BRIEFING - April 2025

Setting recycled-content targets for steel under the ELV Regulation

A contribution towards a more resilient European economy and circular automotive industry

Key results of a quantitative impact study by Oeko-Institut

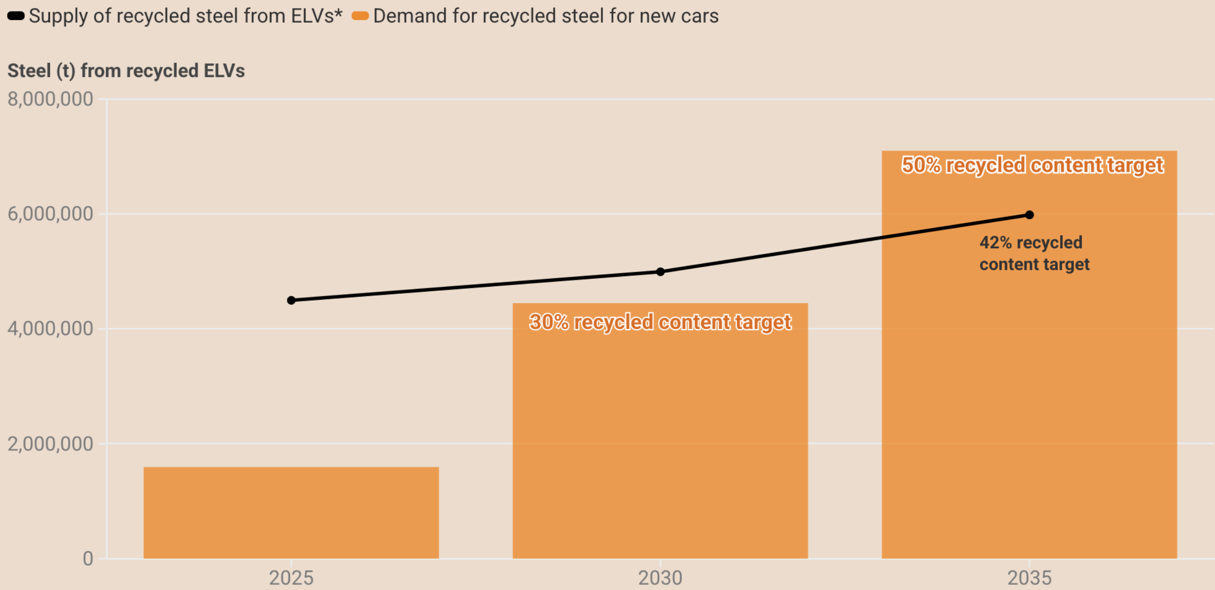
Summary

In 2023, the European Commission released a proposal for a new End of Life Vehicle Regulation (ELVR). The proposal builds on and aims at replacing two existing Directives: Directive 2000/53/EC on end-of-life vehicles and Directive 2005/64/EC on the type-approval of vehicles with regard to their reusability, recyclability and recoverability. It is being discussed by the EU Parliament and Member States and should be finalised in early 2026.

While the best way would have been to propose green steel targets overall, including recycled steel, the only option on the table today is recycled content. And even if there is great potential to increase the use of recycled steel in new cars, the European Commission (EC) did not propose any binding targets. Instead, they have only committed to conducting a feasibility study. In its European Steel and Metals Action Plan launched on March 19, the EC proposed to conduct the feasibility study until “the end of 2026”.

To assess how to increase scrap-based steel use in the automotive industry under the proposed ELV regulation, T&E commissioned Oeko-Institut to conduct a dedicated feasibility study on steel recycled targets. Oeko-Institut was chosen as they had already carried out a study to support the impact assessment for the review of Directive 2000/53/EC on end-of-life vehicles in 2023. This briefing outlines the key findings from the study. It shows that **setting steel recycled content targets (30% in 2030 and 40% in 2035) and recycled steel quality requirements are technically and economically feasible**.

Comparison of demand for recycled steel in new cars from recycled content targets with supply of recycled steel from ELVs (EU)



Source: Öko-Institut e.V.
* Assumes 15% of steel from ELVs is contained in reused and remanufactured components, 5% is dismantled prior to shredding and 80% is shredded

These targets – ideally as part of broader green steel quotas – should therefore be included by co-legislators as part of the ELVR co-decision process.

