# Demand creation for more sustainable products

## The case of steel for the automotive industry

CE Delft

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# Content

# Summary


Investments in sustainable technology often struggle to get off the ground when potential customers lack an incentive to pay the premium associated with a more sustainable product. A policy instrument aimed further down the value chain can create that incentive. This mechanism, 'demand creation'[1], can help unleash investments in sustainable technologies, including hydrogen. This report examines, as a case study, how demand creation can be applied to the use of lower-emission steel in the automotive industry.

The automotive industry would appear to be a logical candidate for mandated demand (hereinafter called a 'demand mandate') given that it has the key features that make demand creation effective: high production volumes, a substantial contribution to $CO_2$ emissions, a relatively low cost impact of steel on the final price of cars, and limited opportunities to circumvent the mandate. Moreover, there is already support within the industry: several automobile manufacturers have already signed long-term contracts for the offtake of green or low-emission steel. This increases the likelihood of a demand mandate being effectively implemented.

The mandate could be imposed on the production of vehicles for the EU market, ensuring that both European and imported vehicles are subject to the same rules. With this approach, production leakage is avoided while producers and manufacturers outside the EU are encouraged to adopt sustainability measures. It would furthermore align with existing regulations. The rule-setting could take the form of a minimum performance standard based on the carbon intensity of the steel used, with a phased tightening of the requirements over time. This provides investment security while accounting for the limited production capacity connected with lower-emission steel in the short term. Compliance monitoring and enforcement could be aligned as much as possible with existing procedures.

As a broader conclusion derived from the lessons learned from the automotive industry, it can be seen that demand creation can only succeed when it is made industry-specific, aligns with existing systems, and is supported by a clear interest and scope for action inside the industry itself, i.e. the companies must see the benefit and be able to act on it. Accordingly, a tailored approach is required for each industry, with a focus on the structure of the value chain, regulations, and market dynamics. Though the automotive industry


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[1] 'Demand creation' refers to the creation of European markets for more sustainable European products, towards the end of value chains. This gives EU-based production/manufacturing companies greater investment security while potentially contributing to the energy and feedstock/raw material transition and helping to boost the strategic autonomy of the Netherlands and the EU.

case study does not offer a blueprint for other industries, it does provide a practical reference framework that can help shape demand mandates for other industries and further strengthen the call for demand creation.

# Preface

This report is a byproduct of the study 'Hydrogen: production cost, import, policy' (CE Delft, 2025c), which was commissioned by The Dutch Association of Tank Storage Companies (VOTOB) and carried out by CE Delft. This study focuses on the Dutch hydrogen market, but the part on demand creation has a wider geographical and product scope. This report is based on chapter 4 from that study.

## Outline of the report

In this report, we discuss the concept of 'demand creation', i.e. the creation of markets (within the EU and beyond) for more sustainable products through rule-setting towards the end of the value chain. We see that sustainable investments struggle to get off the ground when potential customers are not incentivised to pay the 'green premium' associated with a sustainable product. A policy instrument aimed further down the value chain can create that incentive. We explore this policy option using a case study on the possibilities and potential implementation of demand creation for the steel used in passenger vehicles. After an introduction of demand creation in chapter 1, we explain in chapter 2 that we chose the automotive industry because a quick survey revealed that this industry holds significant potential. In chapter 3, we then present the various links in the automotive industry value chain and provide insight into the possibilities for making the steel used in passenger vehicles more sustainable. Chapter 4 describes where a mandate can be set in the automotive industry and how compliance can be enforced. Lastly, in chapter 5 we describe a number of lessons learned for a broader rollout of demand creation to other industries. In chapter 6 we present our conclusions concerning demand creation.

# 1 Background

Investments in making Dutch (and the broader EU) industry more sustainable are being held back by insufficient market demand for sustainably produced products. Major European industrial companies fall under the EU Emissions Trading System (EU ETS) and are obliged to reduce their greenhouse gas emissions. The number of new free emission allowances issued decreases each year and from 2040 no new free emission allowances will be issued under the EU ETS. This reduction requires investments in sustainability (electrification, hydrogen, bio-based materials/feedstocks, CCS); however, we see that these investments struggle to get off the ground when potential customers are not incentivised to pay the 'green premium' associated with a sustainable product. A policy instrument aimed further down the value chain can create that incentive.

Early in 2025, 91 parties (based in the Netherlands and other countries in the EU) sent a letter to the European Commission with a 'call for demand creation'. 'Demand creation' refers to the creation of European markets for more sustainable European products, towards the end of value chains. This gives EU-based companies greater investment security and can contribute to the green transition and help boost the strategic autonomy of the Netherlands and the EU.

**Examples of existing demand mandates in the fuel market**

To stimulate market demand for more sustainable products, demand mandates are already in place in various markets (particularly fuel markets). A number of examples are described below.

- The Dutch regulation on an annual binding renewable energy target for transport for the years 2022 to 2030 (*Jaarverplichting Energie voor Vervoer 2022-2030*), derived from the EU Renewable Energy Directive, requires fuel suppliers to supply a certain percentage of sustainable fuels (such as biofuels and electricity) to the Dutch market annually (CE Delft, 2022). This share is measured in renewable fuel units (hernieuwbare brandstofeenheden, or HBEs in short) and is registered in the Dutch register for energy for transport (*Register Energie voor Vervoer*). One HBE represents 1 gigajoule (GJ) of renewable energy supplied to the Dutch transport market. In The Netherlands, the Dutch Emissions Authority (Nederlandse Emissieautoriteit, NEa) is both the implementing body and the supervisory authority. Starting in 2026, the HBE system will be replaced by the ERE system, with one ERE (emissiereductie-eenheid; emission reduction unit) representing a reduction of 1 kg $CO_2$ equivalent ($CO_2$e) in emissions in the value chain compared to fossil fuels.

- The Sustainable Aviation Fuels (SAF) blending mandate, as set out in ReFuelEU Aviation, requires fuel suppliers to, starting from 2025, supply an aviation fuel blend with an annually increasing minimum share of SAF. The minimum share of SAF is set at 2% in 2025, rising to 70% by 2050 (nea, 2025).
- The EU Packaging and Packaging Waste Regulation (PPWR), which came into effect early in 2025, sets mandatory targets for 2030 and 2040 for recycled content in plastic packaging (European Commission, 2025e).

Inhoud

# 2 Why the automotive industry?

Deloitte (2025) recently conducted research into the role of demand creation in increasing sustainability in European heavy industry. Implementing a demand mandate could help foster the development of green hydrogen. This research specifically examines the possibilities for this demand mandate in the **steel and fertiliser value chains**, both of which have several features that could contribute to the effective implementation of a demand mandate (Deloitte, 2025). These features include:

- high production volumes;
- high contribution of material production to total $CO_2$ emissions;
- low contribution of material production to the price of the end product;
- few suppliers on the market;
- few possibilities for manufacturers to circumvent the mandate;
- few substitution options for the commodity.

Based on the findings of the Deloitte study, we have chosen to delve further into the use of steel in the automotive industry. At first glance, this industry has many features that align with those outlined above (see Table 1 below).

Table 1 – Features related to demand creation in the automotive industry

| Features favourable to demand creation | Automotive industry score | Features of the automotive industry |
|---|---|---|
| High production volumes | +++ | The automotive industry is a major consumer of steel: approximately 19% of European steel is used in the automotive industry (Eurofer, 2024), with total consumption coming in at around 24 Mt in 2023. Around 20% of global automotive production takes place in Europe (ACEA, 2025). |
| High contribution of material production to total $CO_2e$ emissions | +++ | Some 16% to 25% of emissions in the automotive production process can be cut by using green steel. |
| Low contribution of material production to the price of the end product | +++ | The use of green steel in passenger vehicles would lead to around a 1% increase in the price of the car. |
| Few suppliers on the market | +++ | Compared to other products, such as fertiliser, the steel-to-car value chain is relatively well defined. |

| | | |
|---|---|---|
| Few possibilities to circumvent the mandate | ++ | The automotive industry is already subject to a relatively large number of EU policies. |
| Few substitution options for the commodity | ++ | Steel is essential in the automotive industry. For example, steel accounts for 50% to 66% of the mass of an average passenger car (CE Delft, 2020). There are some substitution options, however, such as plastics and aluminium, as well as recycled steel. |

Source: CE Delft based on Deloitte (2025).

