

Exemption Evaluation under Directive 2000/53 EC

ACEA et al. Answers to Stakeholder Consultation Questionnaire
of Bio Innovation Service
and The United Nations Institute for Training & Research (UNITAR)
and Fraunhofer Institute for Reliability and Microintegration (IZM) dates 08.02.2024

**ENTRY 2 (c) (ii). Lead in Aluminium alloys not included in entry 2(c)(i).
with a Lead content up to 0,4 % by weight**

Application for an extension of Annex II EU ELV exemption No. 2(c) (ii).

(Lead in Aluminium alloys not included in entry 2(c) (i). with a
Lead content up to 0,4 % by weight)

This application is supported by the following associations:

- ACEA, the European Automobile Manufacturers Association, Brussels
(transparency registration ID number 0649790813-47)
- JAMA, the Japan Automobile Manufacturers Association, Tokyo / Brussels
(transparency registration ID number 71898491009-84)
- JAPIA, the Japan Auto Parts Industries Association, Tokyo
- CLEPA, the European Association of Automotive Suppliers, Brussels
(transparency registration ID number 91408765797-03)
- KAMA, the Korea Automobile & Mobility Association (KAMA), Seoul

This document consists of following two elements:

- PART A Background and technical information
- PART B Answers to the questionnaire

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PART A Background and technical information

Acronyms and definitions

Al	Aluminium
ELV	End-of-Life-Vehicles
Pb	Lead
RoHS	Directive 2011/65/EU, RoHS Directive

1. Introduction

Until the year 2000, there was no legal limit to Lead content in Aluminium. With Commission Directive (EU) 2000/ 53 EC from 18. September 2000, the Commission decided to limit the use of heavy metals in vehicles.

Granted exemptions are listed in Annex II of this Directive. In the initial version of Annex II, exemption 2 allowed the use of Lead in Aluminium with a Lead content up to 0,4 wt. % . Exemption 3 granted specific values for several components. In later Annex II reviews (2002, 2005, 2008) the exemptions 2 and 3 were combined to a new entry 2 with different subentries and specific scope. In 2008, with Commission decision 2008/689/EC, the exemption 2(c) Aluminium with a Lead content up to 0,4 % by weight was added in Annex II.

With Commission Directive 2013/28/EU, entry 2(c) was determined for review. Then with Directive (EU) 2017/2096 entry 2(c) was split into the two subentries 2(c)(i) and 2(c)(ii). In scope of 2(c)(i) are Aluminium alloys for machining purposes with a Lead content up to 0,4 % by weight (to be reviewed in 2021, and in the meanwhile receiving an expiry date as of the 1st of January 2028). Scope of 2(c)(ii) are Aluminium alloys not included in entry 2(c)(i) with a Lead content up to 0,4 % by weight (applies to Aluminium alloys where Lead is not intentionally introduced but is present due to the use of recycled Aluminium). 2(c)(ii) was determined for a review in 2024.



Figure 1.0 Aluminium scrap from ELVs; source: Kirchner VAR Verband der Aluminiumrecycling-Industrie e.V.

The reason why Aluminium under exemption 2(c)(ii) is containing Lead, is that when Aluminium is recycled, Lead is sometimes present in the old scrap. So secondary Aluminium or recycled Aluminium contains Lead as background element ^{1 2}. Therefore exemption 2(c)(ii) is essential for enabling the use of secondary i.e. recycled Aluminium.

The Lead content in the secondary Aluminium depends on the available scrap (see figure 1.0) when the material is produced. To allow the use of different scrap sources derived from the recycling of industrial products with different age, the secondary Aluminium alloys are specified to contain Lead.

2. Markets

2.1 Global and European Aluminium market

2.1.1 Primary Aluminium market

Main producer of refined Aluminium in 2022 was China³ (see figure 2.1.1). The primary and secondary Aluminium production in Europe is currently on risk due to the non-competitive energy prices⁴.

