an option unavailable to EU-based competitors.

③ Since CBAM targets only certain upstream materials (e.g., steel) and not downstream products made from them (e.g., vehicles), non-EU producers can, depending on the sector, **avoid $CO_2$ costs by pre-processing before export.** Evidence suggests this shift is already underway.

④ Meanwhile, **EU exporters subject to ETS are at a disadvantage** in global markets, where competitors face no comparable cost burden.

Beyond economic considerations, a disadvantage for EU producers is that non-EU competitors face less compliance pressure (e.g., net zero targets exists across regions, but with varying levels of enforcement). In contrast, **EU installations are bound by an ETS cap that – according to current plans – will reach zero by 2040, while non-EU installations face no such constraint and can operate indefinitely, serving EU markets – provided they pay the CBAM levy.** This asymmetry creates uncertainty about the long-term viability of EU-based operations prompting some companies to consider divesting from the EU altogether.

**Strengthening the CBAM is essential to level the playing field for EU industry. However, it cannot fully address the competitiveness gap**, particularly as EU producers face structurally higher energy costs. As such, additional mechanisms will be needed to support EU production.

> You will not invest in decarbonizing a plant that is at a risk of closing. **You need to believe it has a long-term future.**
>
> Industrial producer

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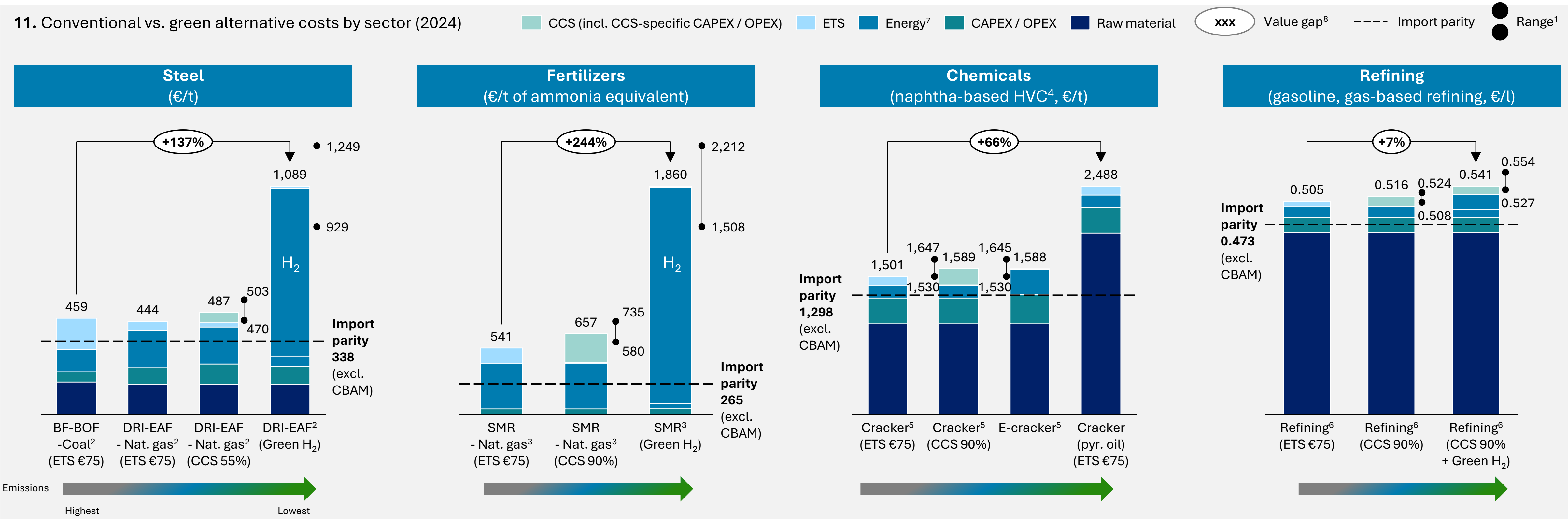
1) Currently relative cost position differs between sectors based on how large the energy and ETS costs are relative to overall cost base. In sectors like fertilizers, EU production is already significantly disadvantaged because natural gas is the largest cost item; 2) Currently CBAM covers cement, iron and steel, aluminium, fertilizers, electricity and hydrogen. There are plans to expand to other sectors, e.g., chemical. If that is implemented, it is possible that some sectors will lose free allowances faster than currently planned

Source: Industry reports; stakeholder interviews; Deloitte analysis

# While conventional production in EU faces competition from imports, investments in lower-emission solutions are considered not viable, given the cost difference (“value gap”)

**11.** Conventional vs. green alternative costs by sector (2024)

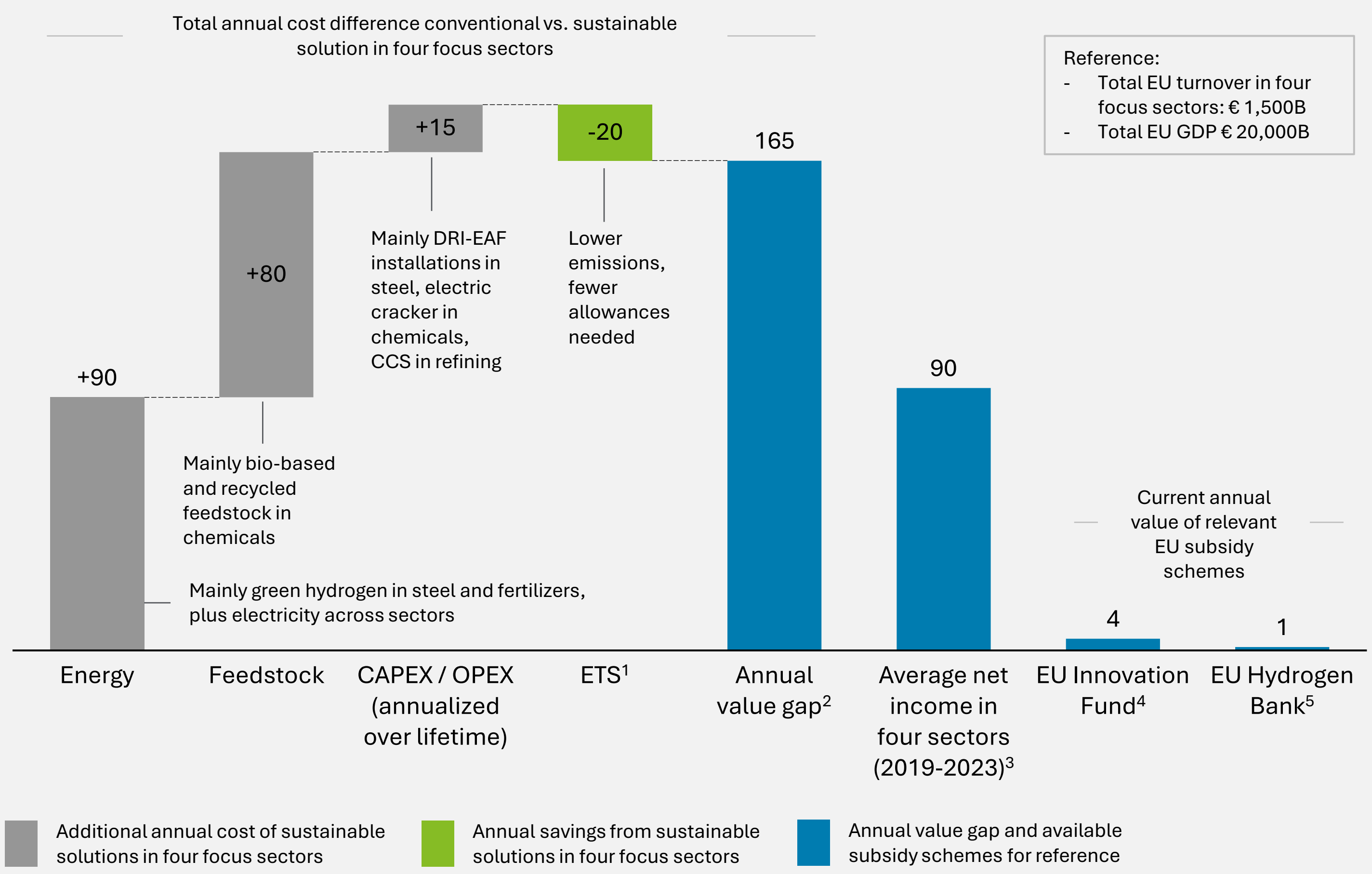


The EU ETS was designed to incentivize the shift to lower-emission solutions. In practice, however, **while the ETS raises conventional production costs, it is unlikely to effectively bridge the cost gap to lower-carbon solutions**. That gap in many cases is so high, that a corresponding increase in ETS price would most likely result in plants shutting down, rather than investments in low-carbon solutions. Across the sectors, thin margins and pressure from imports undermine the business case for switching.

1) Low : $H_2$ @ €8/kg and CCS @ €100/t $CO_2$, High: $H_2$ @ €12/kg and CCS @ €200/t CO2, chart as mid-point. For e-cracker, low: electricity @ €72/MWh and extra CAPEX @ €18/t HVC, high: electricity @ €104/MWh and extra CAPEX @ €18/t HVC, chart as mid-point. ETS @ €75/t $CO_2$ to allow comparison; 2) BF-BOF CAPEX €537/t steel capacity, DRI-EAF $H_2$ CAPEX €800/t steel capacity, 20 years depreciation, OPEX 4.1% of CAPEX BF-BOF and 4.8% DRI-EAF $H_2$, emissions 2.0t $CO_2$e/t BF-BOF, 0.13t/t DRI-EAF-$H_2$; 3) SMR CAPEX € 750 / t $NH_3$ capacity, green $H_2$ CAPEX € 878 / t $NH_3$ capacity, 25 years depreciation, OPEX 2.0% CAPEX SMR, 1.9% green $H_2$, emissions 1.72t $CO_2$e / t in SMR and 0.15t $CO_2$e/t in green $H_2$, $N_2$ cost not included in SMR (generated as by-product), included in green-$H_2$ but minor; 4) High-value chemicals: ethylene, propylene and BTX; 5) CAPEX and OPEX of €283/t HVC all technologies, emissions 1.3 t $CO_2$e/t HVC naphtha cracker and 0.17 t $CO_2$e/t HVC e-cracker, additional CAPEX for e-cracker €18-27/t HVC, feedstock costs for pyrolysis oil-based naphtha are assumed to be twice those of conventional cracker. E-cracker TCO is significantly higher than shown in some countries (e.g., Netherlands) where electricity costs are high; 6) Vemobin ‘Future of Refining in the Netherlands’, CAPEX €3.2/bbl and OPEX 3% CAPEX all technologies, natural gas replaced by electricity @ 20%+ efficiency, 63kt $H_2$ usage assumed 50-50 split between by-product distillation and product of SMR, total emissions of 30 kg $CO_2$e/bbl (1,577kt $CO_2$e/year, 308kt and 1,268kt $CO_2$e/year from SMR and distillation resp.) in gas-based, CCS 90% reduction of distillation and SMR emissions, and CCS and Green $H_2$ scenario 90% emission reduction in distillation and replacement 31kt H2 from SMR with purchased green $H_2$; 7) Gas €38 / MWh (avg. NL TTF ’23-’24), Coal €117 / t (avg. futures ’23-’24); 8) Cost difference between conventional (incl. ETS) and sustainable production. Source: Capital IQ; CBS; Ember; XE; IEA; Vemobin; TNO; ChemistryNL; stakeholder interviews; Deloitte analysis

# Closing the value gap to lower-emission solutions in the four sectors could require over €150B annually, an amount considered impossible to absorb in sector margins or existing subsidies

**12.** Levelized annual value gap in the focus sectors in context (€ B) – ILLUSTRATIVE



**To close the cost difference** between conventional and the lowest-emission solutions currently explored in the four sectors (which together represent around 12% of total EU and 80% of industrial EU emissions) it is estimated that at **up to €165 billion annually would be required.**

This estimate represents annualized capital investments required to transition to the new technology, as well as ongoing difference between conventional and low-emission energy costs and other operating expenses. As such, the value gap **would need to be covered every year, likely for decades.**

Stakeholders involved in this research indicate that it is **not realistic that this cost difference closes through market forces or technology innovation** in the foreseeable future.

They also point out that **bridging the gap through company margins is unfeasible**: even using the total sector income would be insufficient, and because EU profit margins are already low compared to global competitors, their further compression would mean inevitable plant closures and replacing EU production with imports – possibly with even higher $CO_2$ footprint.

The **required funding also far exceeds public subsidy schemes** relevant to heavy industry sectors (e.g., Innovation Fund). Even the size of EU budgets and subsidy schemes with a broader scope are insufficient.

As a result, industry stakeholders argue that a **fundamentally different approach is needed to enable the transition.**

> Subsidies are important, but there is **no scenario in which they are sufficient** to fund the whole transition
>
> Industrial organization

> This is not just about a one-off CAPEX subsidy. This amount would need to be spent **every year, probably for decades**
>
> Industrial producer

1) Based on ETS price of €75/t $CO_2$; 2) Value gaps based on cost analysis and top-down sector volume totals shown earlier in the report – levelized by spreading total CAPEX over plant lifetime; 3) Sector net income average of min €40 and max €140B estimated based on average net margin for a selection of representative companies in the last 5 years, applied to sector turnover. Net margins used: Steel 2% - 4%, Fertilizers 0% - 3%, Chemicals 3% - 10%, Refining 3% - 10%; 4) EU Innovation Fund of €40B between 2020 and 2030; 5) EU Hydrogen Bank budget of 3rd auction planned in 2025

Source: EU; Eurostat; Eurofer; Fertilizers Europe; Cefic; Vemobin; company annual reports; stakeholder interviews; Deloitte analysis

# However, including the cost of low-carbon production in the price of the end products would in most cases result in relatively small cost increases for consumers

**13.** Potential price increase of selected products if sustainable materials are used – ILLUSTRATIVE EXAMPLES

| | End-markets | End-products | Example used | Price increase from sustainable solution | | | |
|---|---|---|---|---|---|---|---|
| | | | | Current price | Of which input cost | Input cost increase[1] | Price increase (one-off) |
| **Steel** | Construction | **House** (foundation, beams, ...) | 185 $m^2$ house | €500,000 | €1,601 | **+137%**<br>BF-BOF (ETS €75) vs. DRI-EAF (Green $H_2$) | 0.2% |
| | | **Wind turbine** | 5MW offshore turbine | €3,000,000 | €88,200 | | 4.2% |
| | Automotive | **Car** (chassis, engine, ...) | Toyota Aygo X | €27,500 | €198 | | 0.7% |
| | | **Truck** (chassis, engine, ...) | MAN TGS 33.480 6x6 | €150,000 | €1,323 | | 0.8% |
| | Groceries | **Steel canned** tomatoes | Supermarket house brand | €0.69 | €0.03 | | 6.7% |
| | White goods | **Fridge** | 300l fridge freezer comb. | €700 | €23 | | 3.7% |
| **Fertilizers** | Groceries | **Tomatoes** (fresh) | 1 kg Roma house brand | €3.67 | €0.01 | **+244%**<br>SMR (ETS €75) vs. SMR (Green $H_2$) | 0.3% |
| | | **Fries** (frozen) | 1 kg house brand | €1.79 | €0.004 | | 0.5% |
| | | **Bread** | Entire whole-wheat bread | €1.75 | €0.01 | | 1.8% |
| **Chemicals** | Groceries | **Water** (plastic bottle) | 330ml house brand | €0.890 | €0.02 | **+66%**<br>Cracker (ETS €75) vs. Cracker (bio-based or pyrolysis oil) | 1.8% |
| | | **Shampoo** (bottle and content) | 300ml bottle | €2.75 | €0.12 | | 2.7% |
| | Automotive | **Car** (interior, electronics, ...) | Toyota Aygo X | €27,500 | €272 | | 0.6% |
| | | **Truck** (interior, electronics, ...) | MAN TGS 33.480 6x6 | €150,000 | €778 | | 0.3% |
| | Construction | **House** (PVC, ...) | 185 $m^2$ house | €500,000 | €6,045 | | 0.7% |
| **Refining** | Transport | **Parcel delivery** (diesel) | Last-mile delivery | €3 | €0.06 | **+7%**<br>Refining (ETS €75) vs. Refining (CCS + Green $H_2$) | 0.1% |
| | | **Flight** (kerosene) | Direct AMS – JFK | €500 | €89 | | 1.3% |
| | | **Shipping** (heavy fuel oil) | 1TEU SHG - RTM | €4,000 | €439 | | 0.8% |
| | Construction | **Highway** (bitumen) | 1km ZOAB highway | €20,000,000 | €180,000 | | 0.1% |
| | | **House** (roofing bitumen) | 185 $m^2$ house | €500,000 | €38 | | 0.0% |
| **References** | Average VAT EU | | | | | | 21.8% |
| | Total inflation EU ’15 – ’24 (average annual 2.7%) | | | | | | 30.2% |

**Heavy industry** producers face relatively **large cost increases** when opting for sustainable alternatives. However, when **passed on to end-products**, the **cost increases** are **smaller**, because these inputs account for a relatively **small fraction** of **total costs.** For example, while a car engine and chassis are often made from steel, their cost is not mainly a result of the amount of steel, but rather of the value-added activities related to how it was designed and manufactured.

True sustainable products require substitution of multiple materials, which results in a higher cost premium. However, that premium would still be relatively modest. For example, a **small car where steel, plastics and glass were all made with sustainable technology would likely face no more than 2-3% cost increase[2]** (assuming no additional margin added in the value chain). Administrative burden could increase this premium, but mandate design should aim for this to be limited.

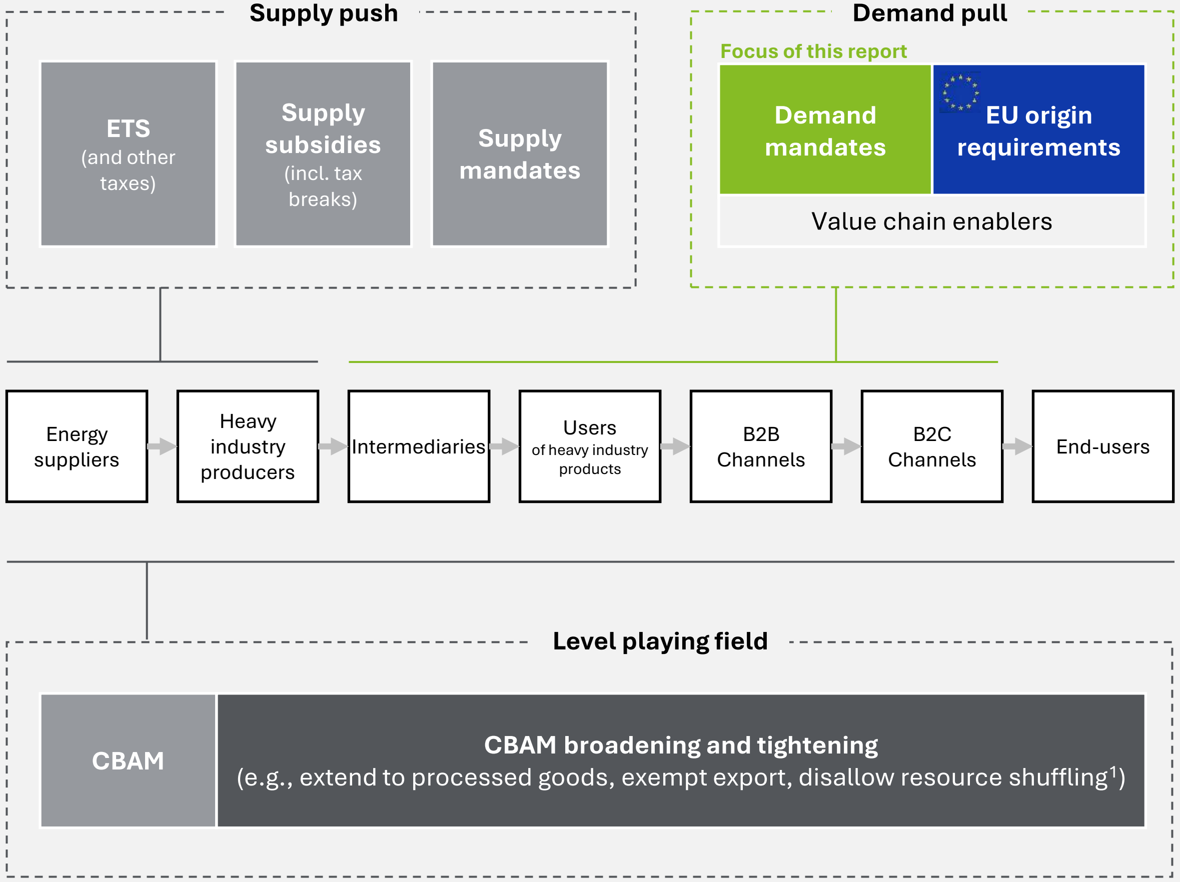
For those products, where even relatively modest price increases impact lower-income households, policy-makers may consider implementing compensation mechanisms (e.g., tax breaks).