The steel industry already has many plans for the production of green steel (and other forms of lower-carbon steel), with various pilot projects currently underway (Leadit, 2025). And there is already demand for these products in the automotive industry. For example, 26 European automotive manufacturers have committed to the procurement of lower-carbon steel. This covers a total of around 1.8 Mt of lower-carbon steel[2] to be procured in 2030, representing approximately 9% of the steel demand in 2030 (Ricardo, 2024). Approximately 70% of these lower-carbon steel commitments are expected to be fulfilled through the procurement of steel made through hydrogen-based direct reduction (H-DR) steelmaking. For example, automotive manufacturer Mercedes-Benz secured a deal with Swedish steel producer Stegra (formerly H2 Green Steel) for the supply of 50,000 tonnes of green steel per year (Mercedes Benz, 2024). Stegra's flagship plant in Boden is on course to start production in 2026 and is expected to be producing 5 million tonnes of green steel annually by 2030 (Stegra, 2025). Other automotive manufacturers, like Porsche and Volvo, have also signed deals with the steel producer.

Given the features stated and the existing support for low-emission steel in the automotive industry, this appears to be a suitable candidate for implementing a demand mandate on a practical level. In this chapter, we provide a rough overview of the automotive industry, examining the value chain and existing policies, among other aspects. We then create a blueprint for implementing demand creation in the automotive industry. This blueprint focuses on answering the following questions for the automotive industry:

- How do we design the demand mandate?
- How do we implement the demand mandate?

[2] This concerns three types of lower-carbon steel: 1) 'Green H-DR', where the hydrogen used in the process is produced using renewable electricity; 2) 'Blue HDR', where the process uses blue hydrogen (grey hydrogen plus CCS); and 3) 'Grey NG-DR' (steel produced using natural gas).

Based on this blueprint, we then sketch out the possibilities for implementing a demand mandate for low-emission steel, provide an idea of future research directions for implementation at EU level, and investigate the extent to which this practical implementation can be applied to other sectors. In our discussion, we use the terms ‘low-emission steel’ and ‘lower-emission steel’. By this we mean steel with a lower carbon footprint than steel produced using the current steelmaking methods. We intentionally avoid using the term ‘green steel’ given the confusion it can cause: the word ‘green’ has a narrower definition for hydrogen than it does for steel.

# 3 Exploring the automotive industry

In this chapter we explore the current state of the automotive industry. We examine opportunities for sustainability in the automotive industry, the use of steel in the industry, and the various steps along the value chain.

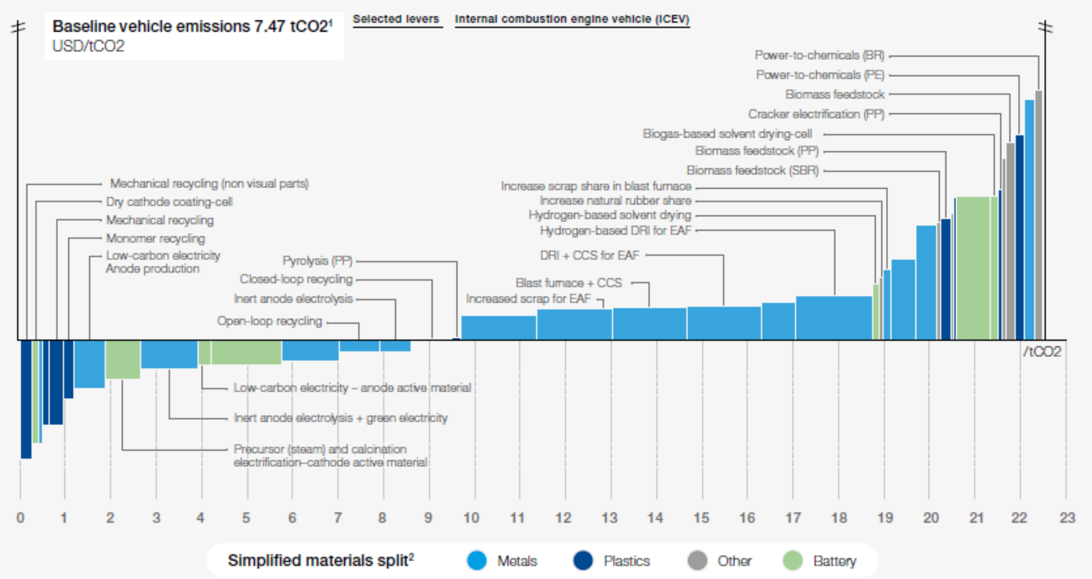
## 3.1 Making the automotive industry more sustainable: options and policy

The automotive industry has several options for becoming more sustainable. Some examples include:

- making manufacturing processes and logistics more sustainable, for example, by using renewable energy in manufacturing processes or reducing emissions from transport vehicles;
- making products more sustainable during the use phase, for example, by making EVs instead of fossil-fuelled vehicles, or reducing emissions through improvements in automotive design;
- making materials used in manufacturing more sustainable, for example by using recycled materials in passenger vehicles.

In the context of investigating the demand mandate, we focus primarily on making materials used in car manufacturing more sustainable. Alongside steel, a passenger vehicle contains many other materials, such as plastic, textiles, rubber and glass (CE Delft, 2020). To gain an idea of the reduction potential of other materials in passenger vehicles, we examine the abatement cost curves for both fossil-fuelled and electric cars. These curves show the extent to which reducing emissions with certain technologies is cost-effective. The abatement cost curve for electric passenger vehicles is shown in Figure 1 (World Economic Forum, 2020). It shows, for example, that making plastics more sustainable through mechanical recycling (dark blue) is the most cost-effective reduction option for an electric passenger vehicle. In general, significant gains can be achieved by decarbonising steel and aluminium (light blue). Steel comprises between 50% and 65% of a vehicle's weight and is responsible for around 35% of an average vehicle's emissions from material use (World Economic Forum, 2020). A demand mandate regarding steel used in passenger vehicles appears to be an effective and realistic sustainability option due to its carbon reduction potential and volume.

Figure 1 – Cost abatement curve for an electric passenger vehicle




1. In this analysis, a premium C-segment vehicle with 1.95t vehicle weight: 1.04t steel; 0.29t aluminium; 0.10t rubber; 0.07t PP; 0.03t PE; 0.05t glass is considered
2. Metals including steel, high-strength steel, aluminium, alumina; plastics including polypropylene, polyethylene, polyamide 6; other materials including rubber, glass
**Source:** McKinsey analysis (Team, McKinsey Decarbonization Pathways Optimizer)

There are already numerous EU laws and regulations in place aimed at accelerating sustainability in the automotive industry and these, of course, impact the industry. An overview of the current EU policy framework relevant to the automotive industry is shown in Annex B.

## 3.2 From steel to cars: steel use and the current value chain

Passenger cars are largely made of ‘flat steel’, one of the two main categories of steel manufactured, the other being ‘long steel’. We explain both below.

- Flat steel products comprise plates and coils of steel (both a few millimetres to centimetres thick and possibly coated). These products are primarily supplied to manufacturers who process the steel into finished products, like cars, batteries, tins, and household appliances. Flat steel is of a higher quality than long steel. In Europe, there is demand in particular for flat steel. In the automotive industry, for example, flat steel is used in the ‘body in white’ (BIW), which forms the vehicle's skeletal structure, the doors, and the wheels (European Commission, 2023).