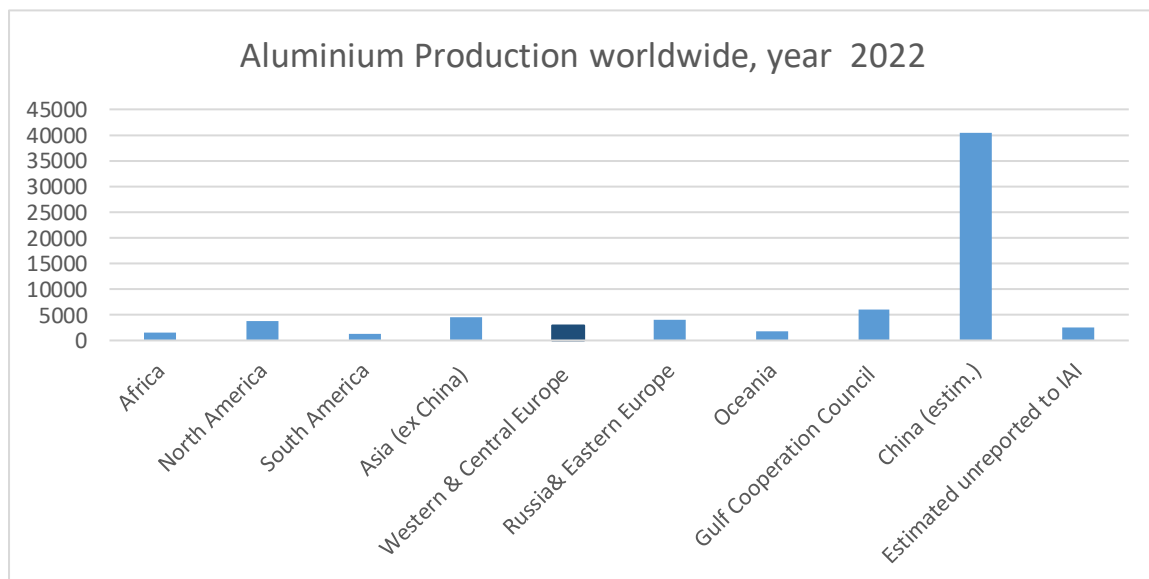


Figure 2.1.1: Global Aluminium production by markets (source see footnote 3)

¹ J. Lohse, U. Pirnkte, K. Sander: Report heavy metals in vehicles I, Final report 27. March 2000; Oekopol – Institut für Ökologie und Politik GmbH Hamburg

² J. Lohse, K. Sander, M. Wirts: Final report heavy metals in vehicles II; July 2001; Oekopol – Institut für Ökologie und Politik GmbH Hamburg

³ See also current data in the JRCRMIS system <https://rmis.jrc.ec.europa.eu/rmp/Aluminium>; last accessed 25.03.2024.

⁴ <https://international-aluminium.org/statistics/primary-aluminium-production/> last accessed 22.03.2024.

The global Aluminium market is crosslinked in a complex structure. This includes the primary and the secondary produced Aluminium.

On global level, in 2020, the share of the Aluminium demand of the transport sector was estimated at around 20 % (see figure 2.1.2).