1) Based on value gap earlier in this report (steel BF-BOF (ETS €75) at €459/t vs. DR-EAF (Green $H_2$) at €1,089/t; fertilizer SMR (NG – ETS €75) at €541/t vs. SMR (Green $H_2$) at €1,860/t; HVC gas naphtha cracker (ETS €75) at €1,501/t vs. Pyrolysis oil cracker at €2,488/t; refining gas-based at €0.505/l vs. gas-based (CCS and green $H_2$) at €0.541/l); 2) Steel and chemicals / plastics as shown above with total impact of 1.2%. Glass input cost assumed € 150 per car, green premium in line with steel, resulting in €220 cost increase, or 0.8%

Source: Agora; Bloomberg; ING; ETC Mission Possible; IEA; NEA; CBS; CPB; Sustainability by numbers; Rentel; Ethical Consumer; JEMA; Transition Asia; The Liquid Grid; Mintie; Forbes; RMI; TEI; Articles from: Journal of the Air & Waste Management Association; International Journal of Environmental Science and Development; Technical University of Denmark; Energy Policy; DHL; KLM; Port of Rotterdam; Scania; Volvo; VTT technical research centre of Finland; Lahti University of Technology; Agronomy for Sustainable Development; Deloitte analysis

# Heavy industry stakeholders call for extension of current policies, especially through broadening and tightening the CBAM and implementing demand-side mandates

**14.** Potential policy instruments to improve EU competitiveness and boost uptake of sustainable products



**Supply push**

**ETS** (and other taxes)

**Supply subsidies** (incl. tax breaks)

**Supply mandates**

**Demand pull**

Focus of this report

**Demand mandates**

**EU origin requirements**

Value chain enablers

Energy suppliers → Heavy industry producers → Intermediaries → Users of heavy industry products → B2B Channels → B2C Channels → End-users

**Level playing field**

**CBAM**

**CBAM broadening and tightening**
(e.g., extend to processed goods, exempt export, disallow resource shuffling[1])

Stakeholders argue that **without policy changes, the EU production risks being replaced by imports, with minimal sustainability gains.** While current supply-side measures – such as the ETS and subsidies – are important to incentivize sustainable production, they do not address the uneven playing field issues described earlier. The subsidies and other supply-side mechanisms (e.g., reduced VAT and tax breaks for industrial producers) should be retained and possibly expanded – e.g., to lower energy costs in the region – but relying solely on them to bridge the cost gap between sustainable and conventional products would demand massive public spending, which would likely be economically and socially unsustainable.

Stakeholders call for the existing instruments to be improved and expanded:

- **Extending and tightening the CBAM is necessary** to prevent further displacement of EU production by imports. Without it, the EU's strategic autonomy could be undermined, with little effect on global emissions. However, **even with tighter CBAM, uptake of sustainable products is unlikely, as the value gap to conventional solutions remains too wide.**
- To address these challenges, stakeholders stress **the need to go beyond supply-side and border measures by introducing demand-side instruments.** Specifically, they advocate for demand-side mandates – requiring that an increasing share of products in key markets be made using sustainable methods. This would create demand certainty, enabling investments, economies of scale, and the development of a robust market.
- The mandate **could be reinforced by an EU origin requirement** to support strategic autonomy and avoid displacement by lower-cost (often subsidized) import. For example, linking public funding to minimum level of local content is an approach used in some countries to encourage local production without violating free trade agreements.
- In some cases, **value chain enablers** might need to be established to help producers and suppliers connect and fulfil demand mandates. These could for example involve trading platforms, common standards (e.g., carbon accounting, EPD[2]) and partnerships.

> Building a business case for decarbonized products also requires concrete measures on the demand side**. Businesses will only make the necessary investments if they are sure there is a market for their products**
>
> EU Clean Industrial Deal

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1) Resource shuffling happens when non-EU producers allocate the "greenest" products to the EU, without changing production processes. This lowers their CBAM levy, while their global emissions stay the same; 2) Environmental Product Declaration

Source: Stakeholder interviews; Deloitte analysis

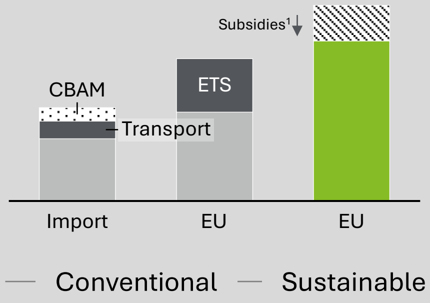
# Combining current supply-side policies with new demand-side mandates and tightened CBAM, could reverse the shift from EU production to imports and boost uptake of sustainable products

**15.** Impact of potential policy instruments on EU industry – ILLUSTRATIVE

Existing and planned instruments

Potential new instruments (focus of this report)

### 1. Current situation, incomplete CBAM

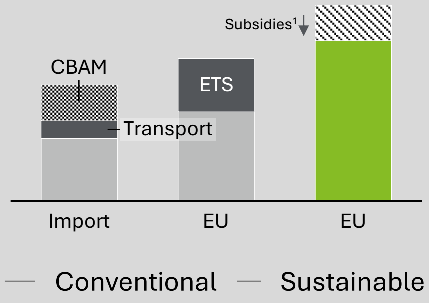


Due to higher energy cost and ETS, production in EU is more expensive than import.

Importers are expected to pay import duties through CBAM, but these are lower than ETS cost paid by EU producers and can be circumvented, e.g., by importing end products instead of base materials (explained earlier).

Sustainable production is significantly more expensive than conventional, even after subsidies.

### 2. CBAM extension and tightening

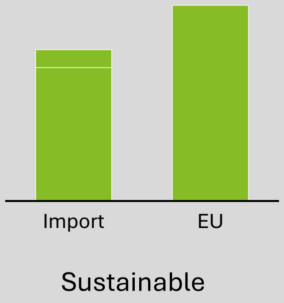


By extending and "tightening" CBAM (e.g., covering downstream products, banning resource shuffling), importers pay duties that are more aligned with the ETS cost paid by EU producers.

EU producers regain some competitiveness, although energy cost in the EU is still higher than elsewhere.

Sustainable products remain more expensive than conventional ones, and even when the gap is small, investments are hindered by uncertainty of demand.

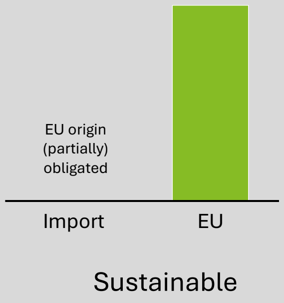
### 3. Demand mandates



Products sold in EU must fulfil sustainable standards (e.g., emission intensity, specific technology).

While sustainable production outside EU remains in many cases less expensive (e.g., because of subsidies), increased certainty of demand and the relatively small impact on end products could reduce risk for EU producers and trigger investments.

### 4. Demand mandates with EU origin requirements



Products sold in EU must fulfil sustainable standards and must be (partially) made in EU using EU-produced components.

"Green premium" paid by EU citizens funds EU investments.

For the applicable market segments (e.g., public procurement, defence), the requirement removes the competition from import, but it maintains competition within the EU.

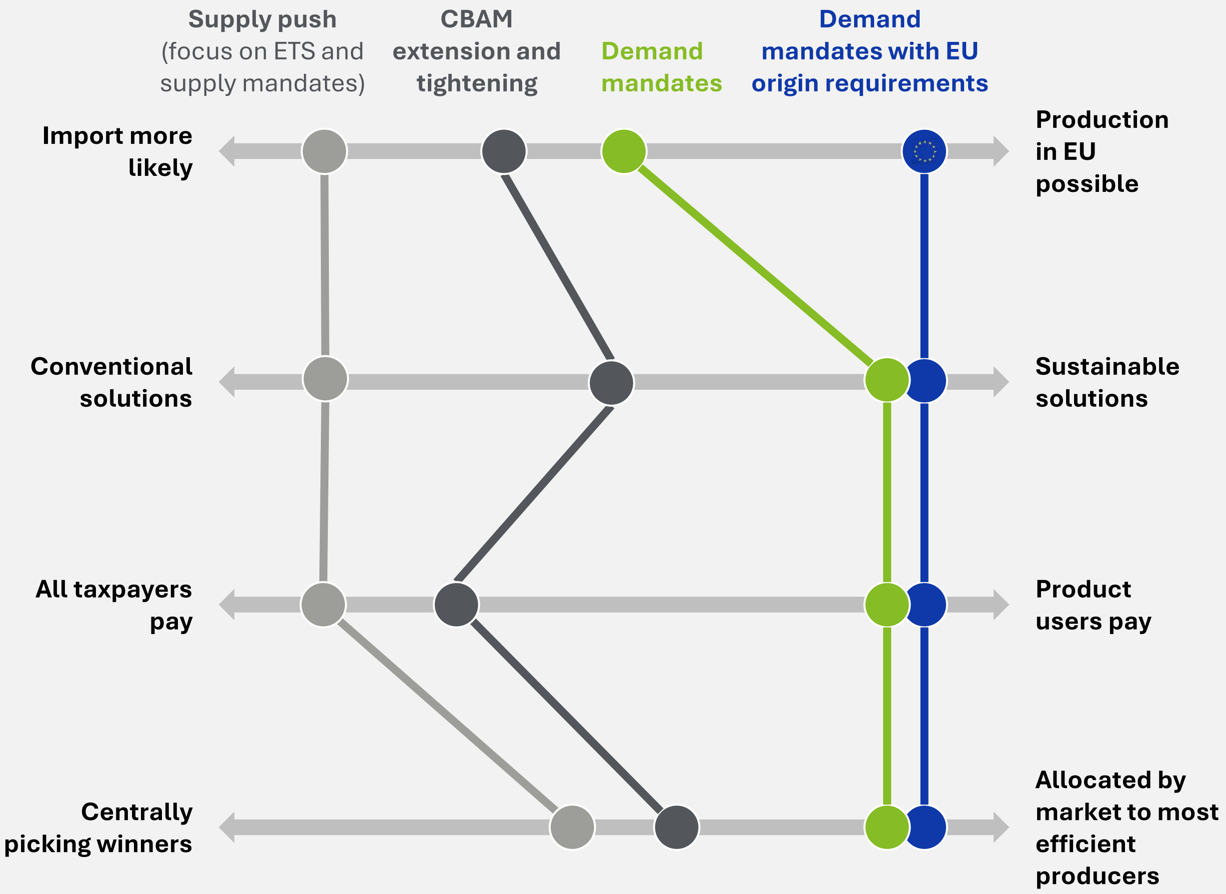
**Tightening CBAM may not be possible for some sectors (e.g., Chemicals) where 'tracking $CO_2$' through complex value chains is nearly impossible – alternatives may be needed to create a level playing field**

1) As indicated earlier, subsidies are likely to be required to stimulate initial investments, but will most likely be insufficient to close the value gap to sustainable solutions and imports

Source: Stakeholder interviews; Deloitte analysis

# The mandate can also help achieve actual emissions reduction and more efficiently allocate resources, by placing the cost on product users and relying on markets to allocate resources

**16.** Effect of potential policy instruments – ILLUSTRATIVE



**Supply push** (focus on ETS and supply mandates)

**CBAM extension and tightening**

**Demand mandates**

**Demand mandates with EU origin requirements**

**Import more likely** ↔ **Production in EU possible**

**Conventional solutions** ↔ **Sustainable solutions**

**All taxpayers pay** ↔ **Product users pay**

**Centrally picking winners** ↔ **Allocated by market to most efficient producers**

Because of higher conventional and sustainable production costs, EU producers are considered structurally disadvantaged versus import in most policy scenarios. Demand mandates with EU origin requirement would help make EU investments viable.

Without a demand-side mandate, imports of products using conventional / grey energy will likely increase, especially if EU producers face supply-side mandates (e.g., RFNBO) while importers do not. For many products, offshoring the production and paying for emissions under CBAM will likely remain more attractive than investing in decarbonisation.

Substantially increasing subsidies to meet supply-side mandates would likely impose a significant taxpayer burden, with uncertain outcome (e.g., potentially billions euro to decarbonize each plant without certainty of demand for sustainable products).
A demand-side approach would tie the cost more directly to product usage, potentially influencing consumer choices.

Supply-side instruments, even if scaled up and improved, would primarily benefit existing producers. In contrast, a demand mandate could foster the emergence of new producers, potentially in more advantageous locations within the EU.

By stimulating the market for low-emission products (therefore reducing emissions), demand mandates would complement the ETS and other climate policies, and help mitigate the risk of sharp ETS price spikes

Source: Stakeholder interviews; Deloitte analysis

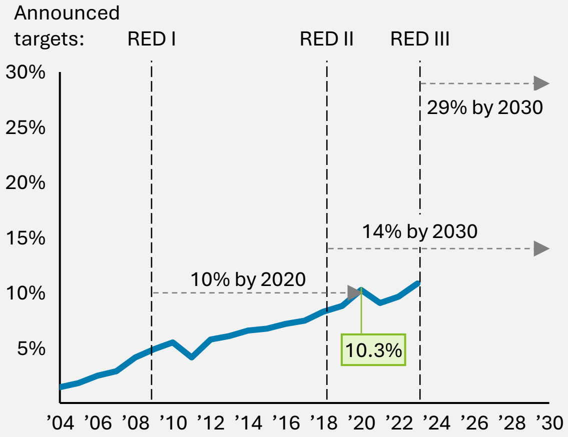
# Examples in other sectors illustrate that demand-side mandates can stimulate sustainable investments in the EU

**17.** Example demand mandates and resulting EU investments

**Ethanol blending in petrol in EU**

EU has been promoting use of biofuels, like ethanol, in transport, stimulated by a 2009 target of 10% renewable fuels in transport by 2020. RED II/III further increased the targets and set rules on types of biofuels used.

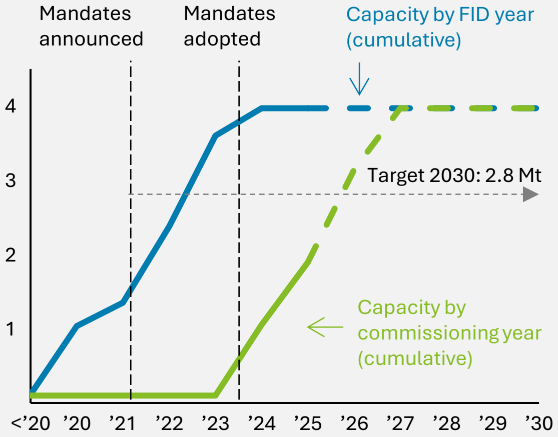
**Renewable energy share in transport** (%)



**ReFuelEU Aviation: EU-wide Sustainable Aviation Fuel (SAF) blend mandate**

Mandating that aviation fuel at EU airports contains a minimum of 2% SAF in 2025, increasing to 70% by 2050. The obligation is placed on fuel suppliers, with airlines having a reporting requirement.

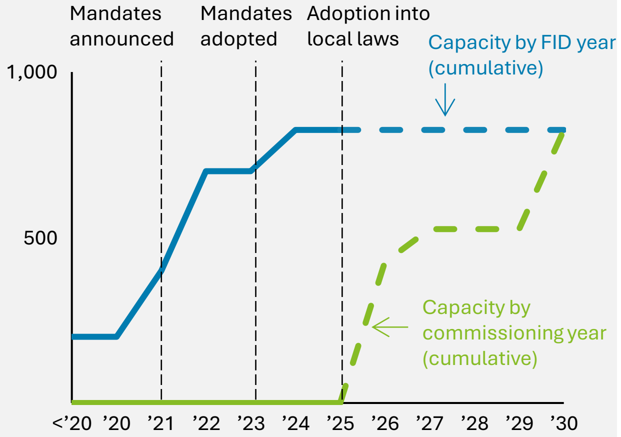
**SAF – production capacity**[1] (Mt)



**RED III – Green $H_2$ mandates for transport, enabled through a "refinery route"**

2030 target that at least 1% of energy in transport must be RFNBO (largely green $H_2$). Use of RFNBO in refineries also contributes to the target.

**Green $H_2$ for refining – production capacity** (MW)



There have been several notable examples of demand-side policies in the EU.

Since 2003, the EU has been promoting the use of biofuels in transport. The first target was set in 2009 on the use of renewable energy in transport. This has sparked investments in ethanol capacity, mainly by member state-specific introductions of E10. **RED III increased the target to 29% share of renewable energy in transport by 2030**.

**ReFuelEU Aviation** sets a straightforward requirement: **a growing share of fuel supplied at EU airports must be SAF**, including bio-SAF and e-SAF targets. This mandate has provided demand certainty, which – with the inclusion of international aviation in the EU ETS – has triggered **multiple SAF production final investment decisions across Europe**. Some airlines have also introduced SAF surcharges to help offset the green premium.

Lastly, **RED III requires that at least 1% of energy used in the transport sector comes from renewable fuels of non-biological origin (RFNBOs).** This target can be met either through direct use of green hydrogen as a fuel or via the "refinery route". As a result, green hydrogen projects in the EU have accelerated, with some of the most advanced initiatives linked to refining (e.g., Holland Hydrogen I in NL).

[1] Includes HEFA (Hydroprocessed Esters and Fatty Acids), Alcohol-to-Jet, Fischer Tropsch and other. Excludes co-processing and Power-to-Liquid

Source: Eurostat; ePure; US Department of Agriculture EU Biofuels; European Commission; European Union Aviation Safety Agency; Shell; Air Liquide; TotalEnergies; RWE, Neste; Preem; Austrocel; Clariant; Versalis; ST1

# **What** could be a conceptual architecture of demand mandates

# Demand-side mandates should be guided by the principles of scale, effectiveness, feasibility, and competitiveness

**18.** Proposed principles for demand mandate

✓ Examples of when the principle **IS FOLLOWED**

| **Scale** | **Effectiveness** | **Feasibility** | **Competitiveness** |
|---|---|---|---|
| Mandate should target a material share of emissions | Mandate should stimulate actionable demand and supply | Mandate should be implemented and enforced at reasonable cost | Mandate should maintain a level playing field for EU producers |
| | Mandate should have a short implementation time with clear investment horizon towards net zero | | |
| ✓ Applies to products with significant **EU industrial emissions** | ✓ Applies where **consumers cannot bypass** the mandate | ✓ Adds marginal reporting or tracking **costs for companies** relative to mandated demand | ✓ **Importers are held to the same standards** as EU producers |
| ✓ Targets **main sources** of lifecycle emissions within those produces | ✓ Producers are technically and economically **able to scale** supply | ✓ Targets a **manageable number of products and companies** | ✓ Green premiums paid by EU citizens are used on **investments in EU** |

Mandates should be **tailored to specific sectors**, while maintaining maximum practical **cross-sector coherence**. Implementation should be as much as possible at the **EU level.**

Source: Stakeholder interviews; Industry reports; Deloitte synthesis

# The principles help make choices around demand mandate design – in terms of markets and products, mandate holders, metrics, compliance mechanisms and access requirements

**19.** Proposed demand mandate design framework (key choices)

| Design choices | | Potential criteria to design a specific demand mandate | |
|---|---|---|---|
| 1 **MARKETS AND PRODUCTS** | 1.1 | Where **emissions**[1] are the highest | S |
| | 1.2 | Where **products** are relatively **similar**, so mandates do not require many variations | F |
| | | *Preference for products where heavy industry inputs account for large share of emissions and price impact is low* | |
| 2 **MANDATE HOLDERS** | 2.1 | Companies that are **concentrated** (small number accounts for large share of volume) | E |
| | 2.2 | Companies that are **close to end-users** (to avoid circumvention, spread cost) | F |
| 3 **MANDATED METRICS** | 3.1 | Metrics that address **main sources of lifecycle emissions** | S |
| | 3.2 | Metrics that are **measurable** without excessive effort | F |
| | 3.3 | Metrics that are **complementary** to existing policy instruments | E |
| 4 **COMPLIANCE MECHANISMS** | 4.1 | Mechanism that **minimizes burden** on production, supply chains, and enforcement | F |
| | 4.2 | Mechanism that allows businesses to **explain green premium** to consumers | E |
| | 4.3 | Mechanism that most directly **supports sustainable investments** | E |
| 5 **ACCESS AND ORIGIN REQUIREMENTS**<br>Not explored in detail in this report | 5.1 | Stimulate healthy competition, helping **supply** emerge quickly and at acceptable **cost** | E |
| | 5.2 | **Compliance** of import can be **assured** with **acceptable** administrative **burden** | C F |
| | 5.3 | Is **politically, legally and socially acceptable** | F |

Design principles:

- S Scale
- E Effectiveness
- F Feasibility
- C Competitiveness

Heavy industrial materials undergo multiple transformations and are embedded in a many products across complex value chains. Designing demand mandates for these materials requires a series of choices.

The first step is to identify **sufficiently large and homogenous markets and products** in each sector where mandates can be most impactful. These should ideally be markets **where imports are constrained or can be effectively regulated to avoid circumvention.**

Next, it needs to be decided **which actors in the value chain should be mandated.** Ideally, obligations should fall **as close to end-users as possible** to drive demand, while also ensuring that a **relatively small number of companies covers most of the market volume** to minimize administrative burden.

Mandates can be based on various metrics, like emissions, or specific technologies. The chosen **metrics should balance emission impact and feasibility, enabling the EU to fill policy gaps.**

Different mechanisms can be used to ensure mandate compliance. For example, while physical tracking of products offers the highest transparency and might be easier to communicate to consumers, its feasibility is often limited by the complexity and scale of the value chains, especially early in the transition. In such cases, methods such as mass-balance or book-and-claim may be more applicable (explored further in the document).

Finally, mandates may include **provisions on market access** – such as preferential treatment or specific requirements for EU-based producers. These decisions will have implications for alignment with trade rules.