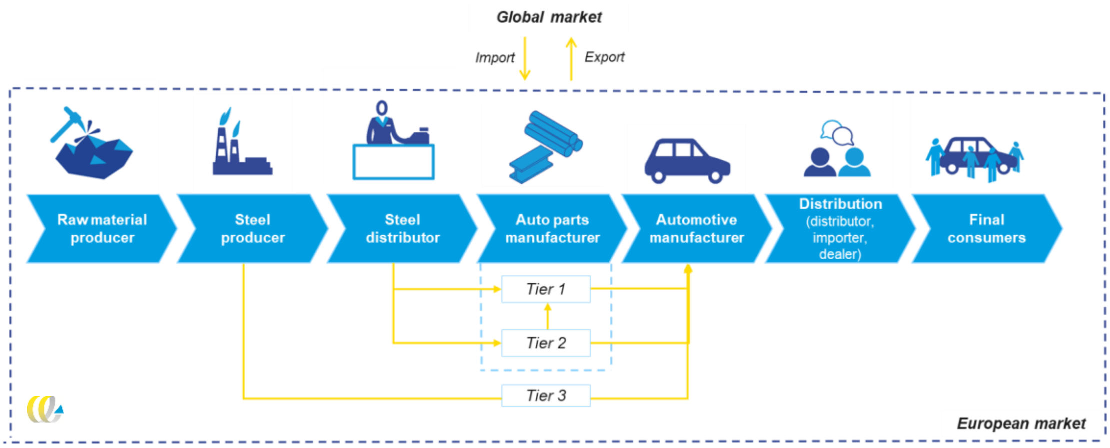
- Long steel products (also called ‘long products’) include bars, rods, reinforcing bar, rails, wire and various steel structural sections and girders, products primarily used in the construction sector. This steel is easier to produce and composed with less precision. China is a major producer of long steel. In the automotive industry, long steel is used for engine block components, for example (European Commission, 2023).

**Steel usage trends in the automotive industry**

Natuur & Milieu (2025) has carried out research into trends in steel usage in the automotive industry. One of these trends is ‘lightweighting’, where traditional materials used in automotive manufacturing are being replaced with lighter materials with the aim of making vehicles less material and energy-intensive. By replacing steel with alternatives or with a lighter type of steel (ultra-strong steel), the amount of steel per vehicle is reduced. Also, to achieve the climate targets, steel with a low carbon footprint will eventually be used, such as recycled steel or steel made using green hydrogen. Lastly, demand for new vehicles will likely decline due to other trends, such as extending the service life of vehicles, and the rise of shared mobility.

The value chain from the production of the steel to the manufacture of the vehicle in Europe comprises several steps (see Figure 2). Below, we explain the various steps in the value chain in more detail.

Figure 2 – Overview of the automotive value chain

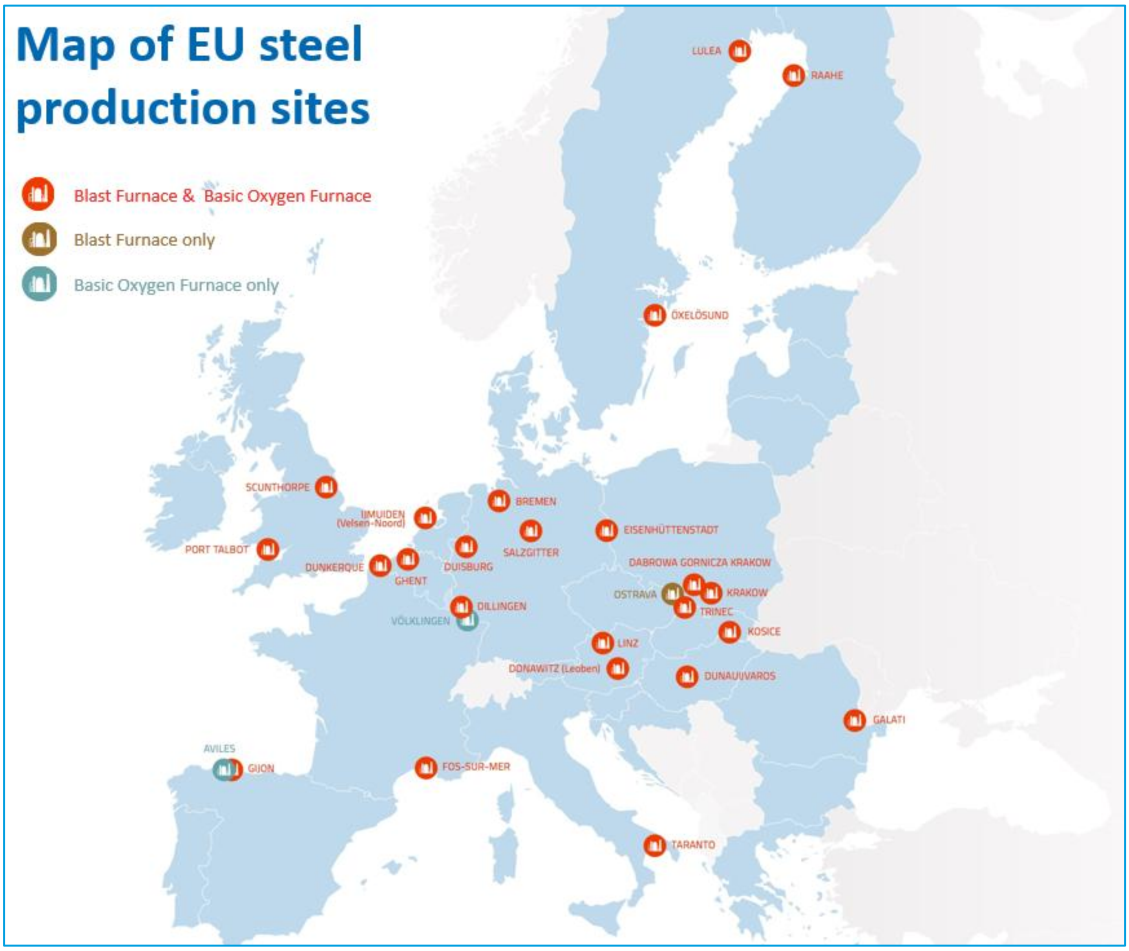



1. **Raw material extraction:** Iron ore is required to manufacture steel. This is mined in places like Australia, Brazil and China and imported by ship to steel-producing companies (CE Delft, 2024).

- *Tata Steel, for example, sources its iron ore for steel production from two iron ore mines in India (Tata Steel, 2025b).*

2. **Steelworks:** The extracted iron ore is smelted into pig iron in blast furnaces. This pig iron is then processed into steel. Currently, the standard for this is BF-BOF (blast furnace, followed by basic oxygen furnace). In the future, other production processes that use an electric arc furnace (EAF) will be explored, like scrap-EAF, BI-EAF, and DRP-EAF (CE Delft, 2024). Figure 3 shows the locations of EU steelworks using the BF-BOF technology. After processing, some of the steel produced goes directly to the automotive manufacturer (in which case the steel producer is a Tier 3 supplier to the automotive manufacturer). In other cases, there is an intermediate step in the value chain, such as the distribution of the steel by steel traders for processing into semi-finished products.

Figure 3 – EU steel producers using BF-BOF technology




Source: Eurofer (2020).

3. **Steel distribution centres:** The steel produced is delivered to intermediaries that focus on the distribution and processing of steel into semi-finished products. In most cases, additional processing, such as bending or cutting the steel, is performed in this step (Eurofer, 2024). Parties in this step of the value chain include intermediaries like service centres and wholesalers/traders. From these parties the steel is shipped to steel users, such as manufacturers of intermediate products (automotive parts), or directly to automotive manufacturers.
   - Tata Steel has a distribution centre (Feijen Service Centre) in Maastricht, for example, dedicated to the heavy gauge and sheet metal products industry. From this centre, they supply cut-to-size heavy plate and hot-rolled strip products for applications such as automotive solutions and shipbuilding (Tata Steel, 2025a). Tata Steel also has service centres in Germany, France, Spain, Norway, Sweden, and Finland.
4. **Auto parts manufacturers:** Some of the steel products from distribution centres ends up with auto parts manufacturers who then supply semi-finished products to the automakers. The value chain has various levels of manufacturers (Knaufindustries, 2024):
   - Tier 1 manufacturers/suppliers, who often have long-term contracts, deliver the finished auto parts directly to the automaker. An example of a Tier 1 supplier is VDL Steelweld (HQ in Breda, with locations around the world), which supplies ‘body in white’ (the vehicle's skeletal structure) to automakers, for example.
   - Tier 2 manufacturers/suppliers make and supply (niche) parts/components, often to Tier 1 suppliers. An example is Nedschoef (HQ in Helmond, with locations around the world), which supplies steel bolts and screws, for example, to Tier 1 suppliers. It is also possible for a supplier to function as both a Tier 1 and a Tier 2 supplier (supplying to both automakers and parts manufacturers); the tiers are not always clear-cut.
   - Tier 3 comprises suppliers of materials (like steel) or components used by Tier 2 manufacturers.