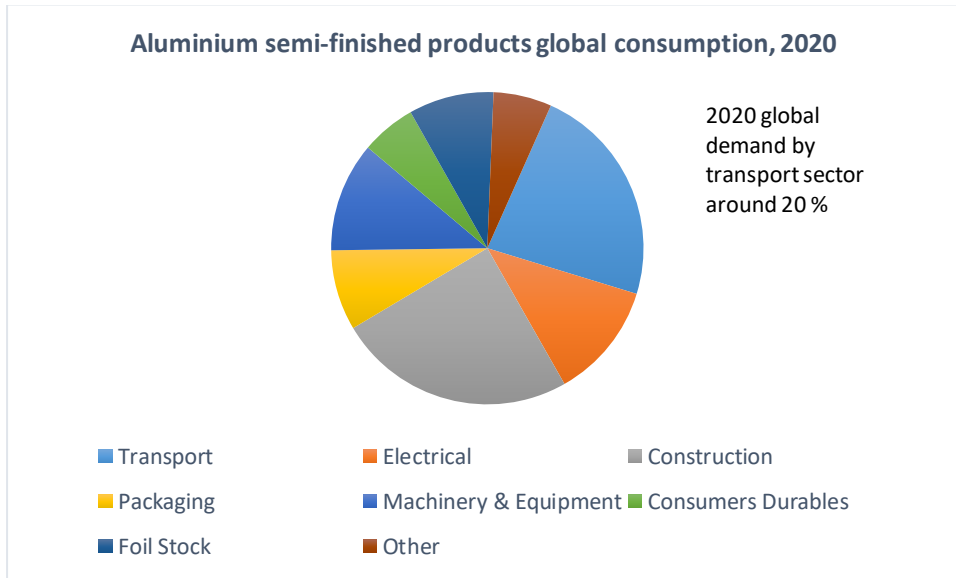


Figure 2.1.2: Global Aluminium semi-finished products demand 2020 by different application sectors.
Data source for figures 2.1.2, 2.1.3 and 2.1.4 ^{5 and 6}

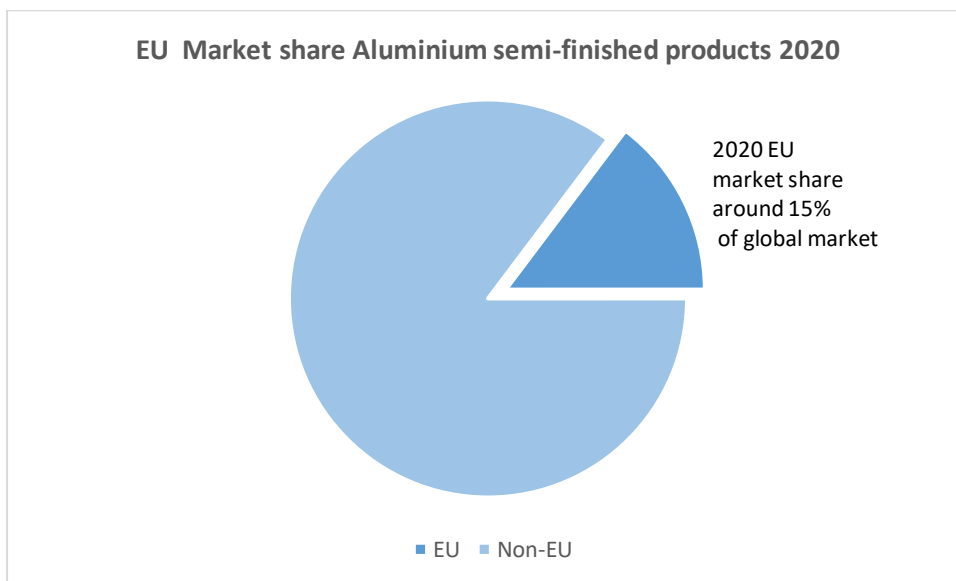


Figure 2.1.3: Aluminium market 2020 EU and non-EU.
Data source for figures 2.1.2, 2.1.3 and 2.1.4 ^{5 and 6}