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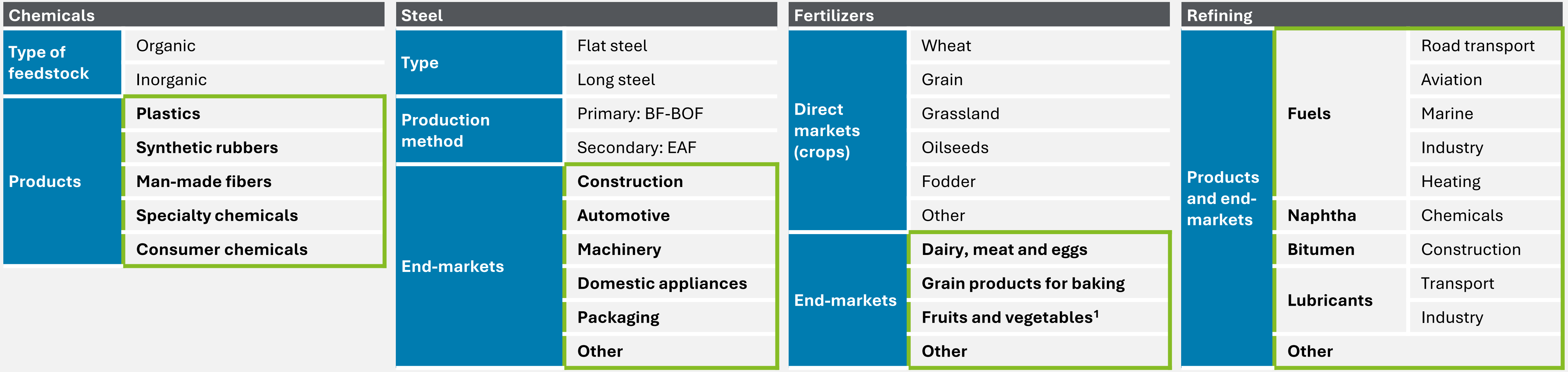
1) Emissions are in most cases a function of volume, except where in different markets different production technologies are used (e.g., scrap steel used more in construction than in automotive)

Source: Stakeholder interviews; Industry reports; Deloitte synthesis

# ① **Markets and products:** First step in mandate design is identifying homogenous end-markets where volumes and emissions are sizeable

**20.** Market and product segmentation in the focus sectors



| **Chemicals** | |
|---|---|
| **Type of feedstock** | Organic |
| | Inorganic |
| **Products** | **Plastics** |
| | **Synthetic rubbers** |
| | **Man-made fibers** |
| | **Specialty chemicals** |
| | **Consumer chemicals** |

| **Steel** | |
|---|---|
| **Type** | Flat steel |
| | Long steel |
| **Production method** | Primary: BF-BOF |
| | Secondary: EAF |
| **End-markets** | **Construction** |
| | **Automotive** |
| | **Machinery** |
| | **Domestic appliances** |
| | **Packaging** |
| | **Other** |

| **Fertilizers** | |
|---|---|
| **Direct markets (crops)** | Wheat |
| | Grain |
| | Grassland |
| | Oilseeds |
| | Fodder |
| | Other |
| **End-markets** | **Dairy, meat and eggs** |
| | **Grain products for baking** |
| | **Fruits and vegetables**[1] |
| | **Other** |

| **Refining** | | |
|---|---|---|
| **Products and end-markets** | **Fuels** | Road transport |
| | | Aviation |
| | | Marine |
| | | Industry |
| | | Heating |
| | **Naphtha** | Chemicals |
| | **Bitumen** | Construction |
| | **Lubricants** | Transport |
| | | Industry |
| | **Other** | |

🟩 **Primary segmentation used in this report** for mandate design

**Potential criteria to select markets and products:**

1.1 Where **emissions** are the highest

1.2 Where products are relatively **homogenous** (similar, share characteristics)

*Preference for products where heavy industry inputs account for large share of emissions and price impact is low*

In most sectors, **markets and products can be segmented in multiple ways** – for example, by feedstock type, production method, or end-use application. These segmentations vary because the **number and nature of transformations from raw materials to final products differ across sectors, and because technologies and feedstocks may have significantly different emissions intensities.**

It is important to understand how volume and emissions flow through each value chain. This enables identification of **high-volume, high-emission, homogenous product groups where a demand mandate could be most effectively applied.**

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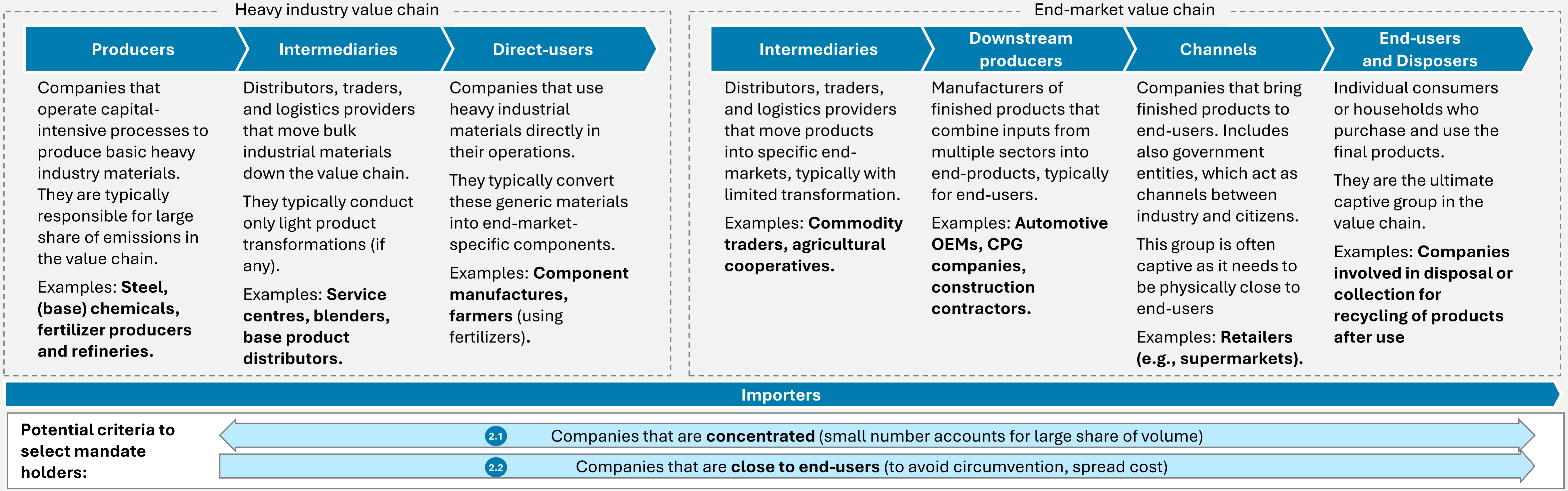
1) Includes among other fruits, permanent crops, potatoes, sugar beets

Source: Industry reports; stakeholder interviews; Deloitte analysis

# ② **Mandate holders:** Mandates should be value-chain specific, placed on companies that are close to end-users and where a small number of them account for a large share of volume

**21.** Generalized heavy industry value chain – SIMPLIFIED



### Heavy industry value chain

**Producers**

Companies that operate capital-intensive processes to produce basic heavy industry materials. They are typically responsible for large share of emissions in the value chain.

Examples: **Steel, (base) chemicals, fertilizer producers and refineries.**

**Intermediaries**

Distributors, traders, and logistics providers that move bulk industrial materials down the value chain.

They typically conduct only light product transformations (if any).

Examples: **Service centres, blenders, base product distributors.**

**Direct-users**

Companies that use heavy industrial materials directly in their operations.

They typically convert these generic materials into end-market-specific components.

Examples: **Component manufactures, farmers** (using fertilizers).

### End-market value chain

**Intermediaries**

Distributors, traders, and logistics providers that move products into specific end-markets, typically with limited transformation.

Examples: **Commodity traders, agricultural cooperatives.**

**Downstream producers**

Manufacturers of finished products that combine inputs from multiple sectors into end-products, typically for end-users.

Examples: **Automotive OEMs, CPG companies, construction contractors.**

**Channels**

Companies that bring finished products to end-users. Includes also government entities, which act as channels between industry and citizens.

This group is often captive as it needs to be physically close to end-users

Examples: **Retailers (e.g., supermarkets).**

**End-users and Disposers**

Individual consumers or households who purchase and use the final products.

They are the ultimate captive group in the value chain.

Examples: **Companies involved in disposal or collection for recycling of products after use**

**Importers**

**Potential criteria to select mandate holders:**

2.1 Companies that are **concentrated** (small number accounts for large share of volume)

2.2 Companies that are **close to end-users** (to avoid circumvention, spread cost)

Value chains vary across end-markets, though some companies - such as retailers – operate across multiple sectors. Mandate holders must therefore be selected for each end-market. To minimize circumvention and spread costs, **mandates should be placed as close to the end-user as possible**. The decision should consider market concentration: mandates are **most effective when applied to actors in concentrated segments, where a few companies control a large share of volume, balancing impact with administrative efficiency**. A mandate could also be beneficial to mandate holders as it could support a level playing field between all mandated companies, and provide clarity and predictability required to make sustainable investments.

Where appropriate, **policymakers may choose to apply mandates to all products sold in the EU**, thereby making all companies of a certain type mandate holders. **However, broad-based enforcement is more challenging – particularly for product attributes that are not visible or easily verifiable.** For instance, it is relatively straightforward to confirm that household goods meets safety standards. In contrast, verifying that those same goods are made with circular plastics – especially when imported – is far more difficult. Therefore, the core premise of the demand mandates approach in this report is that mandates should target specific types of companies, which are responsible for most of the market volume.

Source: Industry reports; stakeholder interviews; Deloitte analysis

# ③ **Mandated metrics:** The chosen metrics should address main sources of emissions, be measurable, and complementary to existing policy instruments

**22.** Main types of mandate metrics – SIMPLIFIED

| Scope<br>Metric | **Production (Scope 1)** | **Feedstock (Scope 3)[1]** |
|---|---|---|
| **Emissions** (solutions-agnostic) | 1. Lifecycle emissions | |
| | 2. Production emissions | Emissions at use (mainly fuels, out of scope) |
| **Specific solutions** | 3. Production technology | 4. Feedstock substitution (or end-of-life method) |

**Potential criteria to select mandated metrics:**

- 3.1 Metrics that address **main sources of lifecycle emissions**
- 3.2 Metrics that are **measurable** without excessive effort
- 3.3 Metrics that are **complementary** to existing policy instruments

**Demand-side mandates would set targets for specific metrics (criteria) at a product-level. Product regulations and standards are therefore a necessary design prerequisite for any demand-side measure. They provide the foundation for setting the level of the mandate.**

The pros and cons of each metric presented here are sector-agnostic, focusing on the trade-off between impact and enforcement cost. However, different metrics are likely to be selected for different end-markets and products.

⊕ **Pros** and ⊖ **cons** of main types of mandate metrics (sector-agnostic)

### 1. Lifecycle emissions

- ⊕ Allows the producers to apply most efficient and mature abatement method (e.g., production vs. feedstock, bio-based vs. recycled)
- ⊖ Might be difficult to enforce - requires harmonized lifecycle emissions accounting, incl. from different ways of disposal to production
- ⊖ Might involve sunk cost (transition, then end-state)

### 2. Production emissions

- ⊕ Allows producers to choose decarbonization technology which best fits their specific context
- ⊕ Relatively easy to enforce - production emissions are assignable to specific assets, and typically already monitored (e.g., for ETS)
- ⊕ Likely lower cost at start as mature technologies can be implemented first
- ⊖ Might involve sunk cost (transition, then end-state)
- ⊖ Targets relatively small part of the emissions in some sectors (especially chemicals and fuels)

### 3. Production technology

- ⊕ Can kick-start otherwise not viable solutions
- ⊕ Supports existing supply-side mandates (e.g., $H_2$)
- ⊕ Creates investment clarity – lowers risk of sunk cost
- ⊕ Helps infrastructure development (e.g., $H_2$ pipelines, CCS pipelines and sinks)
- ⊕ Relatively simple to enforce – does not require emissions accounting, just technology control
- ⊖ May not yield highest emissions reductions per euro spent, as transition solutions are deprioritized
- ⊖ May lead to investing in not the most efficient and mature abatement methods

### 4. Feedstock substitution (or end-of-life method)

- ⊕ Can kick-start otherwise not viable solutions
- ⊕ Easy to specify input standards (e.g., % biogenic carbon, % recycled material)
- ⊕ Targets main emission source of chemicals (i.e., disposal, which is related to feedstock)
- ⊖ May result in investments in "losing" technologies – requires close coordination with other mandates (e.g., SAF) to ensure sufficient feedstock is available
- ⊖ Might be difficult to track feedstock content towards end-product

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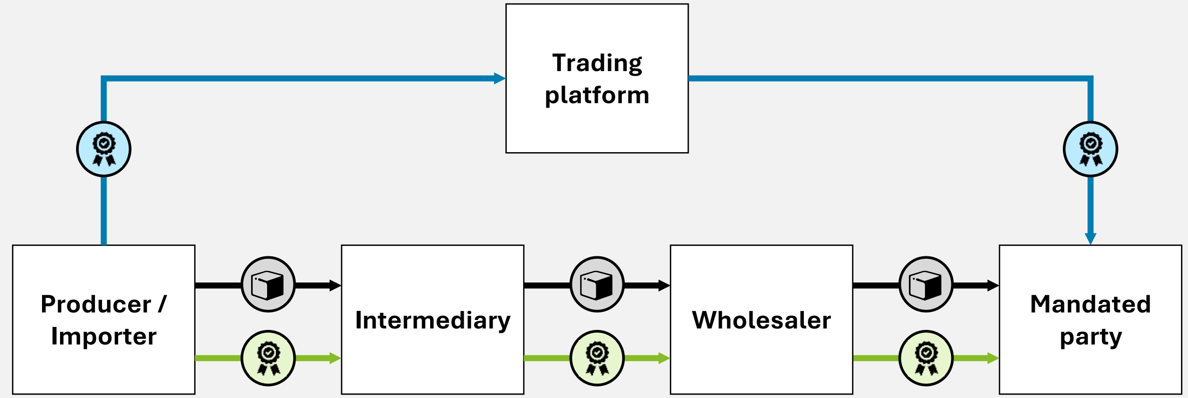
[1] Scope 3 emissions cover all upstream and downstream value chain emissions – not just feedstock. However, for the purpose of designing demand-side mandates, only feedstock emissions are considered. This is because they represent a particularly large share for some heavy industry sectors (notably chemicals) and are the most directly linked to and controllable by producers

Source: Stakeholder interviews; Deloitte analysis

# ④ **Compliance mechanisms:** A mandate would place a requirement near the end-consumer to either use a sustainable component directly or to purchase equivalent certificates

**23.** Typical compliance mechanisms for a demand mandate[1]



Trading platform

Producer / Importer

Intermediary

Wholesaler

Mandated party

→ **Product tracking**

→ Certificate flow: **Mass-Balance**

→ Certificate flow: **Book-and-Claim**

Different mechanisms would likely be used in different end-markets. A combination of mechanisms could also be used, especially for more heterogenous sectors

**Demand mandate would place a sustainability requirement on a specific party in the value chain, typically near the end-consumer.** As noted earlier, the mandate can be based on GHG emissions (e.g., required % reduction versus a reference for a given material), on specific technology (e.g., % of material produced using green $H_2$) or on specific feedstock (e.g., % biobased).

Regardless of the chosen sustainability requirements, the mandates would **require certificates of sustainability to be generated by EU heavy industry producers and importers (when the product first enters the EU).** The exchange of these certificates would be conducted between businesses (B2B).

The type of certificates and their further flow through the value chain would depend on the model used. There are three high-level theoretical models, which could work as follows:

- **Product tracking:** Conventional and sustainable production flows are separated or at least precisely accounted for within one plant. When leaving a production plant, a certain batch of output is certified as sustainable (based on emission intensity or technology), and the rest as conventional. The sustainable batch is certified throughout the value chain until final consumption and retiring of the certificates by the mandated party. Cost may be higher as margins are added across the value chain through bilateral transactions. Especially suited for consumer end-products with little price-elasticity.
- **Mass-Balance:** Each producer (or importer) generates certificates equal to the number of sustainable products made in a period. Each party processing the material into intermediary and end-products reports on how much material complies with the sustainability requirement and certifies it to their customers. Cost of the product at each step is higher by the amount of additional cost of using sustainable technology (assuming no additional margin is added) and to process mass balance certificates.

  The company which holds the mandate to use certain % of sustainable inputs, aggregates the certificates and retires them to fulfil the mandate.
- **Book-and-Claim:** Each producer offers certificates for sale on a trading platform, based on the sustainability characteristics of the products they produced. The cost of the products passing through the value chain remains approximately the same. The holder of the mandate buys certificates corresponding to the amount of sustainable material they are mandated to use (or emission reduction required).

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[1] Simplified schematic, some value chains may require investments by multiple parties in the value chain (e.g., waste separator, pyrolysis oil producer, oil upgrader), which would require additional certificate accounting

Source: Stakeholder interviews; Deloitte analysis

# ④ **Compliance mechanisms:** The choice of compliance mechanism will likely involve trade-offs between burden and level of direct support for sustainable investments

**24.** Comparison of compliance mechanisms

| **Potential criteria to select mechanism:** ↓ | **Product tracking** | | **Mass balance** | | **Book-and-claim** | |
|---|---|---|---|---|---|---|
| | Fully open to imports | EU origin requirement | Fully open to imports | EU origin requirement | Fully open to imports | EU origin requirement |
| 4.1 **Enforcement burden**[1] | 🟥 Requires separate production processes and value chains<br>Extensive burden to control imports | 🟨 Requires separate production processes and value chains<br>Less burden if not needed to control imports | 🟥 🟨 Biofuels scope 3<br>Sustainable and conventional batches need to be accounted for across the value chain. Extensive burden to control imports, except in biofuels (scope 3), where tracking already well established | 🟨 Sustainable and conventional batches need to be accounted for across the value chain<br>Less burden if not needed to control imports | 🟨 Less burden than in other models given no need to track through the value chain, but subject to fraud risks (e.g., GHG certificates in DE through non-existent projects in China) | 🟩 Clear and small set of companies that can generate certificates – easy to control |
| 4.2 **Explanation of green premium** | 🟩 Green premium can be explained as the product itself is more sustainable. Can be supported with product carbon footprint for that specific product. | | 🟨 Green premium can be partially explained as the product is part of a more sustainable batch. Can be supported with product carbon footprint information. | | 🟥 Consumer acceptance may be limited as the claim does not mean the purchased product is more sustainable. | |
| 4.3 **Direct support of investments** | 🟥 Additional margins will likely be added in the value chain, increasing overall green premium. Prices will likely be set in bilateral transactions, possibly less transparent, with less pressure to drive cost down | | 🟨 Some margins might be added along the value chain, increasing green premium | | 🟨 Link to actual emission reduction investments might be hard to establish | 🟩 Direct green premium transfer from end-product to heavy industry producer |
| **Existing examples** | Forest Stewardship Council (100%) | | EU emission standards for cars and vans, RSPO model for palm oils | | Green electricity, biomethane blending obligation, CORSIA – carbon offsets for aviation | |
| **Example claims** | "This product contains 80% zero-emission [material]" | | "This products contributes to 80% emission reduction in production of [material]" | | "By choosing this product, you support up to 80% emissions reduction from production of [material]" | |

**Book-and-claim is likely the most practical mechanism for most applications. However, in some end-products, a more direct physical link to the input material may be preferred, making mass balance or physical tracking appropriate exceptions. A combination of mechanisms could also be used, especially for more heterogenous sectors**

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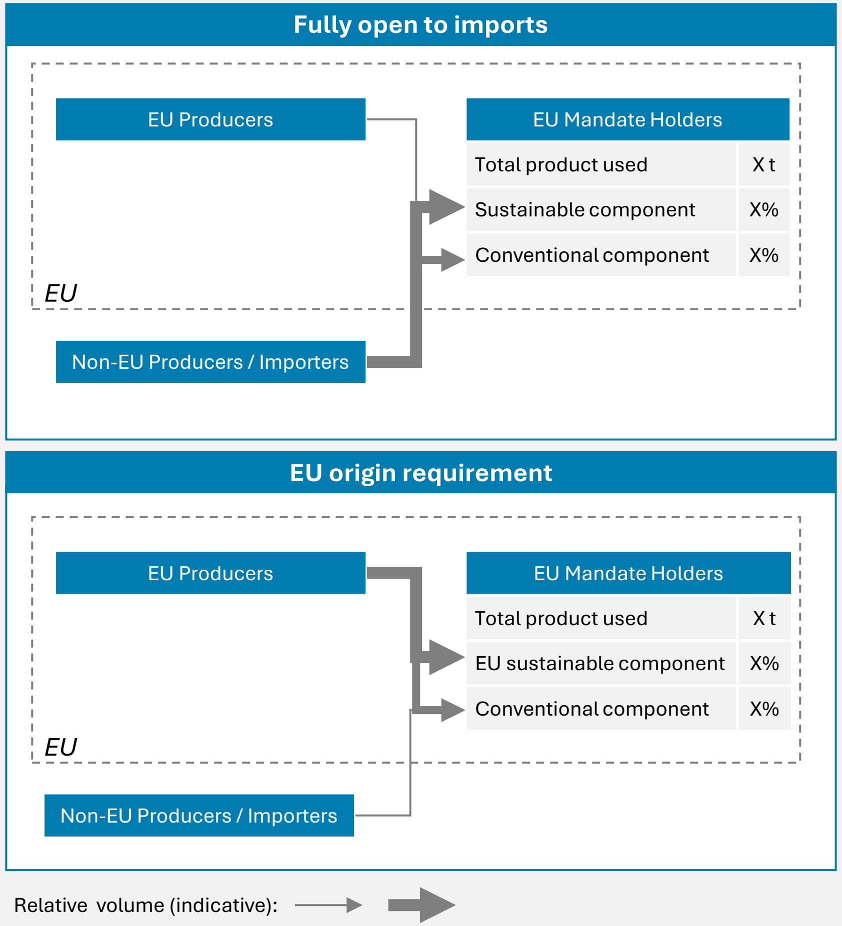
1) Enforcement burden considered higher for "open to all" mechanisms, because it is more difficult to enforce global standards

# ⑤ **Access and origin requirements:** An EU origin requirement could stimulate local investments and lower administrative burden but requires political and legal considerations

**25.** Comparison of access and origin requirements



| **Potential criteria:** | 5.1 **Helping supply emerge at acceptable cost** | 5.2 **Compliance assured with acceptable burden** | 5.3 **Politically, legally and socially acceptable** |
|---|---|---|---|
| **Fully open to imports** | 🟩 More suppliers (EU and non-EU) can participate, enhancing competition, pace of supply and possibly leading to lower prices. | 🟥 Ensuring compliance with sustainability claims requires robust import controls (proven difficult by CBAM), increasing the risk of non-compliant products entering EU. | 🟨 Easier to align with free trade rules.<br>However, "Green premium" would likely flow mainly to non-EU producers, potentially weakening political and social acceptance. |
| **EU origin requirement** | 🟨 Lower competition from outside EU could lead to marginally higher prices. | 🟩 Fewer, mainly EU, producers make verification of sustainability claims significantly simpler and less prone to circumvention, leading to possibly greater environmental benefits. | 🟩 Autonomy, industry, jobs,… Supports EU strategic autonomy, industry, jobs, and technological leadership in green production.<br>🟨 Trade agreements However, may be challenged under free trade agreements – requires legal validation. |

Source: Stakeholder interviews; Deloitte analysis

**When designing demand mandates, policymakers face a key choice: whether to allow global competition or to restrict eligibility to EU-produced goods**. An open to all approach, where both EU and non-EU producers can supply into the mandate, increases market liquidity and may lower costs ("green premium"). However, it brings enforcement challenges, including risks of fraud, and unfair competition from subsidized or less-regulated imports. It may also weaken public support if the transition is seen as benefiting foreign producers at the expense of EU industry.