5. **Automotive manufacturers:** In the automotive context, an Original Equipment Manufacturer (OEM) is the company that designs, builds, and sells vehicles under its own brand. In 2024, there were a total of 255 automobile plants in the EU and the UK, 98 of which focused on passenger vehicles (ACEA, 2024a). Examples of automotive OEMs are Volkswagen, Mercedes-Benz, Renault, etc.

**Size of the European automotive industry and car imports**

In 2024, over 75 million passenger vehicles were manufactured across the globe, 11.4 million of which were built in the EU, representing a market share of 15%. Nearly 40% of the cars (over 4.5 million) that rolled off European assembly lines were exported. A total of 3.4 million cars were imported. This means that of the new cars on the road in the EU from 2024, roughly two-thirds were manufactured in Europe and one-third imported.
Source: (ACEA, 2024b).

6. **Importers and car dealers:** Passenger vehicles are transported either directly from the assembly plant or from the OEM's parking yard to distribution centres, where they are transported further to importers by truck, rail, or ship. From the importers, the cars are distributed to various car dealers, who then sell them directly to consumers. For example, a car produced in France may be sent through the distribution channel (via logistics companies like PON, Louwman, etc.) to various car dealers in the Netherlands. A company in the distribution channel can also position itself in the retail market.

**Market concentration of players in the automotive industry**

Various market players (companies performing particular activities) are present at each stage of the value chain. With high market concentration, there are only a limited number of (dominant) players in the value chain. Low market concentration means that a relatively large number of players compete with each other in a particular step of the value chain. Deloitte (2025) has determined the market concentrations for the various steps in the automotive value chain, as shown in the table below.

| Step in the automotive value chain | Market concentration, based on Deloitte (2025) |
|---|---|
| Raw material extraction | High |
| Steel-producing companies | High |
| Service centres and wholesalers/traders | Medium |
| Auto parts manufacturers | Low |
| Automotive manufacturers | Medium |
| Distribution centres and dealers | Medium – a few large market players |

# 4 Demand creation in the automotive industry

In this chapter, we show how a demand mandate can be implemented in the automotive industry in a practical manner. We examine the design, implementation and enforcement of an EU standard for low-emission steel for the automotive industry.

## 4.1 Possibilities for a standard for low-emission steel in the automotive industry

First, we explore the possibilities for establishing a standard for low-emission steel in the automotive industry. To gain a clear understanding of the possibilities, we examine the following components:

- existing initiatives and standards for low-emission steel;
- technical feasibility of a standard for low-emission steel;
- design of a standard for low-emission steel in the automotive industry.

**Existing initiatives and standards for low-emission steel**
There are currently several initiatives that target the decarbonisation of steel. A proposal was recently made for the Industrial Decarbonisation Accelerator Act to launch a voluntary carbon-intensity label for industrial products (European Parliament, 2025a). This Act is part of the Clean Industrial Deal. Initially, the Commission will start looking into a carbon-intensity label for steel, with cement to follow later. By better informing consumers about the carbon intensity of steel products, companies may be able to charge a ‘green premium’ for producing lower-emission steel (European Parliament, 2025a).

Furthermore, in the working programme for the Ecodesign for Sustainable Products Regulation (ESPR), it has been stated that additional measures will be taken to complement the green steel label under the Clean Industrial Deal. Steel and aluminium have been identified as priorities in the ESPR working plan.

Several other initiatives and standards specifically address green steel, i.e. steel produced using green hydrogen. Besides complying with the standards, steel producers can use these standards as a benchmark for the carbon intensity of the steel they produce (CEPS, 2024). The standards have various thresholds, expressed, for example, in tonnes of $CO_2$ equivalent ($CO_2e$) per tonne of crude steel produced. Table 2 provides an overview of the existing voluntary European standards. The table shows the many differences between the initiatives, such as the product processing stage (crude steel, hot-rolled semi-finished product, etc.) and the carbon-intensity thresholds.

Table 2 – Initiatives and standards for low-emission steel

| Organisation/ Initiative | Product processing stage | Methodological Approach | Quantitative Threshold (t $CO_2$/t steel) | |
|---|---|---|---|---|
| | | | Iron ore-based steelmaking | Scrap-based steelmaking |
| IEA's definition of Near-Zero and Low-Carbon Steel | Crude steel | Sliding scale | 0.4 t $CO_2e$/t crude steel (0% scrap use) | 0.05 t $CO_2e$/t crude steel (100% scrap use) |
| ResponsibleSteel (Core Site Certification and Steel Certification) | Crude steel | Sliding scale | 0.4 t $CO_2e$/t crude steel (0% scrap use) | 0.05 t $CO_2e$/t crude steel (100% scrap use) |
| Low Emissions Steel Standard (LESS) | Hot rolled steel | Sliding scale | 0.52 t CO2/t hot rolled steel (quality steel - QST)<br>0.47 t CO2/t hot rolled steel (reinforcing & structural)<br>(0% scrap use) | 0.17 t CO2/t hot rolled steel (quality steel - QST)<br>0.12 t CO2/t hot rolled steel (reinforcing & structural)<br>(100% scrap use) |
| Climate Bonds Initiative | Crude steel | Pathway by technology route | 1.81 t $CO_2e$/t steel by 2030<br>0.12 t $CO_2e$/t steel by 2050 | 0.32 t $CO_2e$/t steel by 2030<br>0.12 t $CO_2e$/t steel by 2050 |
| Steel Climate Standard - Global Steel Climate Council (GSCC) | Hot rolled steel | Company-specific trajectory based on decarbonisation pathway for flat and long products | Flat products:<br>1.31 t $CO_2e$/t hot rolled steel by 2030<br>0.12 t $CO_2e$/t hot rolled steel by 2050<br>Long products:<br>1.11 t $CO_2e$/t hot rolled steel by 2030<br>0.12 t $CO_2e$/t hot rolled steel by 2050 | |
| Chinese Method C2F Steel (CMC2FS) | Crude Steel or Hot rolled steel | Sliding scale | 0.4 t $CO_2$/t crude steel or hot rolled steel (0% scrap use) | 0.05 t $CO_2$/t crude steel or hot rolled steel (100% scrap use) |

Source: (JRC, 2025).

Most standards use a sliding scale, where a producer's steel receives a label based on its carbon intensity. This is also used by the Low Emission Steel Standard (LESS), for example. Figure 4 shows an example of the sliding scale and the corresponding LESS label.

Figure 4 – LESS classification and label for the carbon intensity of (quality) steel


Source: LESS (2025).

In the case of LESS, the scale ranges from near-zero to E, with E having the highest carbon intensity per kilogramme of steel. The LESS classification (as with other initiatives) also considers the share of ferrous scrap (i.e., scrap metal consisting primarily of iron, steel, or both). This may be due to constraints of the availability of ferrous scrap, given that when it is used for one product it is no longer available for another product (LESS, 2025). Steel is currently largely recycled. If this share is not included in the standard, emissions simply shift to the product with no ferrous scrap, to the effect that reductions in overall emissions are zero. Consequently, with increased use of ferrous scrap, stricter carbon-intensity requirements are imposed (CEPS, 2024).

Despite the many voluntary initiatives and standards, there is currently no universally accepted definition and standard for ‘low-emission steel’ or ‘sustainable steel’ (JRC, 2025).

**Technical feasibility of a standard for low-emission steel**

The primary production route for steel is BF-BOF. This is a steelmaking process where iron ore is reduced using carbon in a blast furnace (BF) to produce pig iron, which is then refined in the basic oxygen furnace (BOF) to make steel. The use of coal accounts for most of the $CO_2$ emissions. Globally, the BF-BOF process produces an average of 2.33 tonnes of $CO_2$ per tonne of crude steel[3], though this average is lower in Europe (CE Delft, 2025a). Steel producers have several options for decarbonising steel. Examples include:

- ‘BF-BOF blue steel’, with carbon capture and storage (CCS) being applied to the primary production route. This process cuts emission by around 20 to 80% compared to the regular BF-BOF process (CEPS, 2024). However, as far as known, no steelworks in the EU are using this process as of yet (CE Delft, 2025a). Given the high investment costs and uncertainties concerning the reduction potential, this route does not yet seem realistic for decarbonising steel for the automotive industry (CEPS, 2024).
- The EAF-DRI route, where either natural gas or hydrogen is used as the reducing agent instead of coal to produce direct reduced iron (DRI), which can then be smelted in an electric arc furnace (EAF) together with ferrous scrap to produce steel. Examples of the steel produced through this route are:
  - *NG-DRI grey steel*: this cuts emissions by around 50% compared to the BF-BOF process (CEPS, 2024). The potential emission reduction percentage becomes even higher when CCS is used in this route (CE Delft, 2024).
  - *$H_2$-DRI blue steel*: this can deliver around a 60% reduction in emissions compared to BF-BOF (CEPS, 2024). However, this percentage depends heavily on the electricity mix.
  - *$H_2$-DRI green steel*: this route yields in the range of 97 to 99% fewer emissions compared to BF-BOF (CEPS, 2024). This process uses 100% renewable energy.