European carmakers rely heavily on high-emission coal-based primary steel

- **Current use of scrap-based steel in the automotive industry is low.** The study shows that as of today there is only a small proportion of secondary steel from post-consumer scrap in new vehicles (11.3% in ICEs, 5.3 % in EVs) in the EU. Overall we calculate that just 6% of current total scrap steel production in the EU goes into new cars.

- **Steel used by major European automakers is estimated to have an emissions intensity equal to or above 2 tonnes CO_2e per tonne** of steel, which is more than double the EU steel industry average (combining both primary & secondary routes).

Copper contamination of steel scrap is a challenge, but can be solved with dismantling and processing

- **The high copper contamination of scrap-based steel is the main obstacle for the uptake of secondary steel in the automotive sector.** The automotive industry demands high-quality steel with a maximum copper content of 0.1% especially for flat steel components, some parts even require 0.06% (e.g. body-in-white components, such as doors, hoods, roofs) to meet strength and safety standards.

- According to Steelonthenet, on average 58% of the total weight of an ICE-vehicle is steel. Flat steel products amount to 46% and long products to 11% of total weight.

- **The average copper content in OECD steel scrap currently ranges between 0.2-0.25%**. Copper concentration in shredded end-of-life vehicle (ELV) scrap can range from 0.23% to 0.7%. A shredded scrap sorting trial conducted by ArcelorMittal showed a copper content of 0.6%. This high copper contamination prevents the use of recycled steel in automotive applications. The automotive sector requires effective copper removal techniques from steel scrap to enable the production of high-quality recycled steel suitable for its needs.

- **About 60% of the copper in a vehicle is in the wire harness and in the engine, e.g. in the ventilation and heating systems**. If about 50% of the main wire harness can be removed prior to shredding, this, combined with the dismantling of electric motors and generators in BEVs, could reduce the copper content in steel scrap from about 0.4% to about 0.2%.

- **The study shows that it is technically feasible to effectively reduce the copper contamination of scrap-based steel from 0.4% to 0.06%, so it can be used in the production of automotive-grade steel in EAFs.**

- This is achieved by dismantling the main wire harness and electric motor before shredding and through mechanical processing of the steel scrap after the shredder.

Copper treatment can be economically feasible

- The comparison of the additional costs with the possible additional revenues shows that a separation of the copper could already be economically feasible today, for vehicle recyclers and for post-shredding sorting plants.
- That this does not happen is due to the fact that such further processing would require additional investment for the shredder companies, which is not economic given the current low demand for high-quality steel scrap.
- However, the study shows that if there is a market for high-quality steel, e.g. via mandatory recycled content targets, then additional investments will be economically feasible.

There is enough steel scrap available for recycled-content targets

- The quantities of recycled steel that can be recovered from ELVs in the EU will be sufficient to achieve a **recycled content target** in the automotive sector of **30% from closed-loop post-consumer scrap by 2030 and 40% by 2035.**

- **The potential for closed-loop ELV recycling in the EU could be significantly higher than it is currently.** Eurostat data shows that only 50% of vehicles placed on the EU market are disposed of and recycled within the EU. The remaining 50% is used car exports, and missing vehicles. However, the valuable materials in electric cars have increased OEM interest in establishing closed-loop recycling within the EU.

Recycled-content targets will create economic benefits for the EU

- Authorized Treatment Facilities/Vehicle Recyclers will be able to collect up to **€125 million annually in additional revenues by 2035** through the sale of copper that has been removed from ELVs.

T&E calls the European Parliament and the European Council to take action to increase the use of recycled steel in new cars within the ELV Regulation, instead of waiting for a future feasibility study and further delaying action. In addition, local content provisions must be added to any such targets to ensure scaling of local recycling capacity, rather than imports. The evidence from the Oeko Institut study shows that it is feasible and economically desirable to set a **30% recycled steel target in 2030 and a 40% in 2035**, as well as **dismantling requirements of copper-rich components**, combined with **quality requirements for recycled steel, specifically a copper contamination level of no more than 0.1%.**

1. Introduction

As the automotive industry moves towards electric vehicles, the environmental impact of the materials used in car manufacturing is becoming increasingly important. **With embedded carbon emissions representing around 60% of an electric car's total lifecycle emissions**, and steel contributing 16% to 27% of these production emissions; reducing emissions from vehicle production is essential to achieving a net-zero automotive sector by 2050 and meeting the EU climate targets.