In contrast, **adding an EU origin requirement narrows the eligible supply base but simplifies oversight.** Monitoring a smaller number of local producers improves the credibility of sustainability claims. This approach also directly supports EU jobs and industrial capacity. However, it may lead to slightly higher prices and could face legal or political challenges, particularly around WTO compliance.

Ultimately, the choice hinges on policy priorities: whether to prioritize open markets and price competitiveness, or to focus on domestic economic benefits and verifiable climate impact.

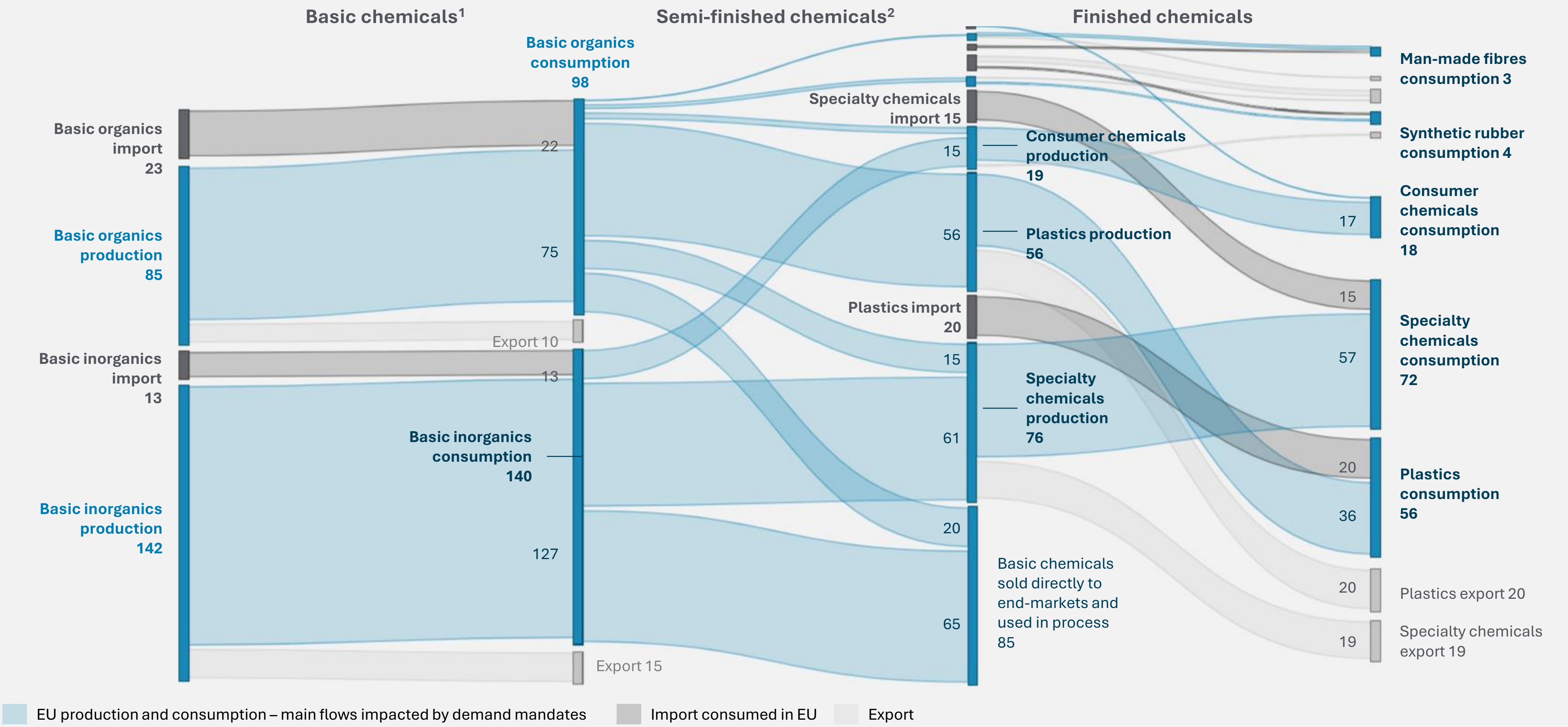
# **How** could the mandates be implemented in the focus sectors

① **Markets and Products**

② **Mandate Holders**

# **Chemicals:** EU production still accounts for most of the region's consumption; specialty chemicals, plastics and consumer chemicals are the largest end-markets

**26.** Chemicals – EU production, consumption and trade flows (Mt, 2023) – INDICATIVE



The chemicals sector is highly complex, involving numerous transformations from basic chemicals to end-use products across diverse markets.

Today, the EU produces most of the basic chemicals used within the EU, though imports remain significant – both in basic chemicals and in (semi-) finished products such as plastics and synthetic rubber.

Specialty chemicals represent the largest end-market of finished chemicals. This segment is highly diverse, serving a wide range of high-value applications including additives, adhesives, dyes, and coatings.

Plastics is the second largest end-market, followed by consumer chemicals.

[1] Organic chemicals are carbon-based chemicals, generally containing hydrocarbons; Inorganic chemicals are not carbon-based, e.g., salts, minerals, metals and alloys; [2] Assumed that consumption of (semi-)finished chemicals are first fulfilled with imports, and then by EU basic chemicals production. Remainder of basic chemicals classified as "Chemicals used within the process, yield loss, other"

Source: Eurostat; Cefic; Petrochemicals Europe

# **Chemicals:** Plastics – especially in packaging, construction and automotive markets seem to be good fits for a demand mandate

**27.** Finished chemicals end-market selection for demand mandate

🟩 Favorable 🟨 Neutral 🟥 Unfavorable ☐ Candidate end-markets for initial demand mandates

| Type | End-market | Example products | Consumption (Mt, 2023) | ⑴.1 Emissions[2] (Mt, 2023) | | ⑴.2 Product similarity (where mandates would not require many variations) | |
|---|---|---|---|---|---|---|---|
| Plastics (56 Mt, 37%) | Packaging | Plastic bottles, food containers,... | 19 | 🟩 | 8 | 🟨 | Diverse products, most volume in food/beverage |
| | Construction | Pipes, insulation, window frames,... | 13 | 🟩 | 6 | 🟩 | Majority in houses and office buildings |
| | Automotive | Bumpers, body panels,... | 5 | 🟨 | 2 | 🟩 | Few types of products (interiors, cables,...) |
| | Electronics | Casings, cable insulation,... | 4 | 🟨 | 2 | 🟥 | Many types of products |
| | Houseware | Kitchen bowls, furniture,... | 3 | 🟥 | 1 | 🟥 | Many types of products |
| | Agriculture | Greenhouse covers, irrigation pipes,... | 2 | 🟥 | 1 | 🟨 | Few types of products (e.g., greenhouses, films) |
| | Other | Medical equipment, textiles,... | 9 | 🟨 | 4 | 🟥 | Many types of products |
| Synthetic rubbers | | Tires, seals, conveyor belts,... | 4 | 🟥 | 1 | 🟨 | Limited products (e.g., tires, gaskets, belts) |
| Man-made fibers | | Protective gear, carpets,... | 3 | 🟥 | 0 | 🟥 | Many types of products |
| Specialty chemicals | | Adhesives, sealants, paints,... | 72 | 🟩 | 10 | 🟥 | Many types of products |
| Consumer chemicals[1] | | Cleaning, personal care,... | 18 | 🟨 | 3 | 🟩 | Majority in cleaning and personal care products |
| **Total sector – EU consumption** | | | 152 | | 37 | | |
| Basic chemicals sold to end-markets and used in process | | | 85 | | 16 | | |
| Exported emissions | | | | | 27 | | |
| **Total sector – EU production** | | | | | 81 | | |

**Packaging, construction, and automotive are the largest end-markets for plastics**, together accounting for 16 Mt of emissions – around 20% of the sector's total.

Given the relatively similar product types in these markets – particularly in automotive and construction – **they appear well-suited for demand-side mandates.**

Specialty chemicals represent another major end-market, responsible for 10 Mt (ca. 12%) of chemicals sector emissions.

However, the product range is highly diverse – spanning adhesives, coatings, pesticides, explosives, and industrial additives – making it significantly harder to design and implement mandates without imposing a substantial administrative burden.

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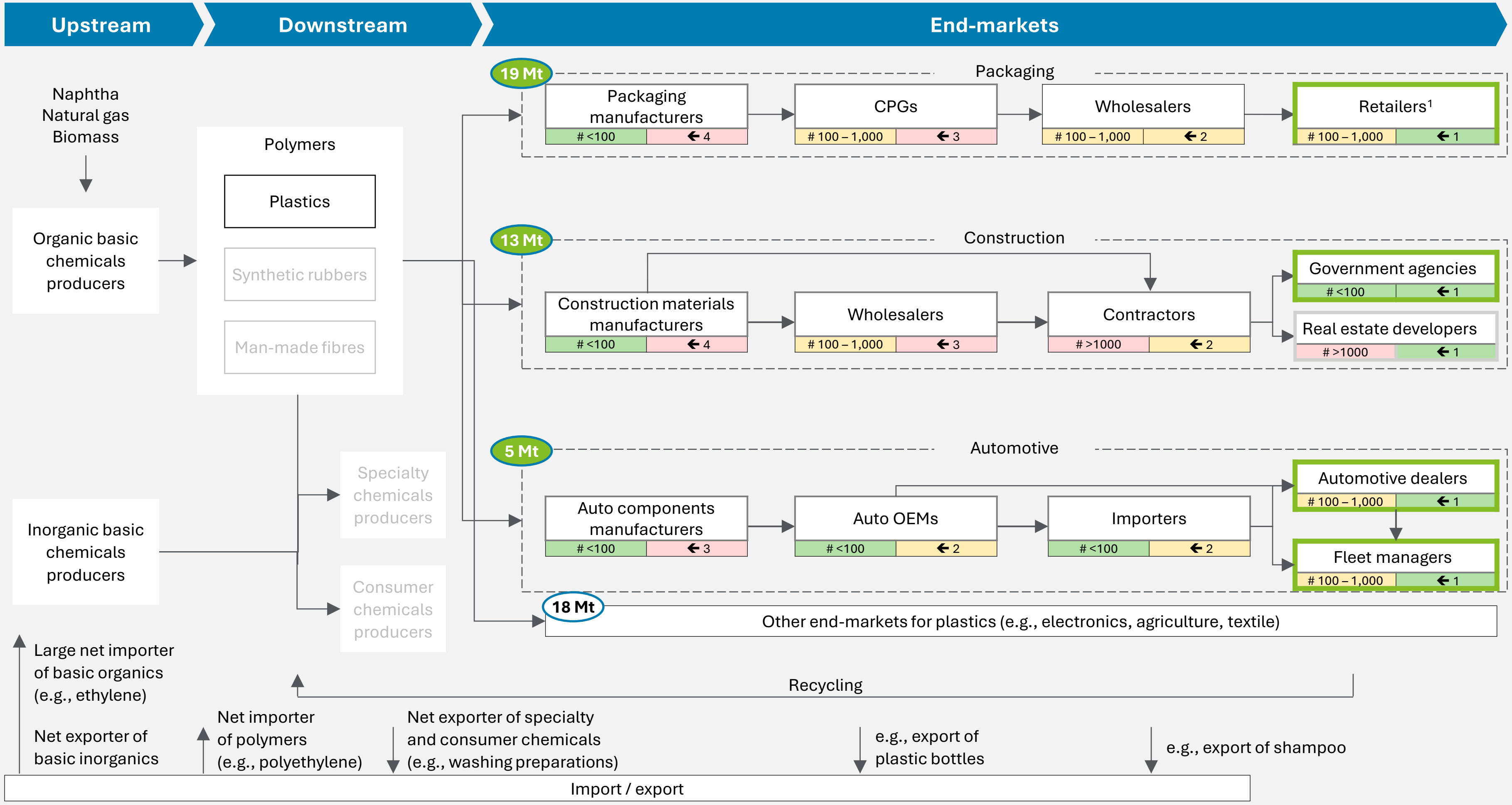
1) Mainly personal care and cleaning; 2) Emissions from EU production that end up in EU consumption are estimated under the assumption that (a) total emissions are split 90-10% between basic organic and basic inorganic chemicals, and (b) flow proportionally to subsequent product types in the value chain as per flows in previous slide

Source: Cefic; Eurostat; Plastics Europe; Stakeholder interviews; Deloitte analysis

# **Chemicals:** Retailers, government agencies, automotive dealers and fleet managers could be potential mandate holders for plastics

**28.** Simplified chemicals value chain for selected end-markets – ILLUSTRATIVE

Σ EU consumption in selected end-markets (2023) 55 Mt



Upstream | Downstream | End-markets

Naphtha
Natural gas
Biomass

Organic basic chemicals producers

Inorganic basic chemicals producers

Polymers: Plastics; Synthetic rubbers; Man-made fibres

Specialty chemicals producers

Consumer chemicals producers

Packaging (19 Mt): Packaging manufacturers (# <100, ← 4) → CPGs (# 100 – 1,000, ← 3) → Wholesalers (# 100 – 1,000, ← 2) → Retailers[1] (# 100 – 1,000, ← 1)

Construction (13 Mt): Construction materials manufacturers (# <100, ← 4) → Wholesalers (# 100 – 1,000, ← 3) → Contractors (# >1000, ← 2) → Government agencies (# <100, ← 1); Real estate developers (# >1000, ← 1)

Automotive (5 Mt): Auto components manufacturers (# <100, ← 3) → Auto OEMs (# <100, ← 2) → Importers (# <100, ← 2) → Automotive dealers (# 100 – 1,000, ← 1); Fleet managers (# 100 – 1,000, ← 1)

18 Mt Other end-markets for plastics (e.g., electronics, agriculture, textile)

Recycling

Large net importer of basic organics (e.g., ethylene)

Net exporter of basic inorganics

Net importer of polymers (e.g., polyethylene)

Net exporter of specialty and consumer chemicals (e.g., washing preparations)

e.g., export of plastic bottles

e.g., export of shampoo

Import / export

**The plastics value chain varies significantly across end-markets** due to the wide range of components and products into which plastics are processed. Often, these components are embedded in larger products – such as vehicles, construction materials – resulting in a complex, multi-tiered value chain. In contrast, plastics used directly, particularly in packaging (e.g., bottles, wraps), follow a simpler value chain.

Across all three end-markets, **several company types operate close to the end user and are physically captive.** These include **retailers** in packaging, **government agencies** in construction, as well as **automotive dealers and fleet managers** in the automotive sector – entities that directly serve consumers and are less mobile, reducing the risk of mandate circumvention. These company groups have also relatively concentrated volumes, which would make enforcement of potential mandates more practical.

Company / organisation type

2.1 # Number of parties making up 50% of volume | ← Distance in value chain to end-user 2.2

🟩🟨🟥 Suitability for mandate holder (positive, neutral, negative)

🟩 Sample potential mandate holders - illustrative

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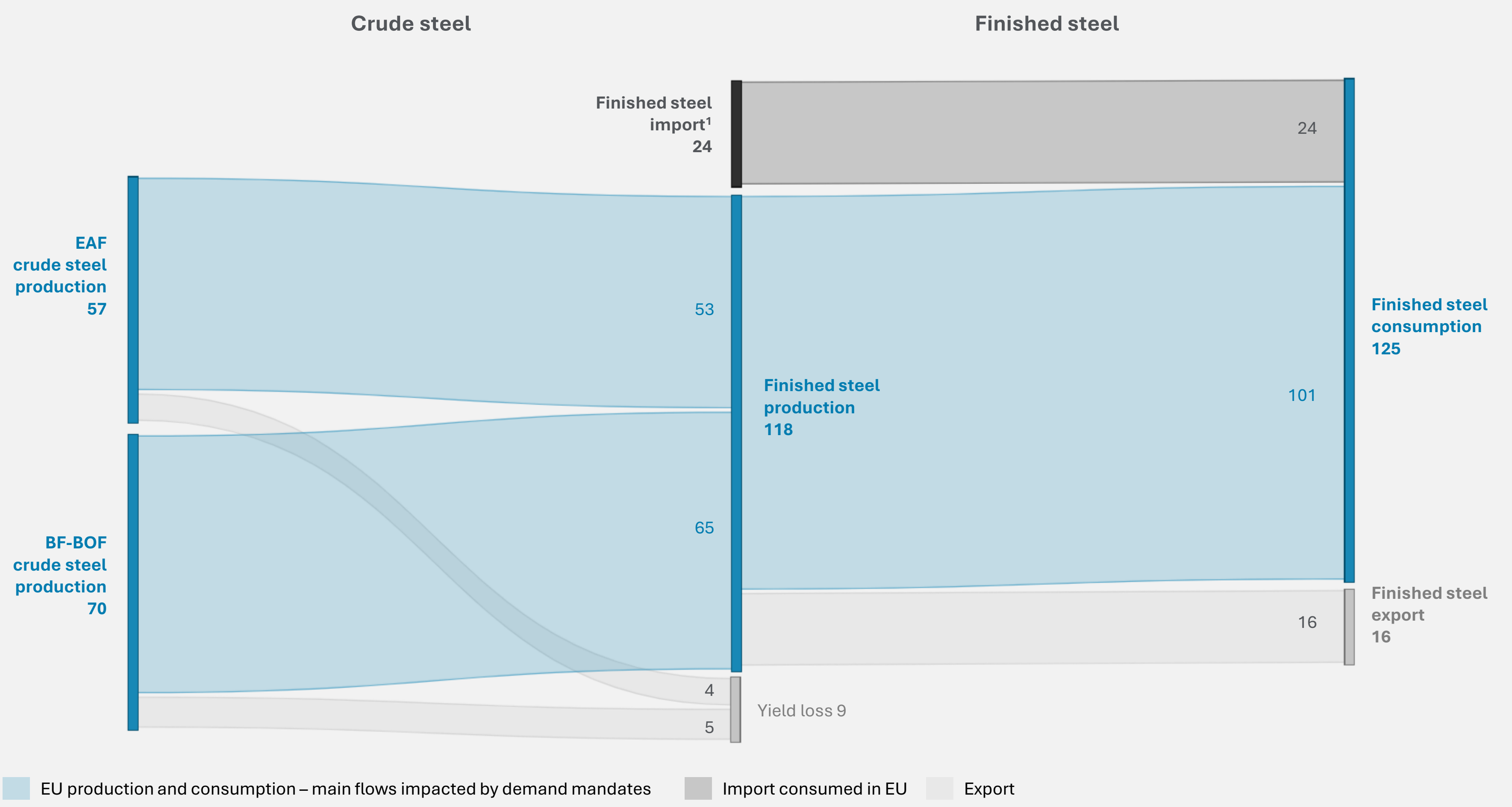
1) Mostly same retailers across packaging and personal care value chains (e.g., supermarkets)

Source: Cefic; Petrochemicals Europe; Plastics Europe; Eurostat; Stakeholder interviews; Deloitte analysis

# **Steel:** Today, more than 80% of steel used in the EU is produced in the EU; imports are kept relatively low due to tariff rate quotas

**29.** Steel – EU production, consumption and trade flows (Mt, 2023) – INDICATIVE



1) Import of finished steel increased from 24% in 2023 to 27% in 2024

Source: Eurofer

Around 55% of crude steel produced in the EU – such as slabs, blooms, and billets – is virgin steel made in coal-based Blast Furnaces and Basic Oxygen Furnaces. This part of the output is also the most emission-intensive. The remaining 45% is produced via Electric Arc Furnaces (EAF), primarily using scrap.

Crude steel is further converted into finished products like hot-rolled and cold-rolled coils, plates, bars, and rebars, which are then used across various sectors after additional processing.