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[3] Both direct and indirect emissions.

When comparing current production methods with the various LESS classifications (see Figure 4), most producers fall into category E (the category with the highest carbon intensity for steel (over 2.25 t $CO_2$/t steel)) or D. Using the NG-DRI route a steelworks could achieve label C. For the A label (less than 0.9 t $CO_2$/t steel)[4], the steel would have to be produced using green hydrogen (100% renewable energy). To achieve the near-zero label for steel, Scope 3 emissions (e.g., emissions from resource extraction) would also have to be reduced (Germanwatch, 2024). CCS could also be used to decrease carbon intensity and get a better label for the steel, but currently no European producers are pursuing this route (CE Delft, 2025a).

A steelworks is currently being built in Sweden that will be taking the $H_2$-DRI route. Other European steel producers also have plans, focused particularly on $H_2$-DRI. The progress of these plans is uncertain, however, partly due to high energy prices and uncertainty about future energy policy.

**Design of a standard for low-emission steel in the automotive industry**

As explained previously, the steel industry is pushing for a standard and label for low-emission steel. By introducing a low-emission steel label, steel producers could potentially charge a green premium for their lower-emission steel. Creating more demand for sustainable products at the end of the value chain can accelerate the transition to a sustainable value chain.

A standard for low-emission steel in the automotive industry could take the same form as the existing standards in the steel industry: a standard based on the carbon-intensity profile (*tonnes of $CO_2$e per tonne of steel produced*). Requirements could be imposed, for example, on the emissions profile of the steel used in passenger vehicles: for the production of *1 kg of steel in a car, a maximum of X tonnes of $CO_2$ may be emitted in the production process*. The standard could then be structured in various ways, for example:

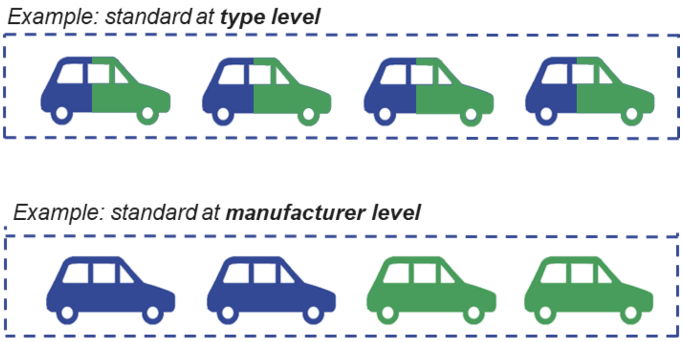
- a standard for the steel used per vehicle type, *for example: car type X may have (averaged across the production line) a maximum steel carbon intensity of X tonnes of $CO_2$e.* Alternatively: *car type X must have (averaged across the production line) at least an X low-emission steel label*;
- a standard based on the average steel usage per manufacturer, *for example: automaker X may emit (averaged across all production lines) a maximum steel carbon intensity of X tonnes of $CO_2$e*. Alternatively: *automaker X must have (averaged across the production line) at least an X low-emission steel label*;
- a mix of the above.

An example of what the standard might look like for an automaker is shown inFigure 5. If the standard were to be implemented at type level, this would mean that every vehicle would have to meet the standard based on its carbon intensity: each car must comprise a

[4] In the case that no ferrous scrap is being used.

percentage of ‘low-emission’ steel. For a standard implemented at the manufacturer level, there is more freedom in implementing the standard. This can be done in a manner similar to that of a standard at type level, but also by compensating a ‘high-emission’ line of cars with a ‘lower-emission’ line to meet the average carbon-intensity profile of the standard.

Figure 5 – Example of a low-emission steel standard for an automaker




With such a standard, the automotive industry would set a feasible target for the steel industry while also providing additional leverage for decarbonising investments for the steel industry. Implementing the standard this way would leave scope for introducing progressively stricter emission profile requirements for steel in passenger vehicles. For example, by 2030, X% of the steel in cars, per manufacturer, must have label C, and X% must have label A by 2040. The standard can also be varied; for example, a minimum of X% of the steel in cars must have label B, and a maximum of X% must have label D.

By setting the standard based on the carbon-intensity profile of steel used in cars, the steel industry continues to have the option of achieving the standard through various decarbonisation methods and technologies, such as through the use of ferrous scrap, blue or green hydrogen, or natural gas and possibly CCS. Depending on the type of technology used, the steel produced will fall within a specific classification (based on the carbon-intensity profile), for example, label E to near-zero. By imposing compliance with the standard further upstream in the value chain, steel producers outside the EU that supply steel to the EU automotive market can also be required to comply with the standard. This will ultimately enhance the sustainability of steel production, not only in Europe but also worldwide (CE Delft, 2025a).

A standard based on the carbon-intensity profile of steel, however, will not always lead to direct investments in green or blue hydrogen plants, given that there are more sustainability options available that allow producers to comply with the standard. For example, certain steelworks have plans in place to replace BF with $H_2$ as well as to replace BF with NG-DRI (Leadit, 2025). The final choice will depend on the profitability of green and blue hydrogen transition pathways compared with natural gas, for example. The EU ETS will also play a decisive role in this. Currently, the EU-based steel industry receives free emission allowances to prevent carbon leakage outside the EU (CE Delft, 2025a). However, starting from 2034 the steel industry will no longer receive these free allowances (in line with the transition pathway and the introduction of the Carbon Border Adjustment Mechanism [CBAM]) (NEa, 2024). This will make the business case for using natural gas less economically attractive compared to, for example, blue or green hydrogen.

Another aspect to consider is the product level at which the standard concerning the carbon-intensity profile is applied. Existing low-emission steel initiatives primarily focus on a standard for either crude steel or hot-rolled steel. In Europe, nearly 130 million tonnes of crude steel were produced in 2024, and a total of approximately 118 million tonnes[5] of hot-rolled products were produced that year (Eurofer, 2025; Worldsteel Association, 2025). To be able to correctly compare the carbon intensity of steel, a uniform calculation methodology is needed. If imports were to fall under the demand mandate, it is important that this calculation methodology also be applicable to steelworks outside the EU.

Lastly, automakers can also choose, if technically feasible, to replace steel with plastic or aluminium, for example. By having the standard apply solely to the carbon-intensity profile of steel, additional requirements cannot be imposed under the standard on making other components of a car more sustainable, such as sustainability regarding the use of plastics or textiles.

## 4.2 Implementing a standard for low-emission steel in the automotive industry

In addition to exploring the possibilities for establishing a standard for low-emission steel, we are investigating how the standard can be practically integrated into the automotive value chain. Our focus is on answering the following questions:

- Where in the value chain should the demand mandate be imposed?
- How can low-emission steel be certified?
- How can the demand mandate be monitored and enforced?
- To what extent can this all be aligned with existing legislation?

**Mandate for cars produced for the European market**
There are several points along the automotive value chain where the demand mandate could be imposed. Consideration would need to go to which party in the value chain would be required to comply with the legislation. A logical place to apply the demand mandate would be at the production level of new cars produced for the EU market. Implementing it at this point in the value chain seems most consistent with existing standards and it would keep the playing field level. Applying this earlier in the value chain, such as at the point of the production of car parts and components, would seem difficult to enforce due to low

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[5] Approximately 61% of this was flat steel and 39% long steel.

Inhoud

market concentrations: the sheer number of market participants would make monitoring such an instrument difficult. Further down the value chain, at car dealerships, for example, would be practically impossible: car dealers would then be required to have a mandatory share of ‘sustainable’ cars in their showrooms.