In July 2023, the European Commission proposed a regulation to replace Directive 2000/53/EC on end-of-life vehicles with circularity requirements for vehicle design and management. The Commission's impact assessment report recommended a recycled-content target for plastics and highlighted the positive environmental and economic impacts of recycled-content targets for steel. However, the Commission's proposal did not include a quota for steel, citing uncertainties. Instead, it proposed conducting a feasibility study 23 months after the new regulation's entry into force to assess appropriate targets for recycled steel in new vehicles (see Article 6.3 of Commission proposal). However, in March, the EC communicated that the publication of the feasibility study will be pushed forward to "the end of 2026".

Conducting a feasibility study only 23 months after the new regulation's entry into force, would basically mean that recycled-content quotas for steel in cars would only take effect in the mid-2030s. This timeline would lag well behind the market, as **automotive industry leaders have already set their own recycled-content targets**. Volvo has committed to using 25% recycled steel by 2025 and 35% by 2030, with their new EX30 model already containing 17% recycled steel. BMW also aims for 50% secondary materials per vehicle by 2030.

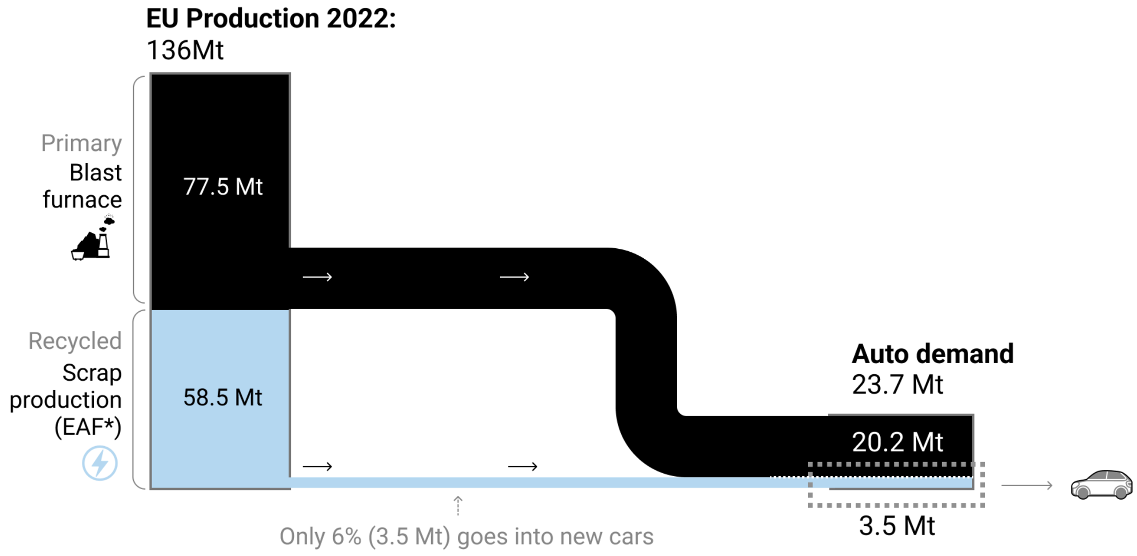
However, the recently published Auto Supply Chain Leaderboard by Lead the Charge shows that the industry as a whole is not progressing with decarbonizing its steel supply chain. The results present a dismaying picture regarding steel decarbonization. After an initial flurry of progress by multiple automakers last year, performance this year has largely stagnated. There is no change in the rank of the top five companies for the steel section from the 2024 edition. Volvo is the only company this year that has increased its score by more than 5 percentage points. Volvo's continued progress in this section sets a clear example of how industry leaders can continue to raise the bar for others to follow.

The EU should follow these industry leaders and create ambitious targets to foster the decarbonization of the automotive steel-supply chain and the uptake of high-quality recycled steel across the entire European automotive industry.
The revision of the end-of-life vehicles (ELV) legislation is a timely opportunity to improve the circularity in vehicle production and to reduce the overall carbon footprint of both ICE and EVs.

As of today the supply of available scrap steel in Europe consistently exceeds recycled steel demand in the EU and the use of recycled steel in the automotive sector from the scrap production route (EAF) is currently very low.

There is only a small proportion of secondary steel from post-consumer scrap currently being used in new vehicles: 11.3% in ICEs and 5.3 % in EVs. Overall we calculate that just 6% of current total scrap steel production in the EU goes into new cars (see graph below).

Only 6% of current EU steel scrap goes into new cars



*Electric Arc Furnace
Source: Ricardo (2024) The use of green steel in the automotive industry.