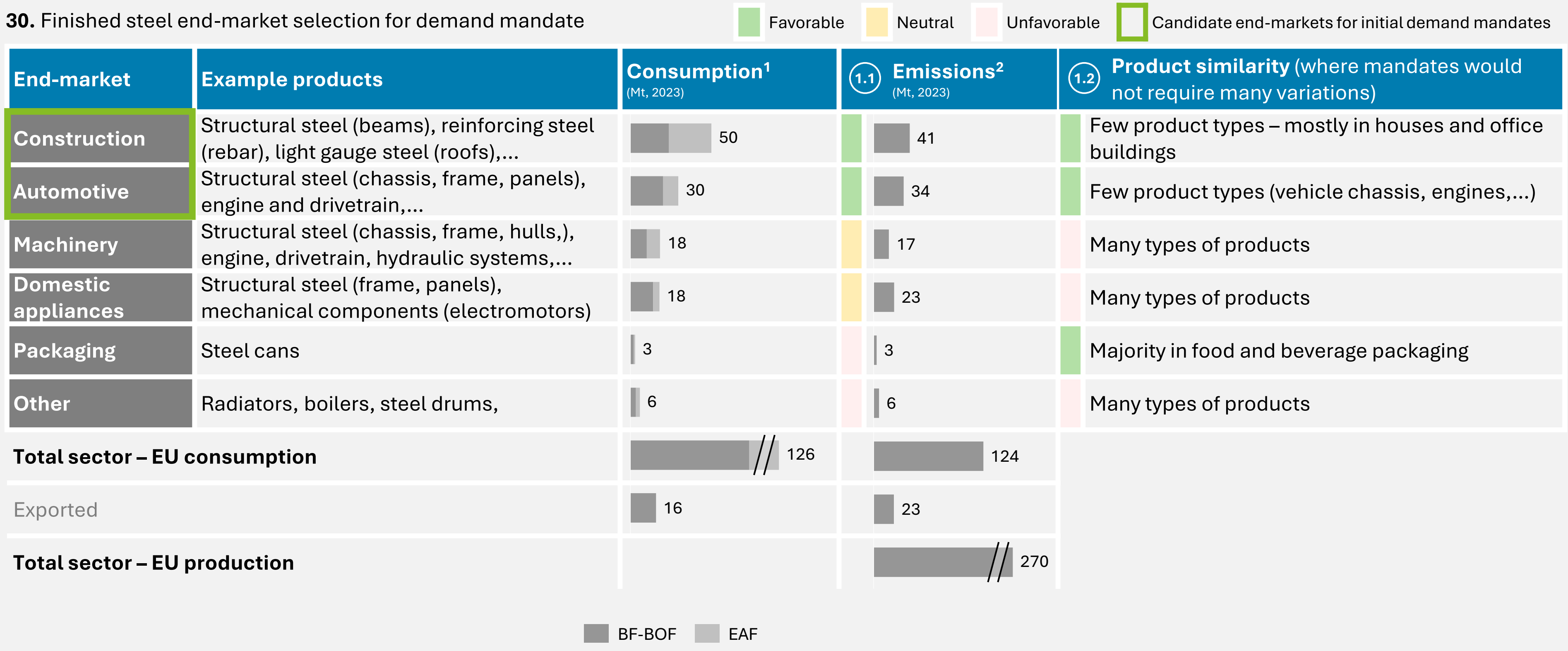
**Roughly 80% of finished steel consumed in the EU is produced domestically. Imports remain relatively limited due to the EU's trade protection measures**, notably a system of Tariff-Rate Quotas (TRQs), which allow a set volume of imports at lower tariffs, with higher duties applied once quotas are exceeded.

These measures help protect domestic producers from market disruptions, particularly in the face of global overcapacity - most notably in countries like China - and reflect the **strategic importance of maintaining domestic steel production.**

In 2025, the EU announced plans to further tighten import protections, including a shift from annual to quarterly TRQs, to guard against import surges potentially redirected from markets like the US, where tariffs are also rising.

# **Steel:** Automotive and construction end-markets seem to be good fits for a demand mandate

**30.** Finished steel end-market selection for demand mandate



🟩 Favorable 🟨 Neutral 🟥 Unfavorable ▢ Candidate end-markets for initial demand mandates

| End-market | Example products | Consumption[1] (Mt, 2023) | (1.1) Emissions[2] (Mt, 2023) | (1.2) Product similarity (where mandates would not require many variations) |
|---|---|---|---|---|
| ▢ **Construction** | Structural steel (beams), reinforcing steel (rebar), light gauge steel (roofs),... | 50 | 🟩 41 | 🟩 Few product types – mostly in houses and office buildings |
| ▢ **Automotive** | Structural steel (chassis, frame, panels), engine and drivetrain,... | 30 | 🟩 34 | 🟩 Few product types (vehicle chassis, engines,...) |
| **Machinery** | Structural steel (chassis, frame, hulls,), engine, drivetrain, hydraulic systems,... | 18 | 🟨 17 | 🟥 Many types of products |
| **Domestic appliances** | Structural steel (frame, panels), mechanical components (electromotors) | 18 | 🟨 23 | 🟥 Many types of products |
| **Packaging** | Steel cans | 3 | 🟥 3 | 🟩 Majority in food and beverage packaging |
| **Other** | Radiators, boilers, steel drums, | 6 | 🟥 6 | 🟥 Many types of products |
| **Total sector – EU consumption** | | 126 | 124 | |
| Exported | | 16 | 23 | |
| **Total sector – EU production** | | | 270 | |

**Construction is the largest steel end-market in the EU by volume.** While a substantial share of the steel used in construction is scrap-based, processed in low-emission EAF facilities, the **volume of virgin steel produced via coal-based BF-BOF route remains high.**

**Automotive**, the second-largest end-market, has a different profile. Due to stringent quality requirements**, virgin steel makes up most steel used in vehicle manufacturing**. As a result, although automotive accounts for 60% of construction's steel volume, it generates over 80% of its emissions.

**Both end-markets are relatively homogenous, with standardized steel products, making them strong candidates for demand-side mandates.**

Other end-markets exhibit much greater product diversity, making them less suitable for demand mandates - at least in the initial phase. However, given their high steel consumption, sectors such as machinery and domestic appliances will also likely need to be addressed at later stages.

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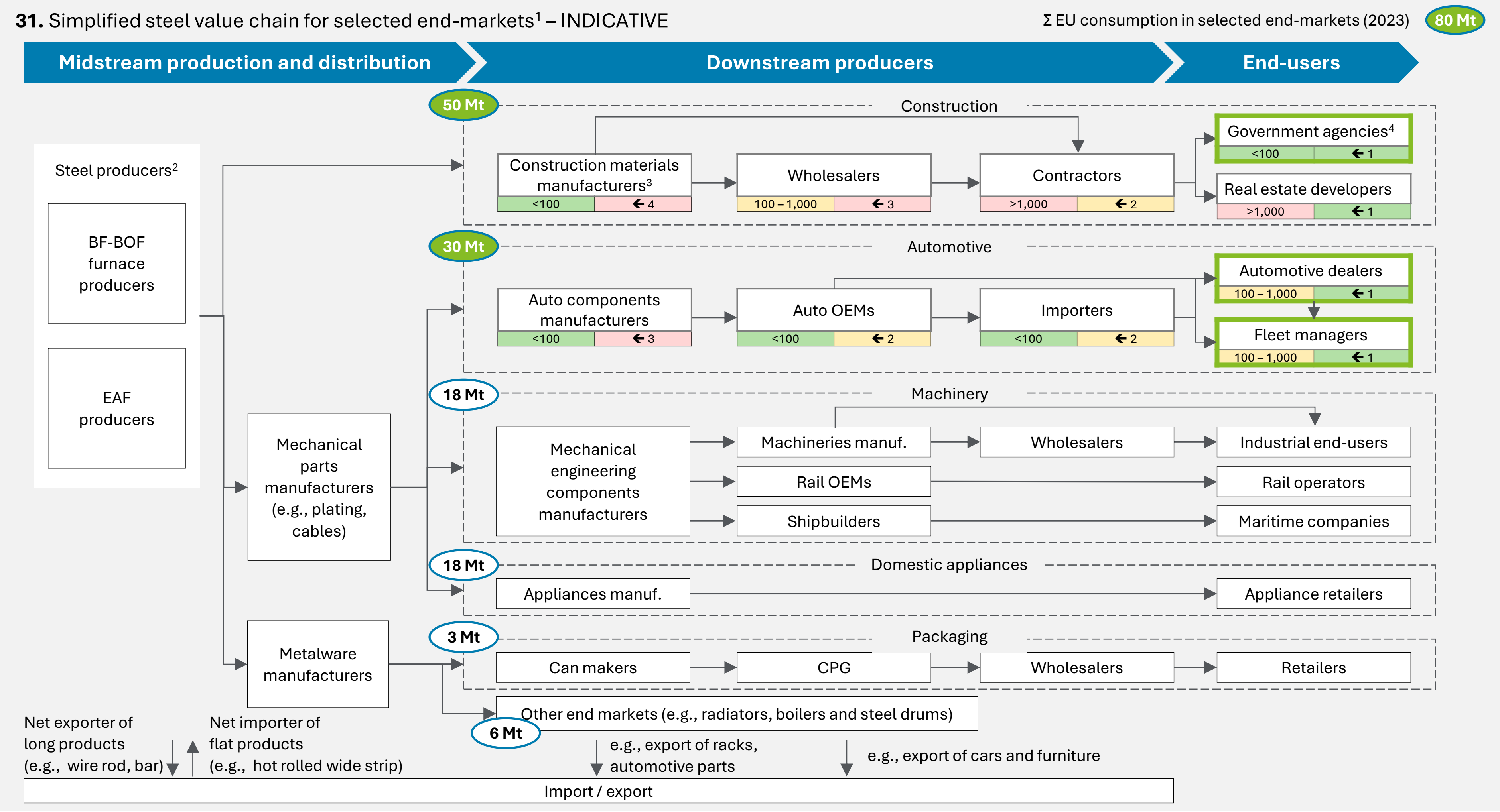
1) Consumption based on end-market specific split flat steel vs. long steel (construction 40-60%, automotive 80-20%, machinery 60-40%, domestic appliances 90-10%, packaging 100-0%) with production routes assumed to be 78% BF-BOF, 22% EAF for flat steel and 20% BF-BOF, 80% EAF; 2) Emissions from EU production for EU consumption estimated with 2.0t $CO_2$e/t for BF-BOF and 0.1t $CO_2$e/t for EAF and scaled from consumption to production volume

Source: Eurofer; Stakeholder interviews; Deloitte analysis

# **Steel:** Government agencies, automotive dealers and fleet managers could be potential mandate holders for construction and automotive

**31.** Simplified steel value chain for selected end-markets[1] – INDICATIVE



Σ EU consumption in selected end-markets (2023) 80 Mt

**Midstream production and distribution** | **Downstream producers** | **End-users**

Steel producers[2]
BF-BOF furnace producers
EAF producers

Mechanical parts manufacturers (e.g., plating, cables)

Metalware manufacturers

50 Mt Construction
Construction materials manufacturers[3] — <100 — ← 4
Wholesalers — 100 – 1,000 — ← 3
Contractors — >1,000 — ← 2
Government agencies[4] — <100 — ← 1
Real estate developers — >1,000 — ← 1

30 Mt Automotive
Auto components manufacturers — <100 — ← 3
Auto OEMs — <100 — ← 2
Importers — <100 — ← 2
Automotive dealers — 100 – 1,000 — ← 1
Fleet managers — 100 – 1,000 — ← 1

18 Mt Machinery
Mechanical engineering components manufacturers
Machineries manuf. → Wholesalers → Industrial end-users
Rail OEMs → Rail operators
Shipbuilders → Maritime companies

18 Mt Domestic appliances
Appliances manuf. → Appliance retailers

3 Mt Packaging
Can makers → CPG → Wholesalers → Retailers

6 Mt Other end markets (e.g., radiators, boilers and steel drums)

Net exporter of long products (e.g., wire rod, bar)

Net importer of flat products (e.g., hot rolled wide strip)

e.g., export of racks, automotive parts

e.g., export of cars and furniture

Import / export

The value chains for construction and automotive steel are largely distinct. Finished steel is converted into sector-specific components – such as beams in construction or engines in automotive.

In construction, the primary direct users of steel are contractors. However, the contractor landscape is highly fragmented, with thousands of firms operating across the EU. In contrast, a significant share of construction projects is commissioned by **government agencies – a relatively small group capable of incorporating sustainability criteria into public tenders.**

In automotive, the risk of imports grows significantly at each step further from the end user, as evidenced by the recent surge in EV imports. This suggests that the **most effective point for a demand mandate is at the end of the value chain, targeting physically captive entities such as automotive dealers and truck fleet managers.**

Company / organisation type
2.1 # Number of parties making up 50% of volume | ← Distance in value chain to end-user 2.2
🟩🟨🟥 Suitability for mandate holder (positive, neutral, negative)
☐ Sample potential mandate holders - illustrative

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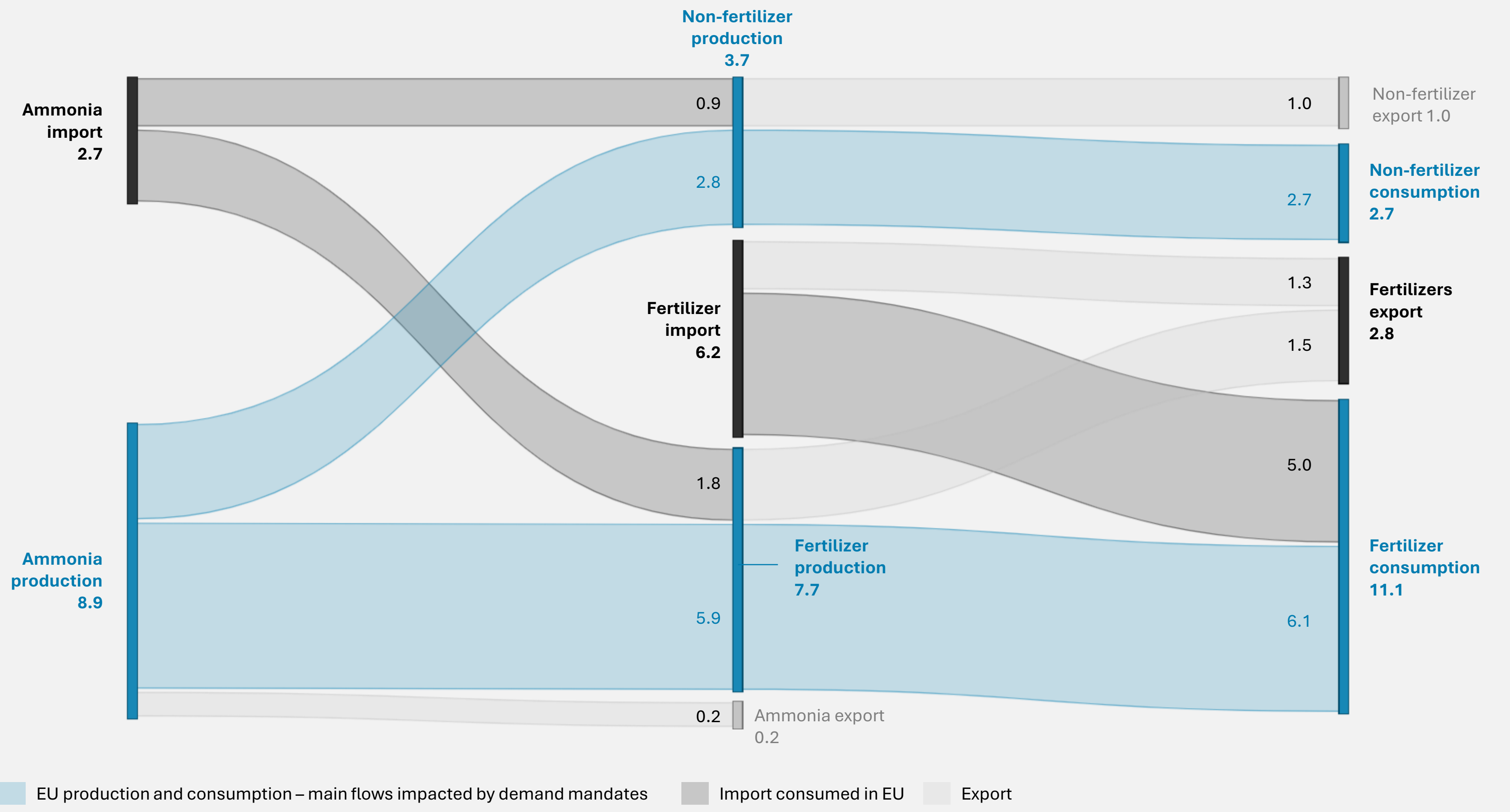
1) All intermediaries and transportation processes are excluded from the value chain, and simplified to focus on large industry-sub industry for steel commodity; 2) In some cases crude steel is directly supplied to large-scale downstream producers with integrated production; 3) Includes tubes consumption sector; 4) Includes national railway companies

Source: Eurofer; Eurostat; Stakeholder interviews; Deloitte analysis

# **Fertilizers:** Ammonia and fertilizers imports account for a substantial share of EU fertilizers consumption

**32.** Fertilizers – EU production, consumption and trade flows (Mt $NH_3$-eq., 2023)[1] – INDICATIVE



Conventional ammonia production relies heavily on natural gas, which is converted into grey hydrogen and then synthesized with nitrogen extracted from the air.

**Historically, the EU produced most of its fertilizers domestically,** leveraging abundant natural gas sourced both locally and through imports.

Following recent sharp increases in gas prices and a decline in domestic gas production (e.g., closing off the Groningen field in the Netherlands), **the EU now depends much more on imports.**

Although the EU consumes approximately 13.8 Mt of ammonia-based products – including fertilizers, as well as industrial and transport applications (e.g., AdBlue diesel additives) – it produces only 8.9 Mt of ammonia domestically.

Imports come both as raw ammonia for further processing and as finished fertilizers.

In the coming years**, international ammonia trade is expected to grow further**, resulting from ammonia's emerging role as an energy carrier and potential future marine fuel. Reflecting this trend, companies in several EU member states have recently invested in expanding ammonia import terminals.

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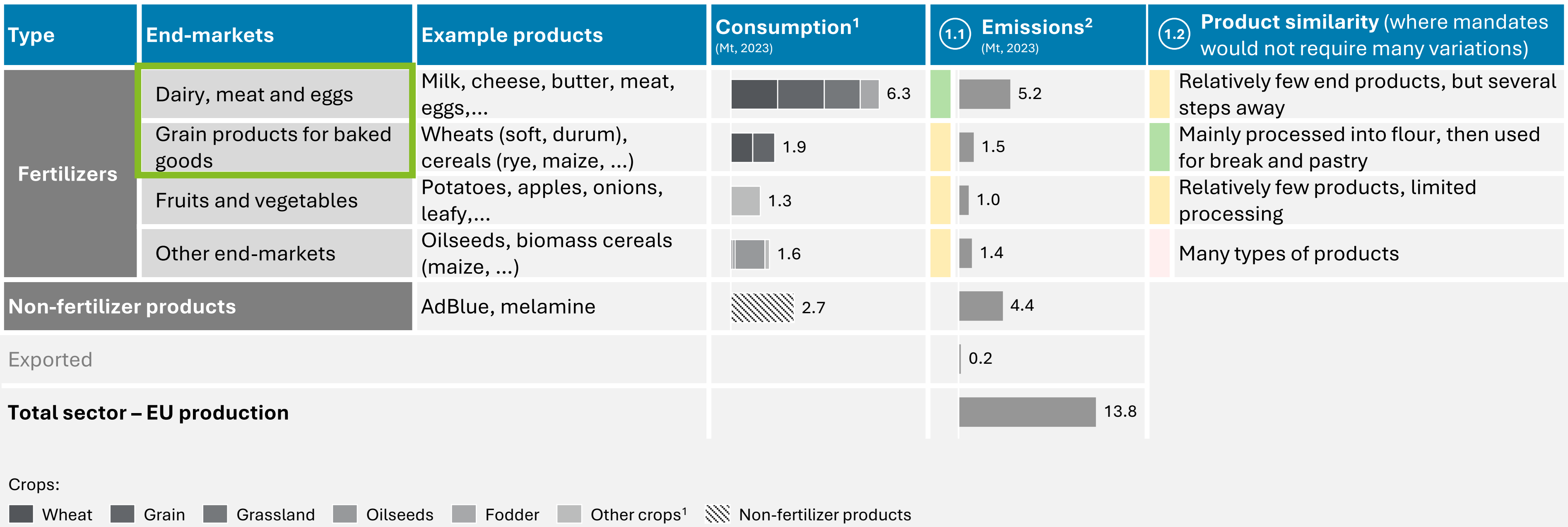
1) Production of fertilizers (7.7 Mt $NH_3$-eq.) calculated through balancing of consumption and trade (11.1 Mt $NH_3$-eq. fertilizer consumer + 2.8 Mt $NH_3$-eq. fertilizer exported – 6.1 Mt $NH_3$-eq.); Production of industrial products assumed to be 33% of total ammonia consumption (3.7Mt $NH_3$-eq. of 11.4 Mt $NH_3$-eq.), of which 73% is consumed within the EU (2.7 Mt $NH_3$-eq.)

Source: Fertilizers Europe; Eurostat

# **Fertilizers:** Dairy, meat and eggs, and grain products for baked goods seem to be end-markets with good fit for a demand mandate

**33.** Fertilizers end-market selection for demand mandate

🟩 Favorable 🟨 Neutral 🟥 Unfavorable ☐ Candidate end-markets for initial demand mandates



| Type | End-markets | Example products | Consumption[1] (Mt, 2023) | 1.1 Emissions[2] (Mt, 2023) | 1.2 Product similarity (where mandates would not require many variations) |
|---|---|---|---|---|---|
| Fertilizers | Dairy, meat and eggs | Milk, cheese, butter, meat, eggs,… | 6.3 | 🟩 5.2 | 🟨 Relatively few end products, but several steps away |
| | Grain products for baked goods | Wheats (soft, durum), cereals (rye, maize, …) | 1.9 | 🟨 1.5 | 🟩 Mainly processed into flour, then used for break and pastry |
| | Fruits and vegetables | Potatoes, apples, onions, leafy,… | 1.3 | 🟨 1.0 | 🟨 Relatively few products, limited processing |
| | Other end-markets | Oilseeds, biomass cereals (maize, …) | 1.6 | 🟨 1.4 | 🟥 Many types of products |
| Non-fertilizer products | | AdBlue, melamine | 2.7 | 4.4 | |
| Exported | | | | 0.2 | |
| **Total sector – EU production** | | | | 13.8 | |

Crops:

Wheat, Grain, Grassland, Oilseeds, Fodder, Other crops[1], Non-fertilizer products

Fertilizers are applied to land in different quantities for different crops. These crops are then used in different end-markets in different quantities[1]

**Crops used as animal feed** – particularly wheat, grains, and grassland – **account for the largest share of fertilizer use in the EU**. As a result, the production of dairy, meat, and eggs is the largest, albeit indirect, end-market for fertilizers. This market remains **relatively homogenous until the final stages of the value chain**, with milk the main ingredient in dairy and beef, pork, and chicken in meat. However, its distance from fertilizer application requires careful consideration in mandate design.