If the demand mandate were to apply to cars produced for the EU market, manufacturers of these cars would be obliged to comply with the legislation. The car manufacturer, such as Volkswagen or BMW, would then be held responsible for ensuring that the steel in its vehicles meets the standard. The result would be that automaker *X* would have to demonstrate, for example, that *the carbon-intensity profile of the steel in X% of the cars it brings to market is a maximum of X or an average of X*. To achieve this, automakers will direct or encourage the parties along the value chain (as they do now with regard to the $CO_2$ emission performance standard) to have/use the necessary materials and/or implement the necessary technological developments.

Applying the mandate at the level of cars produced for the EU market would ensure that the European fleet will become more sustainable, with 50% of the cars available on the market being sustainable, for example. At this point in the value chain, car imports would also be included in the demand mandate: imported cars, too, would need to contain a given percentage of low-emission steel. This creates a level playing field. It could, however, potentially lead to an additional administrative burden in the value chain. Not only will a system be needed in the EU to report and monitor the carbon intensity of steel profiles in cars, but the mandate will also need to be enforced when importing cars.

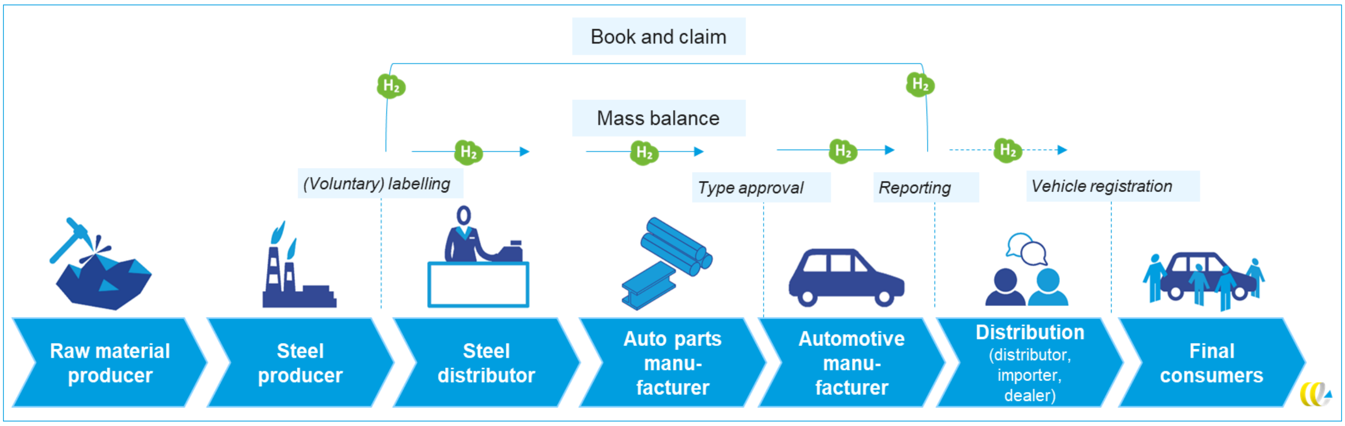
Another point to consider is the exception for car exports. By having the standard apply at the marketing point in the value chain, EU car manufacturers can still export vehicles with no low-emission steel content; after all, the demand mandate would only apply to cars intended for the EU market. This may provide less incentive for making EU industry more sustainable. That said, it will maintain a level playing field.

**Certification of low-emission steel in the automotive value chain**

To document the sustainability of steel throughout the value chain and allow manufacturers to trace the share of low-emission steel, a traceability system would need to be introduced. In this sub-section, we further explore the options for establishing such a system. We explain the options for having certificates for low-emission steel move along the value chain, and we examine which option best suits the automotive industry.

There are various ways to have low-emission steel certificates move along the value chain. To build on the research on hydrogen demand creation by Deloitte (2025), we investigate two traceability (‘chain of custody’ or CoC) systems in the context of the automotive industry: ‘mass balance’ and ‘book and claim’. Both systems are shown (in the context of the automotive industry) in Figure 6.

Figure 6 – Book and claim and mass balance systems




As shown, in the mass balance system a certificate for low-emission steel physically travels with the steel along the value chain, while in book and claim the certificate is separate from the product. Each system is explained further (together with examples) in the text box below.

**Mass balance and book and claim**

*Mass balance system*

In this system, the certificate for low-emission steel is product-specific: the certificate travels with the steel product or piece that has actually been sustainably produced. As a result, the final product, such as a car, will actually contain a portion of low-emission steel. An example of the use of a mass balance system is the voluntary FSC label for sustainably managed forest products. Wood products from FSC-certified forests may be physically labelled 'FSC - 100% from well managed forests' (or similar promotional text), showing that the logging firm has the FSC-FM certificate. Companies that intend to resell the wood after processing and still use the FSC claim must have FSC-CoC (chain of custody) certification (FSC, ongoing). Companies that only want to sell an FSC-certified product without processing do not, in principle, need to be certified: they can use the supplier's FSC certification and licence code on the products (FSC, ongoing). This allows FSC-certified wood to be distinguished from wood that is not FSC-certified. FSC-accredited certification bodies (accredited by Accreditation Services International) monitor certified parties through audits.

*Book and claim system*

In a book and claim system, the steel's low-emission attribute is decoupled from its physical flow, meaning the certificate does not move along the value chain together with the steel. Using a general registry to track and transfer these attributes (a trading system), those required to comply with standards can purchase the number of certificates they need from the steelworks. The product can, however, also be produced without any low-emission steel. An example of a book and claim system can be seen in the Guarantees of Origin (GOs) for renewable electricity. Once electricity enters the transmission system, the 'batch' is no longer physically traceable: renewable electricity mixes with non-renewable electricity on the grid. GOs are created at the point where renewable electricity is generated. End users can then purchase these GOs through a trading system. In the EU, this system of GOs is regulated through the European Energy Certificate System (EECS) (Pianoo, ongoing). National issuing bodies are appointed for each country to monitor the integrity and transferability of the GOs. In the Netherlands this is VertiCer (a subsidiary of electricity TSO TenneT and Gasunie, owner of gas TSO GTS).

The steel value chain (from steel to car) is marked by a high degree of transparency. For example, due to strict quality and safety standards the steel used in the industry must be traceable. An example of a quality standard used in this context is IATF 16949, the global standardised quality management system specifically for the automotive industry (International Automotive Task Force, 2025). This high degree of administrative transparency makes using a mass balance system the logical choice. In this system, the GO (the chain of custody certificate) travels with the steel, similar to the way the FSC label for sustainable forestry moves along the value chain. The steel manufacturer would then receive a label based, for example, on the average carbon intensity of the steel produced. Through physical marking (and record keeping), the carbon-intensity profile information would be passed on to the car parts manufacturers and ultimately to the automaker.

**Certification as an option for a 'green premium'**

In principle, higher production costs incurred by automotive manufacturers are passed on directly to consumers. This would also apply to the additional costs resulting from using lower-emission steel. With a certification system for low-emission steel, these additional costs (the 'green premium') at the end of the value chain would become more transparent. In addition to providing car buyers with transparency (through a label, for example), transparency would offer opportunities to mobilise the use of low-emission steel in the automotive industry at the national level. One example is the French subsidy for new fully electric or hydrogen vehicles with a low carbon footprint; this includes the carbon emissions from both the use phase and the production phase (Ministère de l'économie, 2025). The subsidy is also partly income-dependant. Consideration could be given to a similar subsidy aimed at cars that contain a certain percentage of low-emission steel.
In the Netherlands, tax incentives for cars containing low-emission steel would also be a possibility. An example is the wages-in-kind addition (*bijtelling*) to the taxable salary of employees who drive a

company car. The ‘*bijtelling*’ for electric vehicles is currently lower than that for fossil-fuelled vehicles: 17% compared to 22%.

**Mandate compliance monitoring and enforcement in the automotive industry**
The introduction of a demand mandate would require complex traceability systems to enable compliance monitoring and enforcement as regards the share of low-emission steel in cars. In this sub-section, we further explore the options for monitoring the percentage of low-emission steel in new European cars, as well as the relevant value chain parties.
We examine both compliance monitoring (for the standard) at the level of the manufacturer (average of all cars) and compliance monitoring for one particular type of car (average of all cars of this type).