The amount of recycled steel used in cars is low due to copper contamination. This contamination significantly reduces the steel's quality and can cause surface cracking. For use in the automotive industry, steel must have an average copper content below 0.1% to meet strength and safety requirements. Some car parts require copper content as low as 0.06%.

2. Why recycled-content targets for new cars will improve Europe's competitiveness

The European Commission's Steel and Metals Action Plan, published on 19 March, clearly outlined the current challenges facing the European steel scrap market:

> *"(...) the volume of scrap used for recycling in Europe is diminishing. It is due to two factors: a lack of demand from the EU industry (especially for steel) and better market conditions for scrap in third countries (...) As a result, ferrous scrap exports have more than doubled over the last few years, reaching a maximum of 19.43 million tonnes in 2021 (about 20% of total scrap generated in the EU). (...) To reverse this trend, the first objective is to stimulate*

demand, by increasing the use of such resources in the EU. To achieve this, scrap should be better sorted and treated to ensure its usability in high-quality applications such as automotive."

T&E supports the analysis of the Commission, particularly the emphasis on stimulating demand as an initial step to combat these trends. Recycled content targets for steel, in our opinion, could be crucial in generating this demand and supporting the EU's goal of utilizing our continent's finite resources. Therefore, improving the EU's steel-scrap recycling capabilities will enhance EU competitiveness and lessen Europe's reliance on strategic and critical raw materials.

- **Using less primary steel in European cars would reduce Europe's dependency on coke coal and iron ore.** Through better incentives for scrap recycling, the EU would be able to collect and re-use huge amounts of copper, which the European Commission declared as a strategic raw material in 2023.

- **Using more recycled steel could reduce the EU's need for mined materials.** Recycled steel produced in Electric Arc Furnaces (EAFs) only needs about 5-12 kg of coal for each tonne of steel compared to the 770 kg needed in the primary BF-BOF route. The EU is a net importer of key production inputs for steel. In 2021, the EU imported approximately 28.7 million tonnes of coking coal, accounting for about two-thirds of its total consumption. Coke coal is listed by the European Commission as a critical raw material.

- **The Oeko-Institut study shows that by creating more incentives for the usage of high-quality steel scrap in cars, the recycling industry would be able to collect and recover up to 52.000t of copper p.a. by 2035.** Copper has been declared as a strategic raw material in 2023 by the EU. Copper is needed for all renewable energy technologies, including wind, solar and energy storage, as well as the grid infrastructure.

3. Method and result of the techno-economic impact assessment

3.1 The model and key assumptions

The model, developed by Oeko-Institut, determines the environmental and economic impacts of policy options. It covers the EU-27 and the period up to 2040, with results available in 5-year increments from 2025. Mass flows from sales until end-of-life are key, with impacts directly linked and proportional to them. The model uses data from JRC-RMIS and Greet to model material composition and differentiate mass flows into engine types (ICE, BEV, HEV, PHEV).

50% of EU-placed vehicles are assumed to be disposed of in the EU, based on Eurostat data. Recycling includes depollution, dismantling, shredding, and material-specific processes. For HEVs, PEVs and EVs it is assumed that 90% of the vehicles are processed at recycling plants in the EU. This assumption was made following interviews with OEMs and recycling companies as part of the ELV Impact Assessment supporting study on their expectations regarding the return rate. Due to the valuable materials in electric cars, there is a much greater interest from OEMs in establishing closed-loop recycling within the EU.

The study makes a clear distinction between flat and long steel as well as cast iron. The authors use the date of "Steelonthenet", which shows that 75% of the total weight of an ICE passenger car is composed of metal (iron, steel, aluminium, magnesium, copper, and zinc). Overall, on average 58% of the total weight of the vehicle is steel. Flat steel products amount to

Share of steel and iron products in passenger cars PoM in the EU [% of total weight]

Material	ICEV	HEV	PHEV	BEV
Steel	57.4%	58.0%	54.6%	56.5%
Flat steel	46.0%	46.5%	43.8%	49.1%
Long products	11.4%	11.5%	10.8%	7.4%
Cast Iron	8.9%	8.8%	8.5%	1.4%

Source: Support Study Oeko (2022), expressed in %; additional assumptions for flat steel and long products

46% and long products to 11% of total weight (see chart). Flat steel is mostly used for bodywork (body, doors, boot/bonnet, bumpers etc.) and non-exposed components (fuel tank, exhaust system, radiator, wheels etc.) of a vehicle, while long steel is used for the engine, transmission, and powertrain. Battery electric vehicles (BEVs) do not have a crank shaft or a piston. Therefore, fewer long products are needed for BEVs than for ICE vehicles. **The authors of the study assume that the share of long steel for BEVs will be 40% less compared to ICE vehicles.** The differing proportions of long and flat steel in BEVs and ICEs mean that with the shift to electric drives, the use of recycled steel in new cars is even more difficult to implement.