**The second-largest fertilizer end-market are crops used for baked goods, especially wheat.** These products also relatively homogenous up to the processing stage, with flour serving as the primary semi-finished product, used for bread and pastry baking.

**Both end-markets – particularly grains – are exposed to import competition** at different stages, which must be factored into the design of any demand-side measures.

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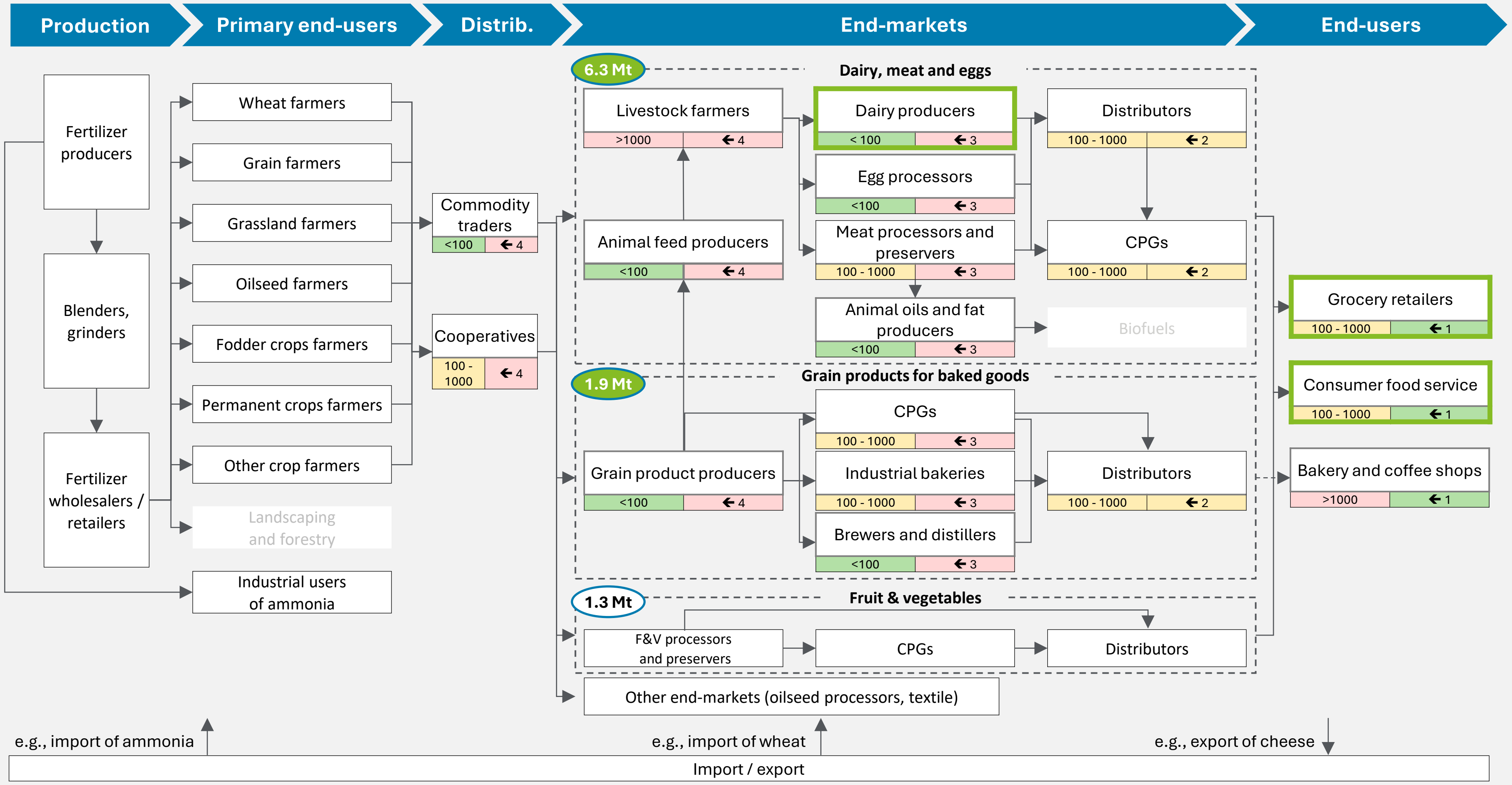
1) Fertilizer consumption by end-market estimated based on total end-market volume, split of crops in each end-market and average fertilizer use per crop: 66% of cereal (wheat and grain, 6 Mt $NH_3$-eq.) consumed by livestock (dairy, meat and eggs end-market), rest assumed part of grain products for baked goods. 100% grassland (1.5 Mt $NH_3$-eq.) and fodder (0.8 Mt $NH_3$-eq.) consumer by livestock (dairy, meat and eggs end-market); oilseeds, biomass cereals and cotton categorized as other end-markets. Rest of crops (permanent crops, potatoes, sugar beets) categorized as fruits and vegetables end-market;
2) Total ammonia production emissions proportionally allocated based on consumption volumes
Source: Eurostat; Fertilizers Europe; Stakeholder interviews; Deloitte analysis

② MANDATE HOLDERS

# **Fertilizers:** Dairy producers, grocery retailers, and food service could be potential mandate holders in the chosen fertilizer end-markets

**34.** Simplified fertilizers value chain for selected end-markets – ILLUSTRATIVE

Σ EU consumption in selected end-markets (2023) 8.2 Mt



Production

Primary end-users

Distrib.

End-markets

End-users

Fertilizer producers

Blenders, grinders

Fertilizer wholesalers / retailers

Wheat farmers

Grain farmers

Grassland farmers

Oilseed farmers

Fodder crops farmers

Permanent crops farmers

Other crop farmers

Landscaping and forestry

Industrial users of ammonia

Commodity traders <100 ← 4

Cooperatives 100 - 1000 ← 4

6.3 Mt Dairy, meat and eggs

Livestock farmers >1000 ← 4

Dairy producers < 100 ← 3

Distributors 100 - 1000 ← 2

Egg processors <100 ← 3

Animal feed producers <100 ← 4

Meat processors and preservers 100 - 1000 ← 3

CPGs 100 - 1000 ← 2

Animal oils and fat producers <100 ← 3

Biofuels

1.9 Mt Grain products for baked goods

CPGs 100 - 1000 ← 3

Grain product producers <100 ← 4

Industrial bakeries 100 - 1000 ← 3

Distributors 100 - 1000 ← 2

Brewers and distillers <100 ← 3

1.3 Mt Fruit & vegetables

F&V processors and preservers

CPGs

Distributors

Other end-markets (oilseed processors, textile)

Grocery retailers 100 - 1000 ← 1

Consumer food service 100 - 1000 ← 1

Bakery and coffee shops >1000 ← 1

e.g., import of ammonia

e.g., import of wheat

e.g., export of cheese

Import / export

The fertilizer value chain forms the basis of food production. Farmers apply fertilizers to grow crops, which are then processed into food, animal feed, or other products such as seed oils and textiles.

**Grocery retailers and food service providers are strong candidates for demand mandates** due to their proximity to end users – making them physically captive – and their relative market concentration.

For dairy, which accounts for a significant share of fertilizer use, **mandates could potentially also be placed on dairy producers**. Although they are further removed from the consumer, dairy producers are still physically captive due to strict food standards and the high cost of transport relative to product value. As volume aggregators earlier in the value chain, targeting them could also reduce the administrative burden of mandate enforcement.

Company / organisation type

2.1 # Number of parties making up 50% of volume

← Distance in value chain to end-user 2.2

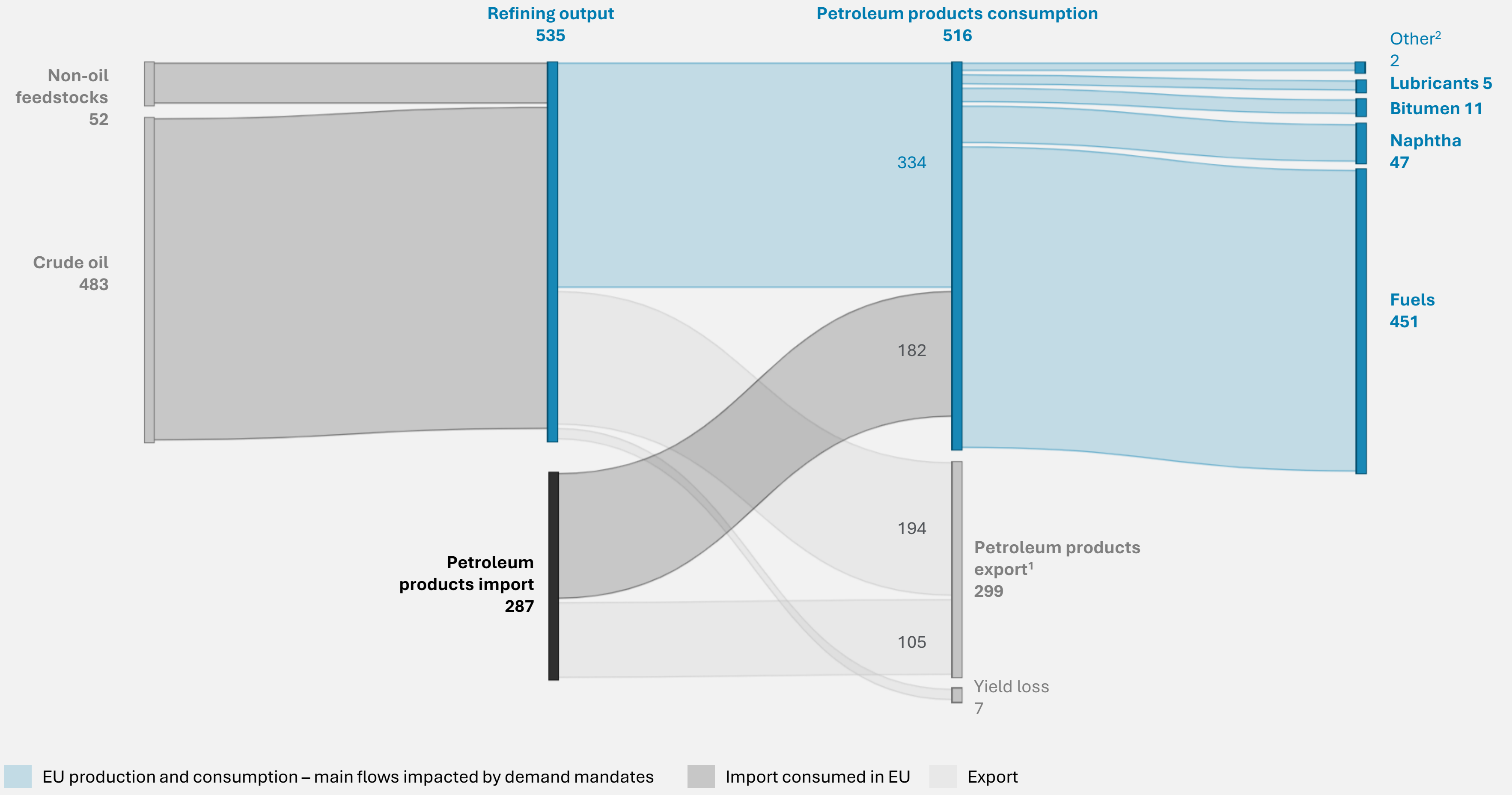
🟩🟨🟥 Suitability for mandate holder (positive, neutral, negative)

🟩 Sample potential mandate holders - illustrative

Source: Fertilizer Europe; Eurostat; Stakeholder interviews; Deloitte analysis

# **Refining:** EU maintains a positive trade balance in petroleum products with extensive international trade; fuels account for majority of consumption

**35.** Refining – EU production, consumption and trade flows (Mt, 2023) – INDICATIVE



**The EU maintains a positive trade balance in refining output**, with domestic production exceeding total EU consumption of petroleum products. However, due to differing consumption patterns – such as limited diesel use in the U.S. – **the EU still engages in significant two-way trade of refined products.**

**Fuels are by far the largest end-market for refineries.** While overall fuel demand is expected to decline over the coming decades, **some consumption will likely persist well into the 2040s and likely beyond**, particularly for aviation fuels (kerosene) and marine fuels.

**Naphtha, the second-largest refinery product, will likely remain in demand as long as the chemical industry continues to operate within the EU**. Assuming successful policy interventions – including demand mandates – support viability of domestic chemical production, naphtha consumption will likely persist for the foreseeable future.

**Other refinery products, such as lubricants and bitumen, will likely continue to be consumed for the foreseeable future**. Most types of machinery require lubricants, and infrastructure projects – such as road and roof construction – will likely continue to depend on bitumen.

1) Export assumed to come proportionally from import and production; 2) 'Other' includes other oil products N.E.C., white spirit and special boiling point industrial spirits, and paraffin waxes.
Source: Eurostat (Supply, transformation and consumption of oil and petroleum products); Deloitte analysis

# **Refining:** Transport fuels – being the largest refining end-market, with few types of products – seems to be a good fit for a demand mandate

**36.** Finished petroleum product end-market selection for demand mandate

🟩 Favorable 🟨 Neutral 🟥 Unfavorable

| Type | End-market | Example products | Consumption[1] (Mt, 2023) | (1.1) | Emissions[2] (Mt, 2023) | (1.2) | **Product similarity** (where mandates would not require many variations) |
|---|---|---|---|---|---|---|---|
| Fuels | **Transport** | Petrol (cars), kerosene (planes), fuel oil (ships) | 341 | 🟩 | 38 | 🟩 | Few types of fuels (e.g., gasoline, diesel, kerosene, HFO) with renewable versions already available (e.g., HVO, SAF) |
| | **Industry** | Diesel, petrol for machines | 67 | 🟨 | 8 | | |
| | **Heating** | LPG, kerosene | 43 | 🟨 | 5 | | |
| Naphtha | Basic organic chemicals | Plastics (PP, PE) | 47 | | 5 | | Covered in chemicals section |
| Bitumen | **Construction** | Asphalt, roofing | 11 | 🟥 | 2 | 🟩 | All bitumen products in asphalt and roofing |
| Lubricants | **Transport** | Engine oil | 3 | 🟥 | <1 | 🟨 | Few types of products (e.g., engine oils, industrial lubes ) |
| | **Industry** | Bearing lubricants | 2 | 🟥 | <1 | | |
| Other | | Special industrial spirits, paraffin wax | 2 | 🟥 | <1 | 🟥 | Many types of products |
| **Total sector – EU consumption** | | | 516 | | 58 | | |
| Exported and loss | | | 200[3] | | 35 | | |
| **Total sector – EU production** | | | | | 93 | | |

Candidate end-markets for initial demand mandates

Potential candidate end-markets for second stage of demand mandates (considering long-term consumption patterns)

Transport fuels are by far the largest end-market for refining. Any policy intervention targeting refineries must take this into account. These fuel products are also relatively homogenous, making demand mandates easier to implement and enforce with minimal administrative burden.

Given these characteristics, **transport fuels are strong candidates for demand mandates** – particularly in the initial phase.

However, **as fuel demand declines in the coming decades, alternative approaches will be needed.** These should consider that certain refinery outputs – such as lubricants and bitumen – will likely remain essential to the EU economy.

Despite their smaller volumes, these products may also warrant inclusion in demand mandates to help maintain sufficient domestic refining capacity.

1) Consumption per end market is mapped following 'Supply, transformation and consumption of oil and petroleum products'. Agriculture and construction are added to Transport end-market for fuels. Heating end-market includes households and commercial/public services; 2) Emission factor across petroleum products: 0.17 t $CO_2$ / t petroleum product; 3) Does not add up (compared vs. previous slide) due to rounding effect

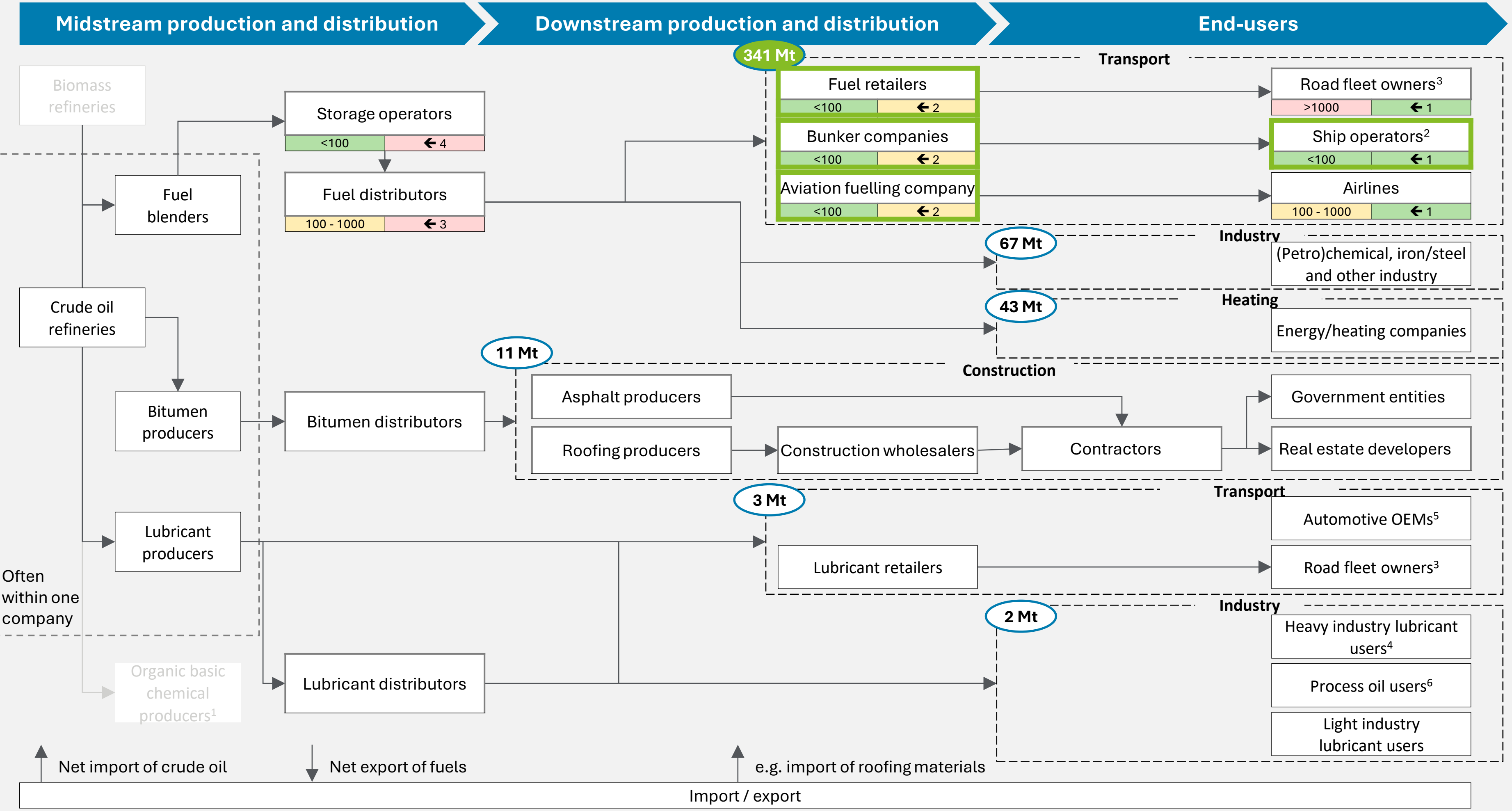
Source: Eurostat (Supply, transformation and consumption of oil and petroleum products); Stakeholder interviews; Deloitte analysis

② MANDATE HOLDERS

# **Refining:** Fuel retailers, bunker companies, aviation fuelling companies and ship operators, could be potential mandate holders in the chosen refining end-markets

**37.** Simplified refining value chain for selected end-markets – ILLUSTRATIVE

Σ EU consumption in selected end-markets (2023) 341 Mt



Midstream production and distribution

Downstream production and distribution

End-users

Biomass refineries

Storage operators

<100 | ← 4

Fuel blenders

Fuel distributors

100 - 1000 | ← 3

Crude oil refineries

Bitumen producers

Bitumen distributors

Lubricant producers

Lubricant distributors

Organic basic chemical producers[1]

Often within one company

341 Mt

Transport

Fuel retailers

<100 | ← 2

Bunker companies

<100 | ← 2

Aviation fuelling company

<100 | ← 2

Road fleet owners[3]

>1000 | ← 1

Ship operators[2]

<100 | ← 1

Airlines

100 - 1000 | ← 1

67 Mt

Industry

(Petro)chemical, iron/steel and other industry

43 Mt

Heating

Energy/heating companies

11 Mt

Construction

Asphalt producers

Roofing producers

Construction wholesalers

Contractors

Government entities

Real estate developers

3 Mt

Transport

Automotive OEMs[5]

Lubricant retailers

Road fleet owners[3]

2 Mt

Industry

Heavy industry lubricant users[4]

Process oil users[6]

Light industry lubricant users

Net import of crude oil

Net export of fuels

e.g. import of roofing materials

Import / export

Most refinery products are distributed by **vertically integrated companies that operate refineries and downstream activities**. Fuel retailers and bunkering companies are physically captive and highly concentrated, making them **strong candidates to hold demand mandates.** In some countries (e.g., Netherlands, Germany) these companies already hold emission reduction mandates (although excluding refining) as part of RED II/III.