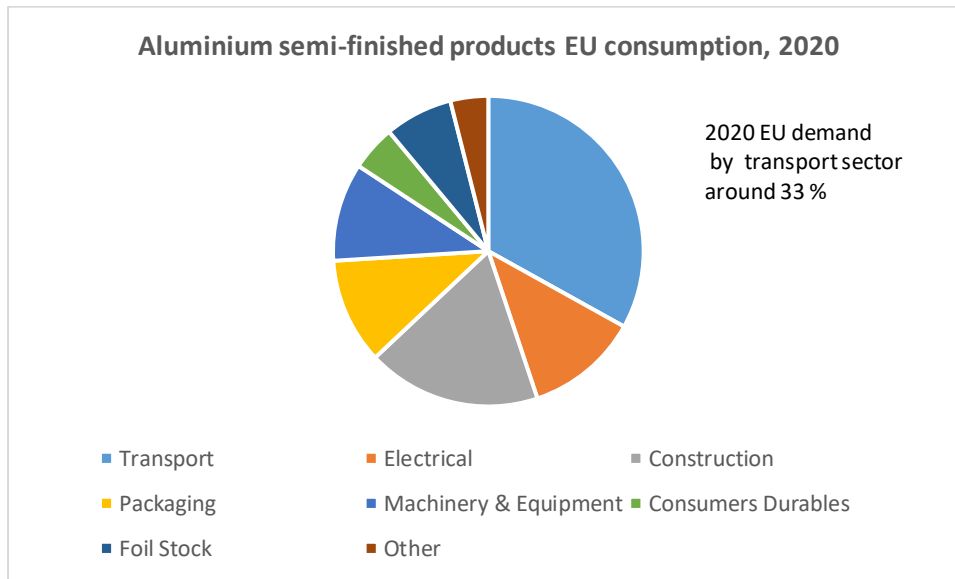


Figure 2.1.4: EU Aluminium semi-finished products demand 2020 by different application sectors.

Data source for figures 2.1.2, 2.1.3 and 2.1.4 ⁵ and ⁶

Figures 2.1.2 to 2.1.4 visualise that the European Aluminium market, with a percentage of around 15%, is part of a larger global market. Therefore, it is important to understand that the European Aluminium market for transportation applications is part of a much larger global market for the transport sector. Besides that, the material standards in the different markets differ and are not unified.

⁵ https://international-aluminium.org/resource/opportunities-for-aluminium-in-a-post-covid-economy/?_thumbnail_id=6715; last accessed 23.03.2024.

A second source for the estimated Aluminium use in Europe in the year 2022 is published within an European Commission report on critical raw materials from 2023⁶. The EU 2022 figures for Aluminium share per application and NACE Code are listed in the table 2.1.

Material	Application	Share	NACE 2 sector	VA in million €
Aluminium	Construction	21%	C25 – Manufacture of fabricated metal products, except machinery and equipment	163 568
Aluminium	Automotive Industry	19 %	C29 – Manufacture of motor vehicles , trailers and semi-trailers	194 448
Aluminium	Transport Equipment	19 %	C30 – Manufacture of other transport equipment	55 777
Aluminium	Packaging	15 %	C25 – Manufacture of fabricated metal products, except machinery and equipment	163 568
Aluminium	High Tech Engineering	11 %	C28 – Manufacture of machinery and equipment n.e.c.	204 200
Aluminium	Consumer Durables	5 %	C25 – Manufacture of fabricated metal products, except machinery and equipment	163 568
Aluminium	Refractories	3 %	C23 - Manufacture of other non-metallic mineral products	64 990
Aluminium	Cement	3%	C23 - Manufacture of other non-metallic mineral products	64 990
Aluminium	Abrasives	2%	C23 - Manufacture of other non-metallic mineral products	64 990

Table 2.1: EU Aluminium share per application and NACE Code in 2022

VA: Value added; NACE: Nomenclature statistique des activités économiques dans la Communauté européenne

The authors estimate the share of the Aluminium demand for motor vehicles with 20% of the total European demand in the year 2022.

2.1.2 Secondary Aluminium / Aluminium scrap markets

Secondary Aluminium or recycled Aluminium contains in most cases Lead as tramp element. The Lead content in the secondary Aluminium depends on the available scrap (see figure 1.0) when the material is produced. To enable the use of different scrap sources derived from the recycling of industrial products with different age the secondary Aluminium alloys are specified to tolerate Lead. These material standards are market specific. Aluminium scrap is a global traded product based on demands and prices. The Aluminium scrap market is a global market with different interests in single markets.

Aluminium scrap is worldwide asked, especially as the use of secondary Aluminium saves resources and CO2 emissions significantly. There is no vehicle specific secondary Aluminium market like for beverage cans. The available post-consumer scrap qualities in the different local markets depend on their economic situation and product life cycles. This impact the level of Lead contained in post-consumer Aluminium scrap. Scrap from older products contains more Lead than scrap from younger products.

⁶ [European Union 2023] European Commission DG GROW, Study on the Critical Raw Materials for the EU – Final Report (2023), page 63 doi: 10.2873/725585 Annex 6 Material uses (Aluminium) share, Eurostat 2022 NACE 2 sectors assignment Annual enterprise statistics for special aggregates of activities (NACE Rev. 2). Update from 28/02/2022.