3.2 Steel scrap and copper contamination

The high copper contamination of scrap-based steel is the main obstacle for the uptake of secondary steel in the automotive sector. The automotive industry demands high-quality steel with a maximum copper content of 0.1%, and some parts even require 0.06%, to meet its stringent strength and safety standards.

Today, recycled steel via the electric arc furnace (EAF) route usually contains a significantly higher proportion of copper (typically 0.3-0.4% Cu) than primary steel via the blast furnace - basic oxygen furnace (BF-BOF) route (< 0.02% Cu). Copper concentration in shredded end-of-life vehicle (ELV) scrap can range from 0.23% to 0.7%. While higher copper values could be tolerated for production of long steel and cast iron, a high purity (< 0.1% Cu) is required for the production of high quality flat steel.

Mandatory dismantling of copper-containing components (e.g. main wire harness, electric motor) can help to reduce the copper content in the steel scrap, but further processing of the steel scrap after the shredder is still necessary in order to achieve the high quality requirements for the production of flat steel. This requires an additional treatment step. In principle, there are two options that are being discussed: Dismantling of copper-containing components before shredding and additional sorting of the steel scrap after shredding.

About 60% of the copper in a vehicle is in the wire harness and in the engine, e.g. in the ventilation and heating systems. If about 50% of the main wire harness can be removed prior to shredding, this, combined with the dismantling of electric motors and generators in BEVs, could reduce the copper content in steel scrap from about 0.4% to about 0.2%. As the wires run through the entire vehicle, it is not economically feasible to dismantle the entire wire harness. Dismantling of e-drive motors also has a potential to contribute due to the large volume of copper included in EV motors (close to 29 kg in an average EV motor).

The Oeko-Institut study shows that it is technically feasible to effectively reduce the copper contamination of scrap-based steel from 0.4% to 0.06%, so it can be used in the production of automotive-grade steel in EAFs. This is achieved by dismantling the main wire harness and electric motor before shredding and through mechanical processing of the steel scrap after the shredder.

While dismantling key copper components such as the main wire harness and electric motors before shredding can lower copper content from ~0.4% to ~0.2%, achieving the stringent 0.06% threshold required for flat automotive steel relies on an additional stage of **mechanical scrap processing after shredding**. This involves advanced sorting technologies such as sensor-based systems — including induction sorting, laser-induced breakdown spectroscopy (LIBS), and X-ray fluorescence (XRF) — which detect and separate non-ferrous metal inclusions like copper by identifying their distinct electromagnetic or elemental signatures. These systems can precisely eject copper-bearing particles from the steel scrap flow, significantly improving the purity of recycled steel destined for automotive-grade applications.

Furthermore, the copper tolerance of products can be increased by manipulating processing (i.e., shorter oxidation times and surface quenching) and composition (adding nickel or silicon and avoiding tin) to overcome hot shortness. This has been the approach of Nucor, the largest steel recycling company in the United States, who have been able to penetrate the automotive steel market with EAF steel. Finally, vehicle design changes may also reduce the need for such interventions. Designs exist for **weight-saving aluminium wire harnesses**, and for the wiring wrapping around the vehicle to be detachable with one mechanical motion, making dismantling obsolete or at least easier.

While some ATFs already dismantle the copper wire harness, this practice depends on the facility's capabilities and available equipment. Manual dismantling is more likely in countries with lower labor costs. However, some facilities utilize **tools like the VRS Powerhand** to increase the cost-effectiveness of dismantling. VRS operators suggest that they can process over five cars per hour and generate between £40 and £60 in additional profit per vehicle, depending on the vehicle type and the quantity of valuable materials extracted. This makes VRS an attractive investment for recycling companies.