*Compliance monitoring at manufacturer level*
If the standard for low-emission steel were to be set as an average per manufacturer, monitoring could be arranged through the accounting system. Compliance monitoring would then be done through audits, possibly in a similar way to the FSC label for sustainable forestry. In this case, automotive manufacturer *X* would be responsible for reporting the carbon intensity of all steel used in the production processes for passenger vehicles. Due to the high level of traceability in the steel value chain, verification could be performed by means of random audits. Adding a physical label to the steel, through a mass balance system, for example, would increase traceability in the context of sustainability.

*Compliance monitoring at type level*
If the standard for low-emission steel were to apply to each vehicle type, this aspect could be included in the existing record-keeping process for a vehicle. There are several ‘administrative checkpoints’ along the value chain where passenger vehicles are checked against EU standards, among other things. A key checkpoint is the EU Type Approval (ETA) process, where cars are checked (by type) against EU standards prior to production. The ETA process is explained in more detail in the text box below.

**ETA process for passenger vehicles for the EU market**

In the EU, each Member State is responsible for the ‘type-approval’ of vehicles they plan to sell on the market. This approval process involves checking, for example, whether the vehicle meets EU safety requirements and $CO_2$ emission performance standards. Type-approval is applied to a batch of vehicles yet to be produced by the automaker. Approval is given once the batch has been shown to meet the requirements (based on over 100 aspects) and this has been verified by randomly selecting cars from the production line. Once a vehicle type has been approved, the manufacturer can market it EU-wide without the need for further tests. In the Netherlands this approval is handled by RDW (European Commission, ongoing). Member States then report the technical data of new passenger vehicles (as provided by RDW). The European Environment Agency (EEA) maintains a central database; this data can be used to set targets and monitor emission standards for individual automotive manufacturers (JRC, 2023). Manufacturers outside the EU must also comply with the type-approval requirements. In this case, the vehicles are generally produced specifically for the European market, and the automakers take EU market requirements into account. Responsibility is then assigned to an EU-based representative/legal entity of the car manufacturer based outside the EU.

Incorporating the carbon-intensity level of steel into the type-approval process would enable enforcement of the standard. Car manufacturers would then be required to determine and report the carbon-intensity profile of the steel in a specific car type prior to the start up of production. For example, the steel in the ‘Fiat 500’ has a *maximum carbon intensity of X tonnes of $CO_2$e emissions*. As with the standard at manufacturer level, there would be random auditing at type level to ensure compliance with the required share of low-emission steel in the given car type.

Another important record-keeping point along the automotive value chain is vehicle registration. At this point, the car dealer or importer ensures that the car is registered in the buyer’s name. Monitoring at this point in the value chain seems difficult given the high technical complexity, and it would most likely result in a high administrative burden.

**Potential alignment of the low-emission steel standard with existing legislation**

As previously explained in chapter 2, many policies concerning the EU automotive industry are already in place. The demand mandate could potentially align with existing legislation. Below, we examine specifically its alignment with $CO_2$ emission performance standards.

*$CO_2$ emission performance standards for passenger vehicles*

The European emission standards are defined in a series of EU directives requiring car manufacturers to meet specific emission targets (for $CO_2$ and other emissions and pollutants) during the use phase of a passenger vehicle when producing new cars and vans. For $CO_2$ this is measured as grammes of $CO_2$/km. With each new directive, the $CO_2$ emission targets are tightened further, with the ultimate goal being zero emissions by 2035, meaning that no new cars with a fossil combustion engine may be sold after that year.[6]

One possibility would be to add a life cycle analysis (LCA) component to these emission performance standards. Currently, the requirements apply only to $CO_2$ emissions released during the car's use phase. An LCA component requiring automotive manufacturers to incorporate a minimum percentage of low-emission steel, for example, into passenger vehicles would help make both the use phase and the production phase more sustainable. In addition to a minimum percentage of low-emission steel, such a structure would also allow for the inclusion of standards for a minimum percentage of recyclate content or low-carbon aluminium in passenger vehicles. The question then arises whether an LCA component would be in addition to the $CO_2$ emission performance standard or whether car manufacturers could meet the requirements of the existing standard in part through the LCA component. Further research is warranted in this regard.

Car manufacturers appear to already possess a relatively large amount of information on the materials used and the production processes upstream in the value chain. A lot of data is available in the automotive industry's International Material Data System (IMDS), for example, a system that has been in use since 2000 to track and manage materials (from passenger vehicles, for example). Among its other uses, the IMDS provides the information required to show compliance with the End-of-Life Vehicles Directive and the REACH regulation (AIAG, ongoing). In Germany, too, an online ecosystem is being developed to map the automotive industry and its material use in a more structured way: Catena-X (BMW Group, 2023). Mapping the supply chain is also important in the context of the impending legislation on sustainability reporting. Under the EU Corporate Sustainability Due Diligence Directive (CSDDD), which came into force in 2024, companies are responsible for mapping their 'chain of activities' (supply/value chain), for example (European Commission, 2025c).

*Other EU policies aimed at making steel more sustainable*

In addition to aligning the demand mandate with existing legislation (such as $CO_2$ emission performance standards), it is important to harmonise European policy on low-carbon steel. In various branches of EU climate policy, means of encouraging companies to make steel

[6] There is also similar legislation in place regarding emission standards for heavy-duty vehicles (like trucks and buses). We do not discuss this legislation here, however, given that this does not apply to car manufacturers.

more sustainable are being explored (in general, not just in the automotive industry). A number of examples are described below:

- *End-of-Life Vehicles Directive & revision proposal*: the EU regulation on end-of-life vehicles (ELV) sets targets for the reuse and recycling of vehicle parts and materials at the end of a vehicle's service life. Recently, proposals have been brought forth to amend the legislation within the framework of the Circular Action Plan. These proposals include making manufacturers responsible for end-of-life products, tightening policy on circular design, and setting a mandatory 25% recycled plastic content in the production of new cars. In addition to plastics, the European Commission is currently investigating whether it can also mandate a mandatory share of recycled aluminium or steel in passenger vehicles (European Parliament, 2025b). To the best of our knowledge, there are currently no firm details on how the mandatory plastic content will be structured or how this can be enforced through monitoring systems.
- *Ecodesign:* the Ecodesign for Sustainable Products Regulation (ESPR), which focuses on improving the sustainability of products on the European market, has been in effect since 2024. The key focus areas (minimum ecodesign standards) concern (CE Delft, 2025b):
  - product design (reparability, recyclability, etc.);
  - sustainability (resource efficiency, energy usage, etc.);
  - circularity (design for a second life, modular, etc.);
  - availability of spare parts;
  - information and transparency on the sustainability of the products.

  The ESPR 2025-2030 working plan includes steel and iron as 'priority products' due to their circular potential (European Commission, 2025f).
- *Clean Industrial Deal:* as explained previously in section 4.1 (European Parliament, 2025a), a proposal was recently made for the Industrial Decarbonisation Accelerator Act to launch a voluntary carbon-intensity label for industrial products.

# 5 Demand creation in other industries: lessons from the automotive industry

In this case study we examined whether and how a mandatory requirement for the use of low-emission steel in the automotive industry can be implemented with the aim of providing greater investment security for sustainable technologies, including for green hydrogen. In this sub-section, we share several lessons from this case study with the aim of considering applicability to other sectors.

**Demand creation requires a customised approach: there is no 'one size fits all'.** The automotive industry is a complex industry with a very specific value chain. We see that this industry has several features that are advantageous to introducing standard-setting at the material level. When expanding the concept of 'demand creation' to other industries, it is important to realise that there is no blueprint for all industries and that a customised approach is required.

**Integrate existing systems and regulations as much as possible and engage the industry players in the process.** The automotive industry already has extensive regulations focused on safety and sustainability in the use phase of the vehicle. Systems have been established to implement and enforce compliance with these regulations, such as the EU Type Approval process. The industry itself has also developed standards (IATF 16949) and such. Integrating existing systems limits additional administrative burdens and keeps (unnecessary) new systems from being developed.

**This is more likely to succeed if the industry has a vested interest and has some control over the rest of the value chain.** Automotive industry experts have said that there is a need for material traceability in the automotive industry. Car manufacturers need to have transparency all along the value chain: this gives them a good understanding of the quality of components and, if problems arise, they can trace the origins of their products. Some parties have their own sustainability goals or participate in voluntary initiatives (such as SBTi). Contracts have also already been signed for the procurement of low-emission steel. Standardisation in the value chain can contribute to achieving these goals, and mandatory labelling increases the traceability of materials. Demand creation is also more likely to be successful in other industries if the industry has a vested interest in standardisation and labelling. It is essential, however, that the industry coming under the standard has a certain level of market power and some influence on the upstream value chain.