Even if there are two different main groups for Aluminium in primary use applications, in the post-consumer scrap a separation between wrought and casting alloys is missing in most cases, as the global demand for Aluminium scrap is high and absorbs nearly all Aluminium scrap qualities. And volume scale application of modern separating technologies, which could separate casting from wrought materials, is missing.

For enabling flexibility to use different scrap grades, standards applied in the global automotive industry allow up to 0,4 wt. % Lead content in secondary Aluminium alloys. This is only to ensure that sufficient post-consumer scrap is available and to be processed in volume. There is no OEM specification known, which requires a minimum Lead content in secondary Aluminium alloys. In many cases the secondary Aluminium alloys delivered to produce automotive components do not consume the upper concentration limit of 0,4 wt. % Pb.

The amount of Aluminium scrap recovered from utilization of ELV's is not sufficient to satisfy the demand for recycled Aluminium in current vehicles. Therefore, scrap from other sources like construction or consumer durable products needs to be used and processed to produce the secondary Aluminium materials.

A popular international standard for Aluminium scrap are the specifications from ISRI⁷, which provide clear guidelines on the recommended scrap composition and allowable contamination limits on recycled material transactions (ISRIspecs.org). The standards define the minimum Aluminium content in the scrap fractions e.g. > 99 % or 99,45. They do not directly ban Lead.

Having screened current standards, we see the possibility reducing the limit from 0,4, to 0,3 % for new type approved vehicles after 1.1.2030. This allows to adopt specifications for vehicles being currently under development and validate the materials and components hereof accordingly.

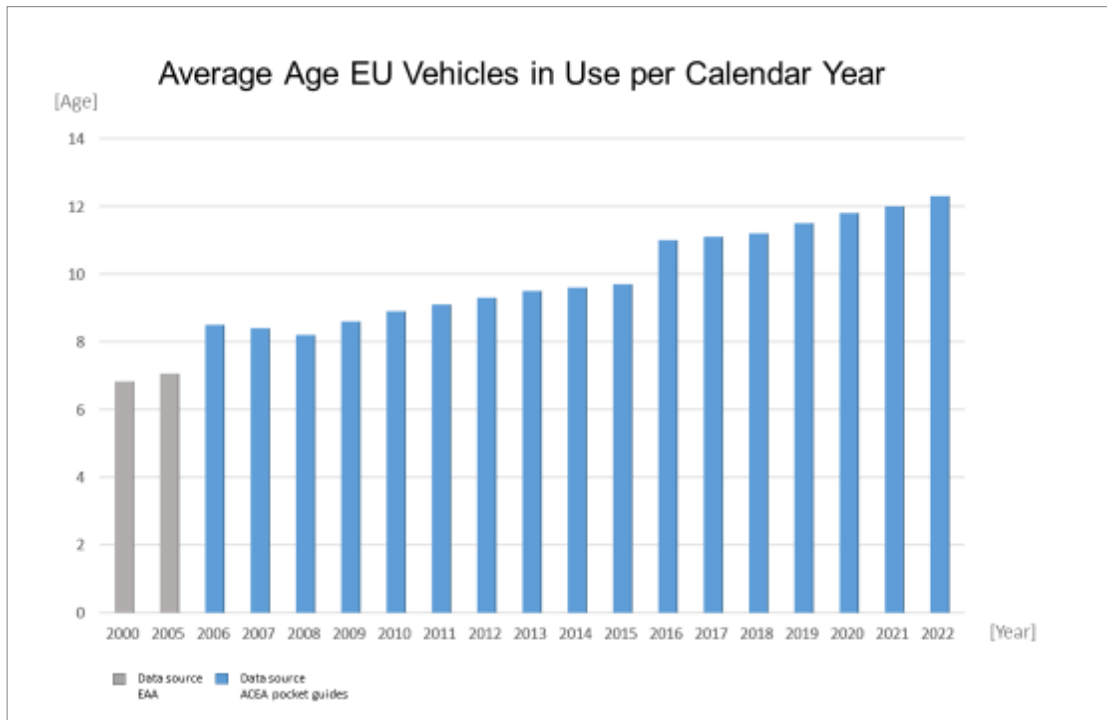
On top of that, the implementation of the proposed regulation on circularity requirements for vehicle design and on management of end-of-life vehicles, will make here another step forward regarding the collection of ELVs. With this regulation manufacturers will be obliged collecting more and grating regulated treatment of ELVs, ensuring more secondary Aluminium remaining in the EU market.