The total investment for a "Powerhand" is approximately 450,000 Euro. If used solely for extracting the copper wire harness, the return on investment could be expected within a year for a facility that processes over 10,000 ELVs annually. The study's authors assume that without a requirement to dismantle the main wire harness, only facilities with a similar or higher annual capacity for treating vehicles would invest in such devices. This is especially true for those facilities that are generally more engaged in removing parts for reuse. However, this could change if the ELVR mandates the dismantling of the wire harness, as is currently proposed.

3.2 Mandatory recycled content targets for steel: The scenarios

Targets were set at varying ambition levels (level 1: 25% in 2030 and 30% in 2035, level 2: 30% in 2030 and 50% in 2035). Secondly, the scenarios differentiated whether the recycled content targets should apply to the entire proportion of steel and iron in cars or whether the targets should apply equally to flat steel, long steel and cast iron. Since the shares of recycled content steel in long steel and cast iron can already be very high, the increase in the targets for flat steel can be lower than if the targets for flat steel, long steel and cast iron apply equally.

3.3 Results

A 30% recycled content target for the automotive sector by 2030 and 40% by 2035 can be achieved solely through closed-loop post-consumer scrap from ELV recycling. This is evident when comparing the required quantities of recycled steel and iron to the available quantities from ELV recycling (see table below). This, however, is contingent upon effectively reducing the copper content in steel scrap to well below 0.1%, and even below 0.06% for some applications.

However, the potential for closed-loop ELV recycling in the EU could be significantly higher than it is currently. Eurostat data shows that only 50% of vehicles placed on the EU market are disposed of and recycled within the EU. The remaining 50% is composed of stock changes, used car exports, and missing vehicles. However, the valuable materials in electric cars have increased OEM interest in establishing closed-loop recycling within the EU.

Comparison of total demand for recycled steel/iron in cars PoM in the case of RC targets and total amounts of steel reused/remanufactured and recycled steel from ELVs in the EU

	Scenario	2025	2030	2035
Total demand of recycled steel/iron for cars PoM [t]	RC 1	1,594,008	4,081,630	4,338,516
	RC 2	1,594,008	4,636,771	7,082,081
	RC 3	1,594,008	3,671,882	4,220,778
	RC 4	1,594,008	4,449,079	7,103,133
Total amounts of recycled steel/iron from ELVs [t]	EoL 1	4,463,752	4,957,980	5,941,928
	EoL 2	4,497,594	4,995,569	5,986,977

4. Policy recommendations

To boost the use of recycled steel use in the EU automotive industry, T&E is proposing the following changes in the ELV Regulation:

- **Setting green steel targets that include recycled steel or – as the next best option – at least mandatory recycled content targets for new vehicles sold in the EU from post-consumer) scrap:** Establish targets for recycled steel content, applying to the total amount of steel in new vehicles, starting with 30% by 2030 and increasing to 40% by 2035.

- **The EU should introduce quality requirements limiting copper contamination to <u>at least</u> 0.1% on secondary steel coming from ELVs** to increase the supply of high-quality scrap steel suitable for the automotive industry. This includes setting clear obligations for dismantlers and recyclers and ensuring compliance with recycling standards.

- **In order to drastically reduce the copper contamination, we recommend removing the main wire harness**, which is about 50% of the entire harness. The requirement for dismantling parts and components prior to shredding in Annex VII-C should be expanded to cover additional materials, including sensors, which are currently not included in the list. This will help avoid contamination of materials, thus increasing the availability of high-quality automotive grade scrap.

- **Improving transparency around steel scrap quantity, quality, and prices:** Developing harmonized definitions and new standards for high-quality steel scrap to facilitate trade in the industry and allow for the traceability of scrap.
- To ensure this leads to growth in local recycling capacities, with ensuing green industrial benefits, any recycled content targets should be complemented with **local content rules**, requiring the majority of the recycled content to be manufactured within Europe. (ie, the EU, the EFTA region and the UK.)
- **Increasing the collection rate of ELVs: Enhance the collection rate of ELVs by improving tracking and reporting mechanisms and by implementing stricter regulations on the export of used vehicles.** Collection of ELVs should be improved by introducing new financial incentives for owners to bring their ELV to an Authorised Treatment Facility by requiring Member States to establish a national Deposit Refund Scheme (DRS) in an effort to improve vehicle collection. Regarding exports, T&E proposes that a Euro 4 limit on vehicles exported to third countries be introduced from 2028 onwards, moving to a 5 year vehicle age limit from 2035 onwards. This will further reduce the flow of old, polluting vehicles to third countries.

Further information

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