**Ensure that imports are also included and that there are no other loopholes.** Where demand creation can work to encourage sustainability measures in EU industry, there is also a risk that its effect will be limited, given that it could lead especially to production leaking to locations outside the EU. This could reduce support significantly. Standardisation could be imposed on production in the EU and on production for the European market. In the case study for the automotive industry, we see that demand creation applied to production for the EU market appears to be the most promising route: this aligns with existing systems and prevents leakage through imports. Currently, a third of cars on the EU market are produced outside the EU, so it is clear that imports are relevant. In the case of the automotive industry, imports are already regulated and must comply with EU requirements. This would be desirable for other industries as well. That said, demand creation can be interesting as well for industries where imports play a limited role, such as the construction sector.

# 6 Conclusion

We see that sustainable investments struggle to get off the ground when potential customers are not incentivised to pay the ‘green premium’ associated with a more sustainable product. A policy instrument aimed further upstream in the value chain can create that incentive. This instrument is called ‘demand creation’. This can lead to unlocking sustainable investments, including in hydrogen. We have explored how demand creation can be implemented for steel in the automotive industry. The automotive industry is a logical candidate for a demand mandate for low-carbon steel given that it has the key features that make demand creation effective: high production volumes, a substantial contribution to $CO_2$ emissions, a low cost impact of steel on the final price of cars, and limited substitution options. Moreover, there is already considerable support within the industry: several automobile manufacturers have already signed long-term contracts for the offtake of green or low-emission steel. A demand mandate also aligns well with the existing structure and regulations in the automotive industry.

We see the following options for establishing a workable standard:

- The standard could apply to the production of vehicles for the EU market, ensuring that both European and imported vehicles are subject to the same rules. With this approach, production leakage is avoided while steelworks outside the EU are encouraged to adopt sustainability measures. A demand mandate also aligns well with the existing structure and regulations in the automotive industry.
- A standard can be set based on the carbon intensity of the steel used, using a phased approach. Given the current limited production capacity for lower-emission steel, we conclude that it would be prudent to start with a modest standard. Setting an ambitious long-term target would provide the necessary investment security.
- Compliance monitoring and enforcement can be aligned with existing processes, either at producer average (accounting, random sampling/audits) or at type level using the EU Type Approval process; in both cases, a mass-balance chain of custody system facilitates traceability.

A key conclusion for application in other industries is that experiences from the automotive industry clearly demonstrate that demand creation can only be successful when made industry-specific, embedded as much as possible in existing regulations and systems, supported by a clear interest and scope for action inside the industry itself, i.e. the companies must see the benefit and be able to act on it. This means that, in each industry, the value chain structure, the extent of existing regulations, and market dynamics must first be carefully examined. Though the automotive industry case study does not offer a blueprint for other industries, it does provide a practical framework for how mandated demand can be implemented in other industries as well. This framework can be further developed and can further reinforce the ‘call for demand creation.’

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# A Interviewpartners

Table 3 – Interview partners and participants of expert session on demand creation

| Organisatie | |
|---|---|
| BOVAG | RAI Vereniging |
| CE Delft | RDW |
| Deloitte | RVO |
| Energie Nederland | Tata Steel |
| LESS Green Steel | VNO-NCW |
| Ministry of Climate Policy and Green Growth (Ministerie van KGG) | VOTOB |

# B Relevant policy for the automotive industry

Many sustainability policies are already in place at the European level that impact the automotive industry. This appendix outlines some examples of relevant policies in the context of low-carbon steel, the automotive industry, or both.

| Legislation | Explanation |
|---|---|
| **EU ETS** | The EU ETS has been in effect since 2005. This means that polluting companies must pay for the right to emit $CO_2$; an alternative is to focus on reduction through clean innovations. From 2040 onwards, there will be no more ETS allowances (if the current reduction curve continues). |
| **CBAM (future)** | The Carbon Border Adjustment Mechanism (CBAM) is a European regulation that ensures a carbon adjustment for the production of products outside the EU. This means that $CO_2$ emissions resulting from production outside the EU are taxed in the same way as $CO_2$ emissions released by EU ETS-regulated companies. Initially, this adjustment applies to the import of cement, iron and steel, aluminium, fertiliser, electricity, and hydrogen from non-EU countries. The CBAM was introduced to support the EU ETS and to enhance the competitiveness of European producers. The CBAM is currently in its transition phase and will become active in 2026. |
| **$CO_2$ emission performance standards for cars and vans** | A European regulation requiring car manufacturers to meet specific $CO_2$ emission targets (grams of $CO_2$/km) for the production of new cars and vans. These $CO_2$ emission targets are becoming increasingly stringent, with the ultimate goal of a 100% $CO_2$ reduction by 2035. This means that cars with fossil combustion engines will no longer be sold after 2035. Between 2025 and 2029, car manufacturers can use a credit system based on the share of zero- or low-emission vehicles (ZLEVs) to increase their $CO_2$ targets. [7] |
| **Car labelling Directive** | A European directive requiring car manufacturers to provide consumers with relevant information about the car's fuel efficiency (and thus indirectly about $CO_2$ emissions) via labels on new cars. |

[7] Similar legislation exists for heavy-duty vehicles, such as trucks and buses. However, we will not discuss this legislation, as it does not apply to car manufacturers.

| Legislation | Explanation |
|---|---|
| **RED III Directive** | The RED III (Renewable Energy Directive III) aims to accelerate the energy transition. It sets a binding target of at least 42.5% of the European energy mix to be renewable by 2030 (EC, n.d.). Part of this Directive is Article 22a, which contains a (Member State) obligation for the use of Renewable Fuels of Non-Biological Origin (RFNBO). These are liquid and gaseous fuels whose energy content is derived from renewable sources other than biomass (CE Delft & TNO, 2023). |
| **Ecodesign for Sustainable Products Regulation (ESPR)** | The Ecodesign for Sustainable Products Regulation (ESPR) has been in effect since 2024 and aims to improve the sustainability of products on the European market. Key components include (CE Delft, 2025b):<br>• product design requirements (e.g., repairable, recyclable);<br>• sustainability requirements (e.g., resource consumption, energy consumption);<br>• circularity (e.g., second-life design, modular);<br>• availability of spare parts;<br>• information and transparency about sustainability on products.<br>The ESPR 2025-2030 work plan includes steel and iron as 'priority products' given their circular potential (European Commission, 2025f) |
| **End-of-life vehicle Directive and proposal** | The End-of-Life Vehicle Regulation sets targets for the reuse and recycling of cars at the end of their lifespan. Recently, proposals have been made to amend the legislation as part of the Circular Action Plan. These include making manufacturers responsible for end-of-life products, tightening policy on circular design, and mandating a 25% share of recycled plastic in the production of new cars. |
| **Critical Raw Materials Act (CRMA)** | As part of the Green Deal Industrial Plan, the Critical Raw Materials Act (CRMA) was introduced in 2024. With this regulation, Europe aims to ensure a sustainable supply of critical raw materials. One of its components focuses on the recycling of critical raw materials, such as cobalt, aluminum, lithium, and magnesium.<br>Automotive components, such as electric vehicle batteries, also contain such critical raw materials. The CRMA sets the following benchmarks for critical raw materials by 2030 (European Commission, 2025d):<br>• > 10% of raw material extraction takes place in the EU;<br>• > 40% of processing takes place in the EU;<br>• > 25% of European consumption comes from recycling;<br>• < 65% of raw material supplies come from a single third country. |
| **Clean Industrial Deal (proposal)** | The Clean Industrial Deal was established by the European Commission to boost both European competitiveness and decarbonisation. The plan focuses primarily on energy-intensive industries (such as steel and chemicals) and the clean-tech sector (such as wind and solar). The Clean Industrial Deal includes the Industrial Decarbonisation Accelerator Act, which focuses on creating demand for sustainable products, including steel. (European Commission, 2025b). |
| **New Batteries Regulation** | The New Batteries Regulation has been in effect since 2023 and applies, among other things, to batteries used in electric passenger cars. The regulation focuses, for example, on making batteries more sustainable throughout their entire lifecycle (European Commission, 2025a). |