2.2. Global and European vehicle market

Figure 2.2.1 visualises that the average age of vehicles in the EU market has increased over the last two decades. The increase was from around 7 years in the year 2000 to around 12 years in the year 2022. The efforts in reducing Lead in Aluminium parts of vehicles therefore will shine up with a time shift in the utilization of ELV's in the EU.

This figure again underlines that with more older vehicles remaining in use in the EU, the share of old scrap, with more lead, remains longer in the EU. This has a positive impact on the European circular economy by saving resources and CO₂ emissions, which we strongly support. However, it also highlights the importance of having enough time for adopting materials and components to a new limit.

⁷ ISRI <https://www.isri.org/> <https://www.isri.org/recycled-commodities/isri-specifications-circular>



*Figure 2.2.1: Average age of vehicles in use in the EU market⁸.
 Data sources for figure 2.2.1 EEA and ACEA pocket guides*

Besides that, an increase in the production of new vehicles results in a higher demand of Aluminium. Even with more secondary Aluminium on the EU market, the share of primary Aluminium will increase to cover the demand of the different industries.

3. Use of Aluminium in vehicles

To contribute to the overall goal to save resources, the automotive industry is actively engaged to enable the use of secondary Aluminium alloys, to close material loops for post-consumer Aluminium.

Closed loop recycling is applied for production scrap in many cases.

For the use of post-consumer Aluminium, the automotive industry is an important market.

⁸ <https://www.eea.europa.eu/data-and-maps/figures/average-age-of-road-vehicles;>
 and [https://www.acea.auto/nav/?search=pocket+guide;](https://www.acea.auto/nav/?search=pocket+guide) last accessed 11.04.2024.

3.1 Literature data

Aluminium in vehicles 2022^{9,10}

A recent study commissioned by European Aluminium and conducted by Ducker Carlisle has evaluated that the average amount of Aluminium used in European cars has increased by 18% from 174 kg in 2019 to 205 kg in 2022. The authors allocate a significant part of the increase to the growth in new registered electric vehicles (EV's). They estimate the Aluminium content in a BEV with around 280 kg on average compared to around 170 kg in a petrol or diesel ICE-only vehicle.

3.2 Figures determined by the automotive industry

2024

We conducted a data evaluation. The figures are based on samples (anonymized data) resp. current provided data. We note that the total amount of Aluminium per vehicle increased. There is a broad range of amounts of Aluminium used in a vehicle. Aluminium uses have a range from around 100 kg to around 380 kg per vehicle. We estimated the average amount of Lead uses per vehicle, covered by exemption 2 c(ii). We estimate that the single concentration ranges between 0,1 and 0,4 %.

We note that the Lead content on average decreased to a mean value of around 60 g, with a range from around 10 g to around 250 g Pb/vehicle. With on average around 60 g Pb /vehicle and 12.910.891 new registered vehicles in 2022 this sums up to around 780 tonnes Pb for all new registered vehicles in scope.

EV have a higher share of Aluminium in use. EV's have less Pb in Aluminium. We assume the reason in the differences of propulsion (ICE vs EV).