**In road transport, end-users cannot bypass these retailers**, as vehicles must be fuelled in proximity of operations.

**In aviation, existing regulations require airlines to refuel within the EU** for part of their journey, reinforcing compliance.

**Shipping**, however, presents a different challenge. Ship operators are not required to bunker in the EU and can easily avoid mandates by refuelling in lower-cost locations. In this case, it may be **more effective to place the demand mandate directly on the ship operators themselves.**

Company / organisation type

2.1 # Number of parties making up 50% of volume | ← Distance in value chain to end-user 2.2

🟩🟨🟥 Suitability for mandate holder (positive, neutral, negative)

🟩 Sample potential mandate holders - illustrative

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1) Covered in chemicals value chain, includes naphtha and paraffins; 2) Global ship operators are subject to extra-EU regulation; 3) Commercial fleets and car lease companies; 4) Iron and steel production industry, general manufacturing, power sector; 5) E.g., first-fill. Automotive manufacturers include automotive component manufacturers; 6) Transformers, data centres, metalworking companies, life sciences

Source: Eurostat; FuelsEurope; International Air Transport Association; Stakeholder interviews; Deloitte analysis

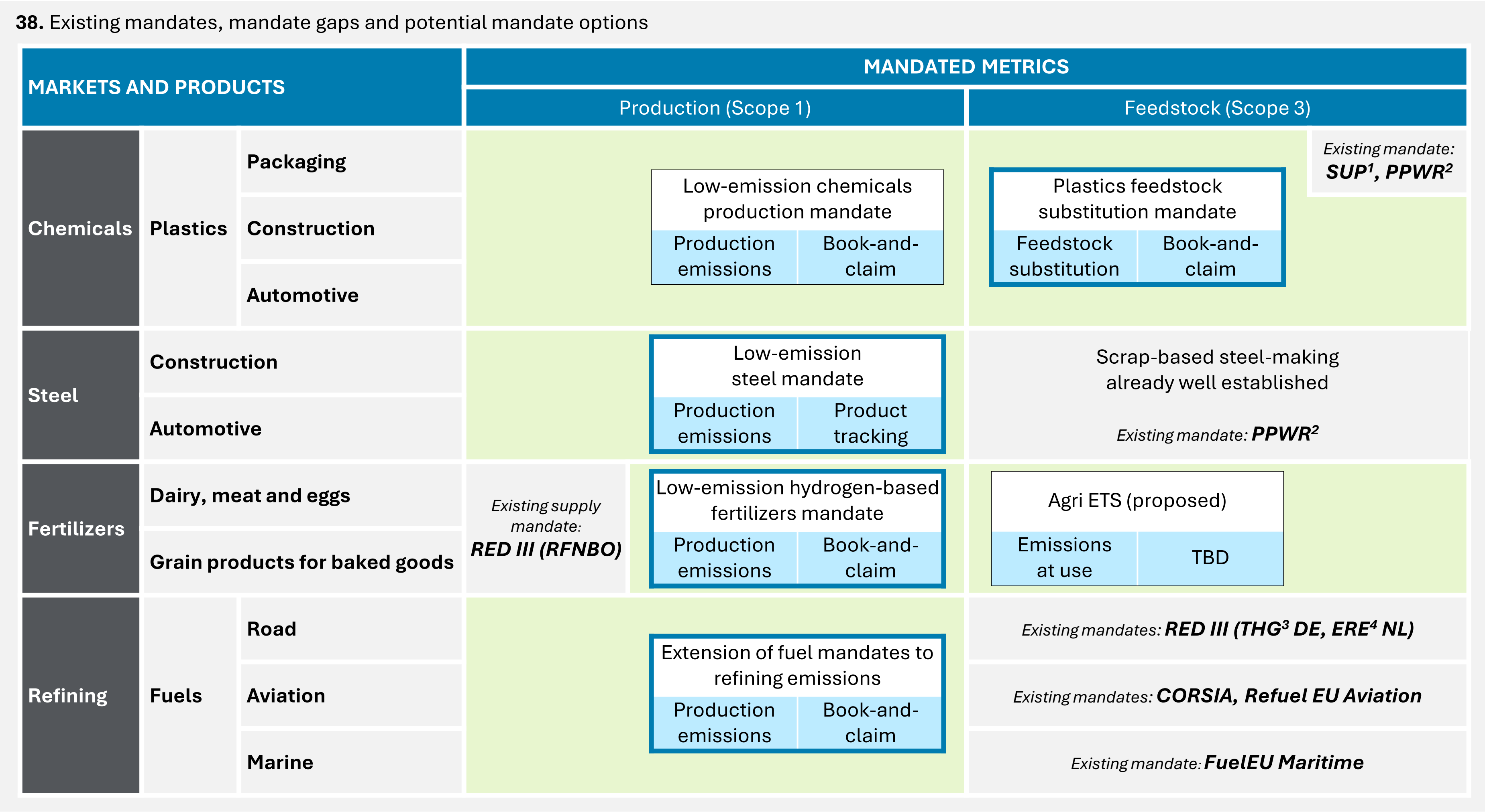
# **How** could the mandates be implemented in the focus sectors

③ **Mandated metrics**

④ **Compliance mechanisms**

# Six potential high-priority mandates emerge across the focus sectors, targeting both emissions and specific feedstock

**38.** Existing mandates, mandate gaps and potential mandate options



| MARKETS AND PRODUCTS | | | MANDATED METRICS | |
|---|---|---|---|---|
| | | | Production (Scope 1) | Feedstock (Scope 3) |
| Chemicals | Plastics | Packaging | Low-emission chemicals production mandate<br>Production emissions<br>Book-and-claim | Plastics feedstock substitution mandate<br>Feedstock substitution<br>Book-and-claim<br>*Existing mandate:* ***SUP[1], PPWR[2]*** |
| | | Construction | | |
| | | Automotive | | |
| Steel | Construction | | Low-emission steel mandate<br>Production emissions<br>Product tracking | Scrap-based steel-making already well established<br>*Existing mandate:* ***PPWR[2]*** |
| | Automotive | | | |
| Fertilizers | Dairy, meat and eggs | | *Existing supply mandate:* ***RED III (RFNBO)***<br>Low-emission hydrogen-based fertilizers mandate<br>Production emissions<br>Book-and-claim | Agri ETS (proposed)<br>Emissions at use<br>TBD |
| | Grain products for baked goods | | | |
| Refining | Fuels | Road | Extension of fuel mandates to refining emissions<br>Production emissions<br>Book-and-claim | *Existing mandates:* ***RED III (THG[3] DE, ERE[4] NL)*** |
| | | Aviation | | *Existing mandates:* ***CORSIA, Refuel EU Aviation*** |
| | | Marine | | *Existing mandate:* ***FuelEU Maritime*** |

**Based on existing mandates in key end-markets and the main sources of emissions, six potential new demand mandates emerge**, including one (AgriETS) already proposed by the EU. These include both emissions-based and specific feedstock mandates, depending on sector characteristics – such as availability of a mature emissions-reduction technology.

Most sector stakeholders strongly prefer book-and-claim compliance mechanisms, with the exception of steel, where product-level tracking using existing systems has been identified as a potential option.

**The mandates outlined here are preliminary concepts that will require further refinement, validation, and elaboration as policy design advances.**

Potential mandate

③ Mandated metric | Compliance mechanism ④

⬜ Existing mandates

🟩 Mandate gaps

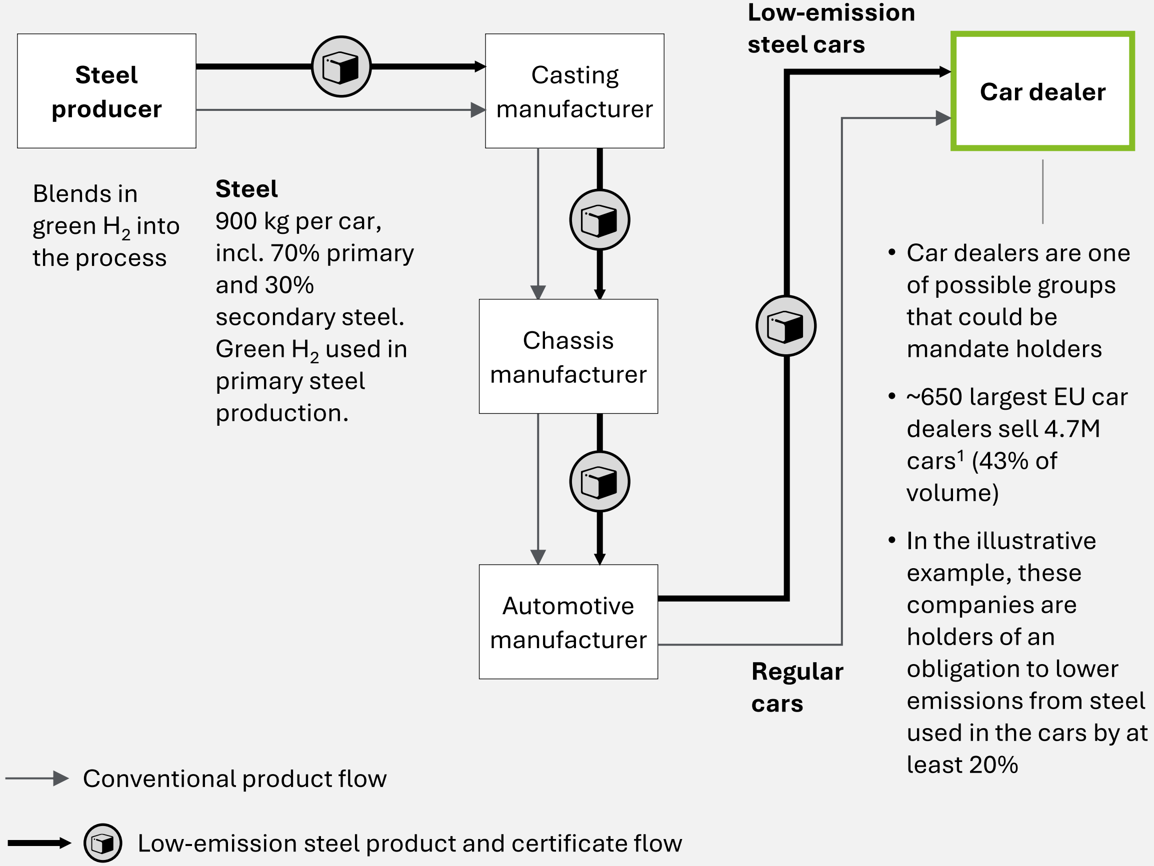
🟦 Examples shown on the following pages

1) SUP = Single Use Plastic; 2) PPWR = Packaging and Packaging Waste Regulation; 3) THG = Treibhausgasminderungs-Zertifikate; 4) ERE = Emissiereductie eenheden

Source: Stakeholder interviews; Deloitte analysis

# Example: **Steel** production emissions mandate in automotive, using product tracking

**39.** Possible mandate mechanics - ILLUSTRATIVE



**Steel producer**

Casting manufacturer

Chassis manufacturer

Automotive manufacturer

**Low-emission steel cars**

**Regular cars**

**Car dealer**

Blends in green $H_2$ into the process

**Steel**
900 kg per car, incl. 70% primary and 30% secondary steel. Green $H_2$ used in primary steel production.

- Car dealers are one of possible groups that could be mandate holders
- ~650 largest EU car dealers sell 4.7M cars[1] (43% of volume)
- In the illustrative example, these companies are holders of an obligation to lower emissions from steel used in the cars by at least 20%

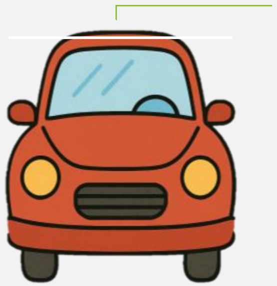
→ Conventional product flow

→ Low-emission steel product and certificate flow

**40.** Mandate holder perspective - INDICATIVE

| | | Value |
|---|---|---|
| **Cars sold by ~650 largest dealers** | | 4.7 M |
| **Required steel[2]** | | 4.3 Mt |
| **CO$_2$ from steel production** (CO$_2$e) | **As-Is[3]** | 6.1 Mt |
| | **Mandate** | Minus 20% |
| | **To-Be** | 4.9 Mt |
| | **Potential reduction** | **1.2 Mt** |

**41.** Cost components of a regular car[4]



**0.9%** Steel (900 kg per car)
+0.3% if 20% low-emission steel is used (fulfilled via DRI-EAF-$H_2$ in this example)

**In the steel sector, a production emissions–based mandate could be considered for the automotive market, with physical tracking as the compliance mechanism.** Existing tracking of plant-level emissions and production technologies could make it feasible to track batches through the value chain, which would enable claims such as specific vehicles being manufactured with low-emission steel.

**Large automotive dealers could potentially serve as mandate holders**, given their control over a large part of sales volumes and their proximity to end customers – making them potentially more captive than automotive producers.

**An emissions-based mandate offers flexibility in the choice of decarbonization pathway**. For instance, while green hydrogen–based steel remains more expensive than carbon capture solutions today, the mandate would accommodate both approaches.

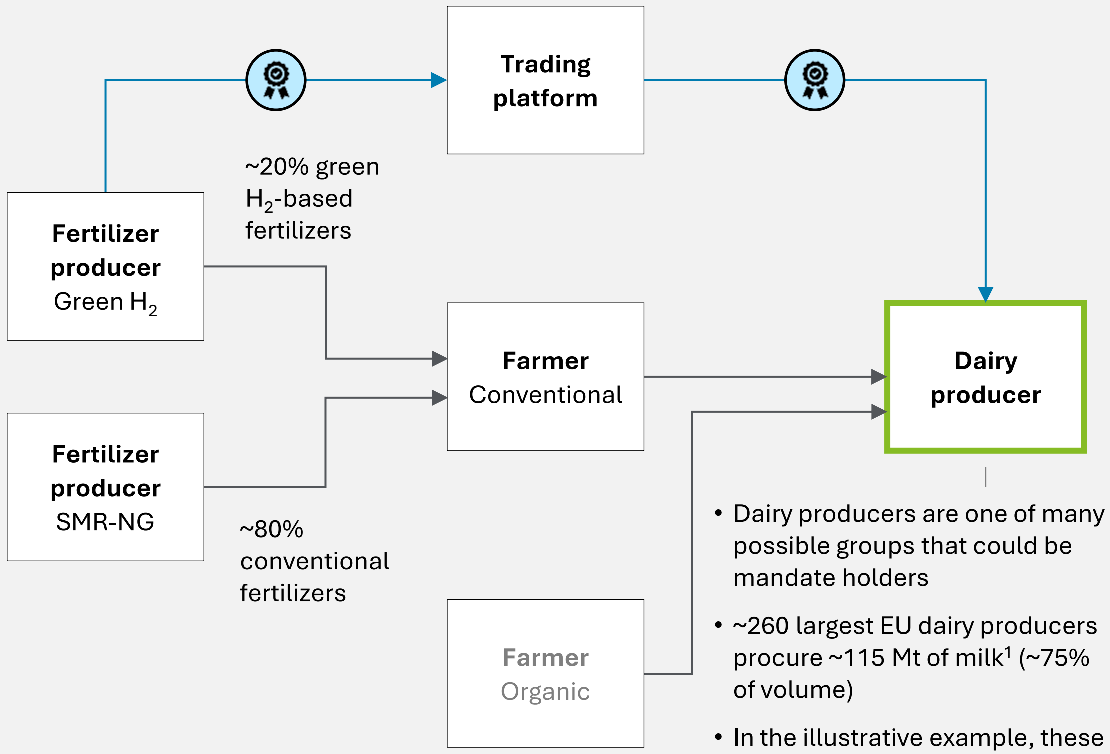
**Currently, steel represents less than 1% of a car's total cost.** A mandate requiring 20% low-emission steel would raise that share to approximately 1.2%, adding estimated ~€115 to the price of a €44,000 car[5].

1) 10.9M cars assumed to be sold by EU car dealers in 2023 (12.2M EU produced – 1.3M net export); concentration estimated based on Eurostat data - 650 companies with >250 employees accounting for 43% of revenue, assumed indicative for volume; 2) Assuming 900 kg steel per car; 3) 70% of steel in cars produced via BF-BOF with emissions of 2.0t CO$_2$e / t steel and 30% via EAF with emissions of 0.10t CO$_2$e / t steel; 4) Volkswagen Passat with retail price of €44k, estimated weight of 1,500 kg of which 900 kg steel; 5) Numbers do not reconcile due to rounding

Source: Eurostat; European Automobile Manufacturers' Association

# Example: **Fertilizer** production emissions mandate in animal feed, using book-and-claim

**42.** Possible mandate mechanics - ILLUSTRATIVE



**Fertilizer producer** Green $H_2$

**Fertilizer producer** SMR-NG

~20% green $H_2$-based fertilizers

~80% conventional fertilizers

**Trading platform**

**Farmer** Conventional

**Farmer** Organic

**Dairy producer**

- Dairy producers are one of many possible groups that could be mandate holders
- ~260 largest EU dairy producers procure ~115 Mt of milk[1] (~75% of volume)
- In the illustrative example, these companies are holders of an obligation to lower emissions from fertilizers used in milk production by at least 20%

→ Product flow

→ Certificate flow (book-and-claim)

**43.** Mandate holder perspective - INDICATIVE

| | | Value |
|---|---|---|
| **Milk procured ~260 largest producers** | | 116 Mt |
| **Fertilizer used[2]** ($NH_3e$) | | 658 kt |
| **$CO_2$ from fertilizer production** ($CO_2e$) | **As-Is[3]** | 1.1 Mt |
| | **Mandate** | Minus 20% |
| | **To-Be** | 0.9 Mt |
| | **Potential reduction** | **0.2 Mt** |

**44.** Cost components of 1 litre of milk

**0.3%** Fertilizer (6 g per litre)
+0.2% if 20% green $H_2$-based fertilizer is used

**8%** Rent, machinery,...

**18%** Labor, contractors,...

**21%** Feed, livestock,...

**52%** Distribution, marketing, margin,...

**In the fertilizers sector, a production emissions–based mandate could be considered for the animal feed market, with book-and-claim as the compliance mechanism.**

**Large dairy producers could potentially serve as mandate holders**. The mandate would require proven emissions reductions from fertilizers used in feed production for dairy cows, based on the volume of milk procured.

Mandate holders **could also meet requirements by sourcing milk from certified organic farms**, assuming their fertilizer use is typically lower – thereby reducing their mandate obligation.

Given concerns about deforestation resulting from production of animal feed – which are considered difficult to address in relation to imported products - the **book-and-claim model would likely only be applicable if it was combined with an EU origin requirement.**

**Currently, fertilizers represent on average ~0.3% of milk's total cost.** A mandate requiring 20% low-emission fertilizer would raise that share to approximately 0.5%, adding less than 1 eurocent to the price of a €1.05 pack of milk (1 liter).