The development on vehicle level is summed up as following

Year	Average weight /vehicle EU Pb [g] per entry 2c(ii)
2010	120
2014	80
2020	70
2024	60

⁹ <https://aluminiumtoday.com/news/aluminium-usage-in-cars-surges-as-automotive-industry-shifts-towards-electrification> referencing to <https://www.duckercarlisle.com/european-aluminum-commissions-ducker-carlisle-for-aluminum-content-in-cars-study/> last accessed 23.03.2024

¹⁰ https://international-aluminium.org/resource/opportunities-for-aluminium-in-a-post-covid-economy/?_thumbnail_id=6715

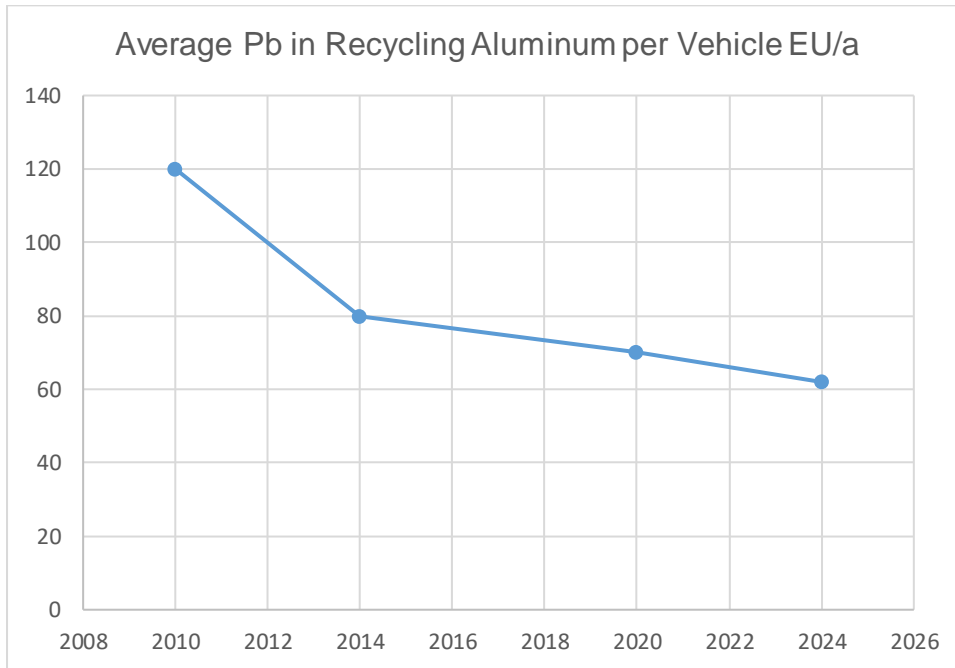


Figure 3.2.1: Average Pb content in vehicle due to use of recycling Aluminium

PART B Answers to the questionnaire for the Review of Exemption 2(c) (ii) of ELV Annex II

Preliminary notes of the consultants

Since the scope of exemption 2(c)(ii) is defined via the scope of exemption 2(c)(i), both exemptions are listed in the below table as exemption 2(c) series even though only exemption 2(c)(ii) is due for review.

Table 1: Current wordings, scopes and expiry dates of the exemption 2(c) series

No.	Exemption	Scope and dates of applicability
2(c)(i)	Aluminium alloys for machining purposes with a lead content up to 0,4 % by weight	Vehicles type-approved before 1 January 2028 and spare parts for these vehicles
2(c)(ii)	Aluminium alloys not included in entry 2(c)(i) with a lead content up to 0,4 % by weight ¹	This exemption shall be reviewed in 2024

Figure B 1: Table 1 from consultant questionnaire on exemption 2(c)(ii)

Baron et al. (2022) recommended in their review of the equivalent **RoHS** exemption 6(b) (I) that the lead content defining the scope of this exemption can be reduced from 0.4 % to 0.3 % as a consequence of this development. The recommended exemption is listed as 6(b) (III) in the below table.

Table 2: Renewal of current exemption 6(b)(I) as 6(b)(III) as recommended by Baron et al. (2022)

	Exemption formulation	Duration
6(b)-I	Lead as an alloying element in aluminium containing up to 0,4% lead by weight provided it stems from lead-bearing aluminium scrap recycling	Expires 12 months after the decision for all categories
6(b)-III	Lead as an alloying element in aluminium casting alloys containing up to 0,3% lead by weight provided it stems from lead-bearing aluminium scrap recycling	Expires on 21 July 2026 for all categories

Source: Baron et al. (2022)

Figure B 2: Table 2 from consultant questionnaire on exemption 2(c)(ii)

Questions of the consultant consortium

Answers in blue color

Question 1.

Can the lead content in exemption 2(c) (ii) be reduced from 0.4 % to 0.3 % to reflect the declining share of lead in aluminium scrap? If not, please explain your objections. Please note that this question does neither imply that the future exemption 2(c)(ii) would automatically follow the expiry date recommended by Baron et al. (2022) nor that the wording of exemption 6(b)(III) would be adopted.

As outlined in PART A, the market for primary and secondary Aluminium is a global market. Even if it was not feasible to find figures for that, we assume that the Lead concentration in Aluminium scrap in ELV's has decreased.

However, there is no vehicle specific Aluminium scrap market, and the available quantities of automotive Aluminium shredder scrap would not be sufficient to satisfy the demand. Firstly, the number of vehicles produced annually has increased. Secondly, the amount of primary and secondary Aluminium used per vehicle has increased and thirdly, the ELV's being scrapped have an average age between 10 to 20 years. Over all sectors and exempting packaging applications, we assume product life cycles between 10 to 40 years. To cover the demand for the use of recycled Aluminium in new vehicles, post-consumer scrap, with different grades, from other industry sectors, has been sourced.

We note the increase in total Aluminium use and the share of virgin Aluminium which is needed to satisfy the demands of all industry sectors. Based on that we expect a further decrease of Lead in post-consumer Aluminium scrap from different industry sectors.

Having screened current standards, we see the possibility to reduce the limit from 0,4, to 0,3 % for new type approved vehicles after 1.1.2030. This allows to adopt specifications for vehicles being currently under development and validate the materials and components hereof accordingly.

To reduce the exemption of Lead in Aluminium to 0.3% would possibly force some recyclers on the global markets to dilute their recycled alloys with more primary material to stay below the exempted levels.

Keeping the exemption of 0.4% Lead content in Aluminium provides an effective and efficient way of utilisation for recycled Aluminium scrap sourced within the entire European Union and enables a transition to a new target from 2030 onwards.

Question 2.

In case you do not agree to reduce the lead threshold to 0.3 %: The revised standard EN 1706 for the chemical composition of cast aluminium was released in 2020/2021 and incorporates the declining lead content in aluminium scrap setting a 0.3 % threshold as well. Why should, in the light of this, the lead threshold remain at a higher level than 0.3 %?

EN 1706 is one standard of other standards applied for castings alloys in the EU. There are numerous other standards (e.g. Japan, Korea, China, North America, South America and India).

Question 3.

If you do not agree to the 0.3 % threshold: Is there any other threshold below 0.4 % that would be acceptable? Please explain the background of your statement.

Please see answers given above.

Question 4.

Following the above prognosis of ACEA et al.: Could the lead threshold level be reduced to 0.2 % in exemption 2(c)(ii)?

Market development is currently not foreseeable. This applies to the available quantity of ELVs as well as the available quantity of scrap qualities on the world market. In addition, the interaction with circular economy goals is still unknown and requires further monitoring.

Question 5.

If not, when would you estimate this 0.2 % level to be achieved in aluminium alloys produced from scrap aluminium?

Please see answer to question 4.

Question 6.

Aluminium alloys for machining purposes are normally wrought aluminium, not cast aluminium. Do you know of cases where cast aluminium or any other form of non-wrought aluminium is used for machining?

We are not aware of such applications.

Question 7.

What is the amount of lead in the scope of exemption 2(c)(ii) that would be contained in vehicles

- a. placed on the EU market
- b. worldwide

in case the exemption is continued? Please provide a rough calculation or substantiated estimate.

We expect a further decrease within the next decade, independently from the current tolerated Pb background concentration level of 0,4 %. Please see also information given in Part A.

Question 8.

Overall, please let us know whether you agree with the necessity to continue the exemption and your arguments for or against the continuation.

Please, see answers given above and Part A.

Question 9.

Is there any other information you would like to provide?

Please, see Part A.