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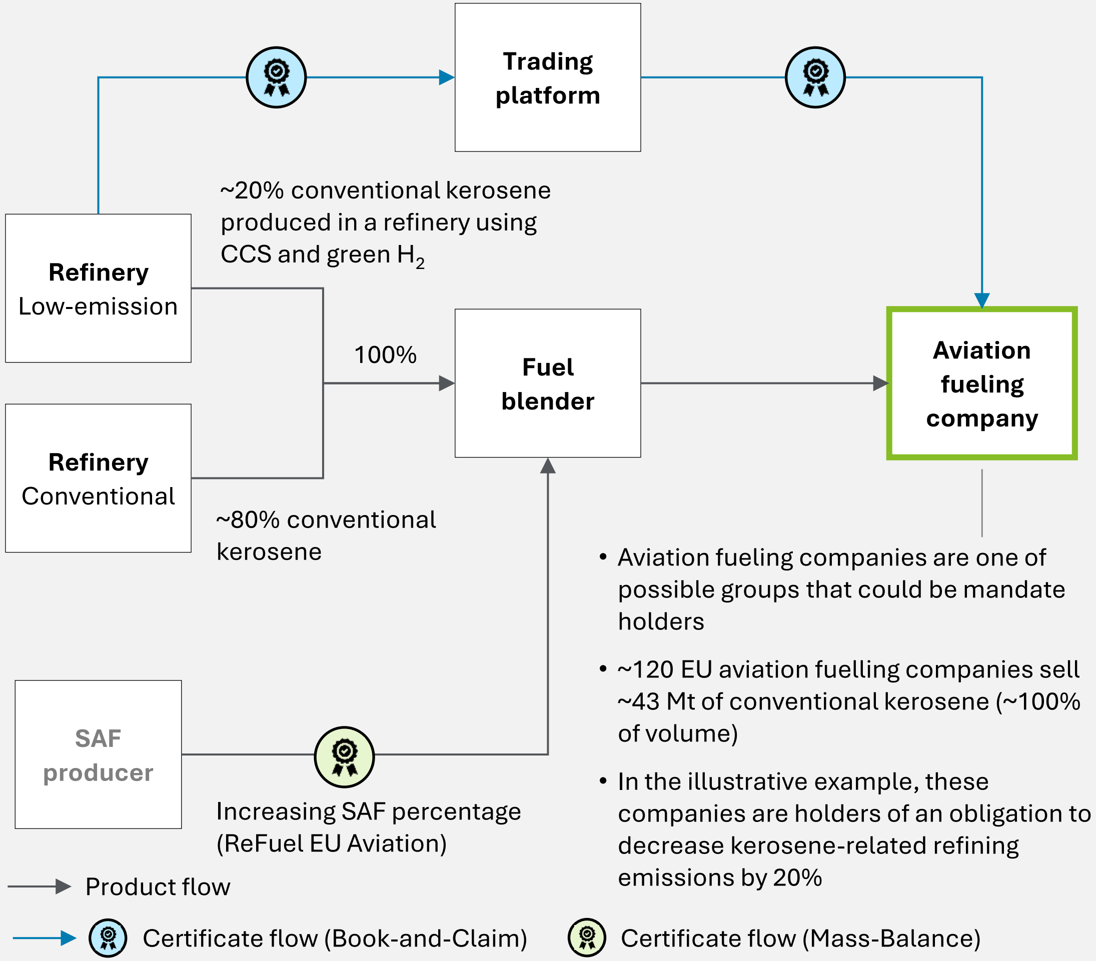
1) Concentration estimated based on Eurostat data - 260 dairy companies with >250 employees accounting for 75% of revenue, assumed to be indicative for volume; 2) 6 g $NH_3$/litre; 3) Assumed emissions of 10 g $CO_2e$ per litre based on 6 g $NH_3$/litre, 1.035 kg/litre and 1.72t $CO_2e$ / t $NH_3$ for SMR-NG
Source: Eurostat; European Milk Board

# Example: **Refining** production emissions mandate in aviation, using book-and-claim

**45.** Possible mandate mechanics - ILLUSTRATIVE



**Trading platform**

**Refinery** Low-emission

~20% conventional kerosene produced in a refinery using CCS and green $H_2$

100%

**Fuel blender**

**Aviation fueling company**

**Refinery** Conventional

~80% conventional kerosene

**SAF producer**

Increasing SAF percentage (ReFuel EU Aviation)

- Aviation fueling companies are one of possible groups that could be mandate holders
- ~120 EU aviation fuelling companies sell ~43 Mt of conventional kerosene (~100% of volume)
- In the illustrative example, these companies are holders of an obligation to decrease kerosene-related refining emissions by 20%

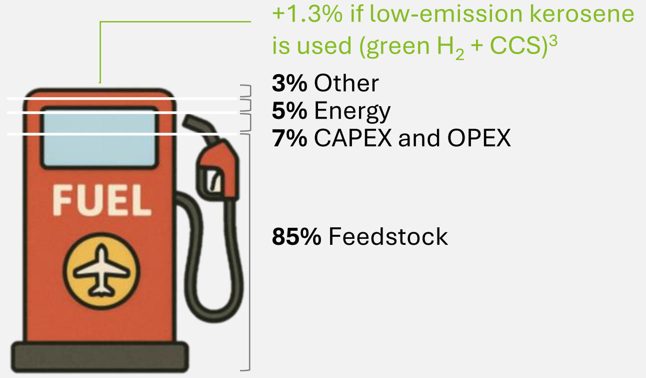
→ Product flow

→ Certificate flow (Book-and-Claim)   Certificate flow (Mass-Balance)

**46.** Mandate holder perspective - INDICATIVE

| | | Value |
|---|---|---|
| **Conventional kerosene sold**[1] | | 43 Mt |
| **$CO_2$ from kerosene production** ($CO_2e$) | **As-Is**[2] | 7.2 Mt |
| | **Mandate** | Minus 20% |
| | **To-Be** | 5.8 Mt |
| | **Potential reduction** | **1.4 Mt** |

**47.** Cost components of kerosene (2030)



+1.3% if low-emission kerosene is used (green $H_2$ + CCS)[3]

**3%** Other

**5%** Energy

**7%** CAPEX and OPEX

**85%** Feedstock

**In refining, a production emissions–based mandate could be considered for the aviation market** (representing 10-15% of typical refinery output)**, with book-and-claim as the compliance mechanism.**

While increasing share of SAF is the main decarbonization route for aviation, conventional kerosene is expected to remain in use for decades. Therefore, reducing emissions from conventional kerosene production remains important.

**Aviation fueling companies could potentially serve as mandate holders**, as almost all aviation fueling in EU is conducted by around 120 companies (which are already identified in the SAF mandates). These companies would be required to purchase certificates proving a certain emission reduction in production of kerosene sold. Alternatively, they could further increase the share of SAF in the blend beyond what is already mandated.

This mandate could potentially be widened to other refining products (e.g., maritime), with likely different mandate holders, to further incentivize investments.

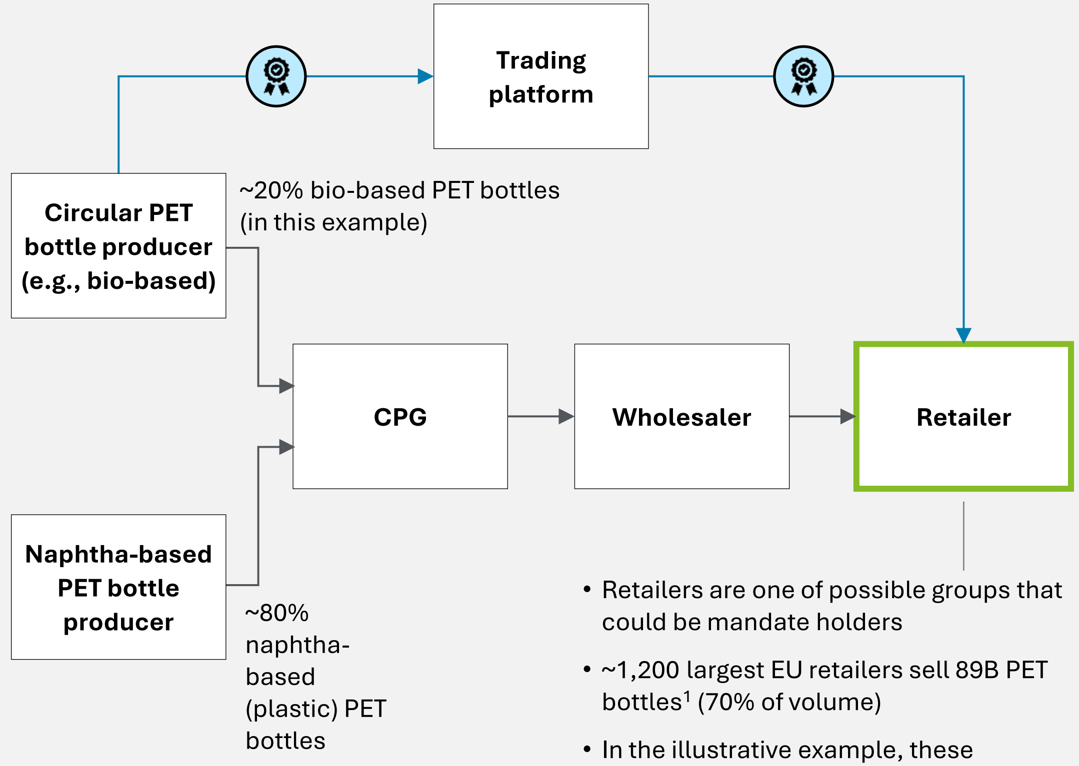
**A mandate requiring a 20% reduction of kerosene-related refining emissions would increase the price of kerosene by approximately 1.3%**, adding approximately 1 eurocent to the price of ~€0.8/kg.

1) Total (conventional) kerosine sold is equal to 46 million x 94% (as 6% is SAF), mandate covers all aviation fuelling companies; 2) Emissions of 0.17 t $CO_2$ / t conventional kerosene; 3) Assumed 6% SAF, and 94% conventional kerosene (of which 20% produced in a refinery using CCS and green $H_2$)

Source: Eurocontrol; European Commission; Eurostat; Vitol; Alternative Fuels Observatory; Deloitte analysis

# Example: **Chemicals** feedstock substitution mandate in plastics, using book-and-claim

**48.** Possible mandate mechanics - ILLUSTRATIVE



**Trading platform**

**Circular PET bottle producer (e.g., bio-based)**

~20% bio-based PET bottles (in this example)

**CPG**

**Wholesaler**

**Retailer**

**Naphtha-based PET bottle producer**

~80% naphtha-based (plastic) PET bottles

- Retailers are one of possible groups that could be mandate holders
- ~1,200 largest EU retailers sell 89B PET bottles[1] (70% of volume)
- In the illustrative example, these companies are holders of an obligation to use bottles with at least 20% of feedstock that is bio-based or comes from other forms of chemical recycling

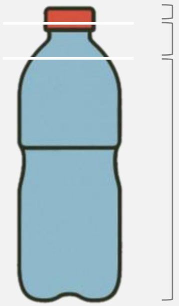
→ Product flow

→ 🏅 Certificate flow (Book-and-Claim)

**49.** Mandate holder perspective - INDICATIVE

| | | Value |
|---|---|---|
| **PET bottles sold by 1,200 largest retailers** | | 89 B |
| **PET content of the bottles sold**[2] | | 2,213 kt |
| **Mandate** (bio-based/recycled) | | Minimum 20% |
| **Mandated volume** | | 443 kt |
| **Lifecycle $CO_2$ from PET**[3] ($CO_2e$) | **As-Is** | 5.1 Mt |
| | **To-Be** | 4.2 Mt |
| | **Potential reduction** | **0.9 Mt** |

**50.** Cost components of PET bottle filled with carbonated soft drink[4]



**5%** Other production

**10%** Materials

+0.2% if 20% bio-based plastic is used (in this example)

**85%** Distribution, marketing, margin,...

**In the chemicals sector, a feedstock mandate could be considered for the plastics packaging market, with book-and-claim as the compliance mechanism.**

**PET bottles** continue to generate significant volumes of plastic waste in the EU. Although recycling rates are improving, large quantities of post-consumer plastics are still landfilled or incinerated.

**Large retailers (e.g., supermarkets) could potentially serve as mandate holders**, as ~1,200 companies are responsible for over >70% of EU sales of PET bottles.

In the example, the retailers would need to purchase and retire certificates representing a given share of the bottles they place on the markets. The certificates would be generated by circular bottle producers – using feedstock that is bio-based or from other forms of chemical recycling.

**The mandate would create a demand signal** for producers of circular plastics.

**Currently, plastic represent on average ~1.6% of a bottle of soft drink's total cost.** A mandate requiring 20% bio-based/recycled plastic would raise that share to approximately 1.8%, adding less than 1 eurocent to the price of a €2.39 bottle of carbonated soft drink.

1) Concentration estimated based on Eurostat data with 1,231 retailers with >250 employees accounting for 71% of revenue, assumed to be indicative for volume; 2) 25 g plastic per bottle; 3) Emissions of 2.3t $CO_2e$ / t plastic for naphtha-based and 0.2t $CO_2e$ / t plastic for bio-based / recycled production, emissions do not include lower electricity/heat generation levels; 4) Assumed sales price of €2.39 per bottle of carbonated soft drink and 25 g of plastic

Source: Plastic Recyclers; Eurostat; Cefic; World Population Review; "Eco-friendly Supermarkets - an Overview" (2016); International Aluminium

# Next steps

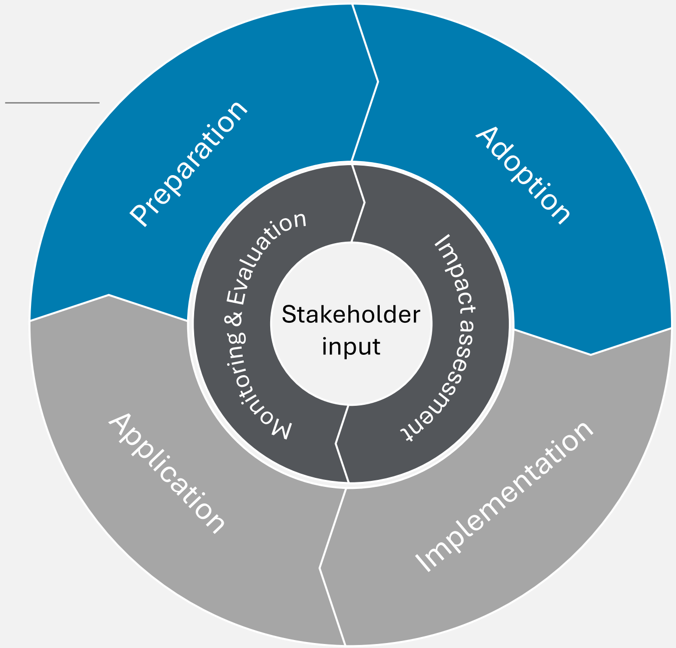
# Potential next steps include establishing a legal basis for introduction of demand mandates and an appointment of a "Lead Markets Working Program"

**51.** Possible next steps within the context of EU policymaking cycle

- ✓ Clarify why additional demand creation is necessary.
- ✓ Develop initial view on what could be a conceptual architecture of demand mandates and how they could be implemented in the focus sectors.
- ○ Establish a legal basis (e.g., in the Industrial Decarbonisation Accelerator Act) for the adoption of product mandates by means of secondary legislation (e.g., delegated acts). This should complement existing policies and enable the EU to fill policy gaps, covering both public procurement, as well as B2B/B2C markets.
- ○ Appoint a "Lead Markets Working Program" and establish its governance – possibly to comprise Lead Markets Platform (Commission, Member States, Parliament, value chain representatives, civil society) and an Expert Group.
- ○ "Working Program" to conduct consultations with sector representatives and other stakeholders, and to prepare impact assessment, incl. how different design choices will contribute to stimulating sustainable investments and strengthening EU industry.

✓ Largely completed ○ Next steps

**EU policymaking cycle**



- ○ Results of the "Working Program" consultations and impact assessment to be presented (e.g., one year after appointment). Results should include recommendation for markets and products, mandate holders, mandated metrics, compliance mechanisms and access and origin requirements for each sector.
- ○ Decide what existing or proposed policies can serve as vehicles for demand mandates (see next slide for initial overview).
- ○ Develop a roadmap for extending the mandates to other sectors, markets, products.

To ensure policy effectiveness and account for sector-specific nuances, **it is essential to involve all key stakeholders, including representatives from companies across the value chains** (such as potential mandate holders), in the design of demand mandates

Source: European Commission "Better Regulation Guidelines"; Stakeholder interviews; Deloitte

# Several existing and proposed policies could serve as the basis for demand mandates

**52.** Existing and proposed policies that can form basis for demand mandates – EXAMPLES

■ Mandates – possible basis for extension

▨ Mandates – would require extensive modifications

░ Other policies and enablers – could support new mandates

Ⓟ Proposed policies

| Policy | Description | Sectors impacted[1] | | | | | Type of policy | Possible policy adjustments to support development of demand mandates for heavy industry |
|---|---|---|---|---|---|---|---|---|
| | | Ch. | St. | Re. | Fe. | Ot. | | |
| Ⓟ **Industrial Decarbonisation Accelerator Act** - initiative to boost competitiveness and productivity, accelerate administrative procedures, and facilitate investments, including by creating lead markets - could form the legal basis for demand mandates | | | | | | | | |
| ■ RED III – **RFNBO for Transport** | Fuel suppliers to reduce emissions of fuels sold or purchase certificates | | | ■ | | | ■ Emissions at use | Extend to cover emissions reduction from production of fuels (refining) |
| ■ **Emission Standards** | Automotive manufacturers to meet emission targets for vehicles sold | | | ■ | | Au. | ■ Emissions at use | Extend to fully renewable fuels (incl. refining technology) |
| ■ **FuelEU Maritime** | Shipping companies to reduce emissions from fuels used | | | ■ | | Ma. | ■ Emissions at use | Extend to cover emissions reduction from production of fuels (refining) |
| ■ **CORSIA** | Threshold emissions set on airlines, which – if exceeded – need to be offset | | | ■ | | Av. | ■ Emissions at use | Lower refining reduction demand, e.g., to a minimum 5% |
| Ⓟ ■ **Agricultural ETS** | Large farmers to have caps on emissions, incl. trading of allowances | | | | ■ | Ag. | ■ Emissions at use | Include fertilizers production in reported emissions |
| ■ **Packaging & Waste Reg.**[2] | Mandates on manufacturers: min recycled content in packaging (all types) | ■ | ■ | | | | ■ Specific feedstock | Extend compliance rules to low-carbon naphtha and steelmaking |
| ■ **Ecodesign for Su. Prod. Reg.** | Framework for setting sustainability rules on products (incl. digital passport) | ■ | ■ | | | | ■ Regulatory framework | Set eco-design standards for steel, tires, chemicals and footwear |
| ■ **Energy Perf. of Buildings Dir.** | Sets targets for energy performance, incl. calculation of life-cycle emissions | ■ | ■ | | | Co. | ■ Regulatory framework | Extend targets to embodied emissions from construction materials used |
| ■ **End of Life Vehicles** | Vehicles sold to have min. recyclable components (incl. plastics and steel) | ■ | ■ | | | Au. | ■ Standards[3] | Extend to materials used for vehicle production like low-carbon steel and chemicals |
| ▨ **RefuelEU Aviation** | Fuel suppliers to meet minimum SAF shares in the fuel blend at EU airports | | | ▨ | | Av. | ▨ Specific feedstock | If changed to GHG, extend to cover emissions reduction from production of kerosene |
| ▨ RED III – **RFNBO for Industry** | Industrial grey $H_2$ users (e.g., fertilizers, refinery route) to blend in green $H_2$ | ▨ | | ▨ | ▨ | | ▨ Production technology | Align supply and demand targets (e.g., RFNBO fertilizer in food products by '30) |
| Ⓟ ▨ **Circular Economy Act** | Harmonization of circularity rules, circularity infrastructure | ▨ | ▨ | | | | ▨ Methodology / feedstock | Extend with mandate for biobased feedstock |
| ▨ **Public procurement direct.** | Sets of rules that standardize how public authorities purchase | | ▨ | | | | ▨ Emissions / feedstock | Introduce sustainability, resilience and possible EU origin criteria |
| ░ **Ecodesign for Su. Prod. Reg.** | Framework for setting sustainability rules on products (incl. digital passport) | ░ | ░ | | ░ | | ░ Regulatory framework | Use digital product passport for mandate setting and tracking at a product level |
| ░ **Fertilizing Product Reg.** | Passport for fertilizers: standards for quality, safety and labelling | | | | ░ | | ░ Standard | Extend to fertilizer production emissions or specific production technologies |
| ░ **Fuel Quality Directive** | Fuel suppliers to meet well-to-wake emissions standards (until 2020 only) | | | ░ | | | ░ Reporting, Standard | Extend product requirements to cover emission reduction from production of fuels (refining) |
| ░ **Construction Products Reg.** | Building materials certification (e.g., flammability). Plan to include emissions | ░ | ░ | | | Co. | ░ Reporting, Standard | Use for harmonized emissions reporting for steel and plastics |
| Ⓟ ░ **Product Env. Footprint** | Method to quantify environmental impact of products over life cycle | ░ | ░ | ░ | ░ | Cg. | ░ Methodology | Define harmonized emissions accounting rules |
| ░ **General Food Law** | Requirement to trace food/feed one step back and forward in value chain | | | | ░ | Cg. | ░ Standards | Define harmonized reporting and tracking rules for fertilizers |
| ░ **Food Info. to Consumers** | Manufacturers/retailers to provide information on food (e.g., ABCD labels) | ░ | | | ░ | Cg. | ░ Standards | Extend information on products lower-emission fertilizers and packaging |

1) Ch. = Chemicals, St. = Steel, Re. = Refining, Fe. = Fertilizers, Ot. = Other (Au. = Automotive, Ma. = Maritime, Av. = Aviation / Airlines, Ag. = Agriculture / Farmers, Co. = Construction, Cg. = Consumer Goods / Food / Retail); 2) Packaging & Waste Regulation builds on earlier policy Single Use Plastic Directive which required Consumer Packaged Goods companies to meet minimum recycled content of single use plastics; 3) End of Life Vehicles might in the future include specific feedstock requirements. Source: European Commission; stakeholder interviews; Deloitte analysis

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# List of acronyms

| | |
|---|---|
| € M, € B | million euro, billion euro |
| B2B | Business to business |
| B2C | Business to consumer |
| BF-BOF | Blast furnace - basic oxygen furnace |
| CAPEX | Capital expenditure |
| CBAM | Carbon Border Adjustment Mechanism |
| CBS | Central Bureau for Statistics, Netherlands |
| CCS | Carbon capture and storage |
| $CO_2e$ | Carbon dioxide equivalent |
| CORSIA | Carbon Offsetting and Reduction Scheme for International Aviation |
| CPG | Consumer packaged goods |
| DE | Germany |
| DRI-EAF | Directly reduced iron - electric arc furnace |
| E10 | Fuel with 10 percent of ethanol blend |
| EEA | European Environment Agency |
| EPD | Environmental Product Declaration |
| EPR | Extended Producer Responsibility |
| ERE | Emissiereductie eenheden |
| ETS | Emissions Trading Scheme |
| EU | European Union |
| F&V | Fruits & Vegetables |
| FID | Final investment decision |
| g, kg | gram, kilogram |
| GHG | Greenhouse gas |
| GVA | Gross Value Added |
| $H_2$ | Hydrogen |
| HFO | Heavy Fuel Oil |
| HRC | Hot Rolled Coils |
| HVC | High Value Chemicals |
| HVO | Hydrotreated Vegetable Oil |
| IEA | International Energy Agency |
| kt, Mt | Kiloton (thousand tonnes), megaton (million tonnes) |
| KSA | Kingdom of Saudi Arabia |
| kW, GW | Kilowatt, gigawatt |
| $NH_3$ | Ammonia |
| NL | Netherlands |
| OEM | Original equipment manufacturer |
| OPEX | Operational expenditure |
| p.a. | Per annum |
| PET | Polyethylene terephthalate |
| PPWR | Packaging and Packaging Waste Regulation |
| PVC | Polyvinylchloride |
| RED I-II-II | Renewable Energy Directive one-two-three |
| RFNBO | Renewable fuels of non-biological origin |
| RSPO | Roundtable for Sustainable Palm Oil |
| SAF | Sustainable aviation fuel |
| SMR | Steam methane reforming |
| SUP | Single Use Plastic |
| TCO | Total Cost of Ownership |
| THG | Treibhausgasminderungs-Quote |
| US | United States |
| WTO | World Trade Organization |

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