Supporting the Evaluation of the Directive 2000/53/EC on end-of-life vehicles

Final Report

Contract details
European Commission – DG Environment A.2.
Service contract supporting the Evaluation of the Directive 2000/53/EC on end-of-life vehicles
under framework contract No. ENV.F.1.FRA/2014/0063

Presented by
Trinomics B.V.
Westersingel 34
3014 GS Rotterdam
The Netherlands

Contact person
Mr. Robert Williams
T: +44 7950 229 107
E: rob.williams@trinomics.eu

Date
Rotterdam, August 2020

Abstract
This report presents the findings of an evaluation study contracted by the European Commission in support of the evaluation of Directive 2000/53/EC on end-of-life vehicles (ELVs). A combination of research methods and analytical tools have been used, including literature review and consultation via both open public questionnaires as well as targeted questionnaires and interviews. Overall, this study finds the Directive effective, relevant, coherent, and adding value at EU level, although it identifies a number of issues that could be improved. Member States have broadly achieved their recycling and recovery targets, the capacity to treat ELVs has increased and hazardous substances have been removed. The current system of ELVs and vehicle registration is resulting in an under reporting in the number of ELVs. Recycling of some ELV material is hampered by their low market value. There is no minimum frequency for evaluating the exemptions for hazardous substances. Overall costs and benefits are hard to quantify and isolate, but there are no clear excess burdens. New materials and the increase in electric vehicles will bring new issues and there is need to consider how the costs and benefits of these are distributed. The need for the ELV Directive remains. There is environmental justification for widening the scope to include more vehicle types, but the economic and other reasons for originally limiting the scope to cars remain valid.

Trinomics

Rotterdam, 3rd April 2020

Client: European Commission – DG Environment A.2

Service request No. 39 under framework contract ENV.F.1./FRA/2014/0063

Service Contract supporting the Evaluation of the Directive 2000/53/EC on end-of-life vehicles

Authors:
Rob Williams, William Keeling, Foivos Petsinaris (Trinomics)
Yifaat Baron, Georg Mehlhart (Oeko-Institut e.V.)

In association with:

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

RICARDO

CONTENTS

List of abbreviations

ACEA	European Association of Automobile Manufacturers
ASR	Automotive Shredder Residues
ATF	Authorised Treatment Facilities
BAT	Best available techniques
BEV	Battery Electric Vehicle
Batteries Directive	Batteries Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators
BEUC	European Consumer Organisation
CLP	Classification, Labelling and Packaging (CLP) Regulation ((EC) No 1272/2008)
CMI	Car Manufacturing Industry
CoD	Certificate of Destruction
EC	European Commission
ECHA	The European Chemicals Agency
EEA	European Economic Area
EEA	European Environment Agency
EEE	Electric and electronic equipment
EHS	Environment(al), health and safety
ELV	End-of-life vehicle
ELVD	Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles - Commission Statement (OJ L 269, 21.10.2000, p. 34–43). Directive as last amended by Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 (OJ L 150, 14.6.2018, p. 141).
EoL	End-of-life
EPR	Extended Producer Responsibility
ELoW	European List of Waste
EV	Electric Vehicle
EU	European Union
EuRIC	European Recycling Industries' Confederation
FCEV	Fuel Cell Electric Vehicle
FTB	Free take-back
FCHC	Fluorinated Chlorinated Hydrocarbon
GHG	Green House Gas
IARC	International Automobile Recycling Congress
ICE	Internal Combustion Engine
IEC	International Electrotechnical Commission
IMDS	International Material Data System
ISG	Inter-service Steering Group
HTP	Human Toxicity Potential
HDV	Heavy Duty Vehicle (e.g. Trucks)
Li-ion batteries	Lithium-ion batteries
LSR	Light Shredder Residues

MS	Member States as addressed by the WFD and the ELV Directive ('Text with EEA relevance'): 28 Member States of the European Union plus 3 States of the European Economic Area (Norway, Iceland, Liechtenstein)
OEM	Original Equipment Manufacturer
PHEV	Plug-in Hybrid Electric Vehicle
PoM	Placed/ Put on the market
PPWD	Packaging and Packaging Waste Directive
PST	Post-Shredder Technologies
SVHC	Substance of Very High Concern
QCR	Quality Check Report
REACH	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC
RoHS	Restriction of Hazardous Substances Directive 2011/65/EC, Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment
SCM	Standard Cost Model
SME	Small Medium Enterprise
TAC	Technical Advisory Committee
ToR	Terms of Reference
VAs	Voluntary Agreements
WEEE Directive	Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)
WFD	Waste Framework Directive, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3) as last amended by Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 (OJ L 150, 14.6.2018, p. 141).
WSR / WShipR	Waste Shipment Regulation, Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste
WStatR	Waste Statistics Regulation, Regulation (EC) No 2150/2002 on EU waste statistics

Executive Summary

This evaluation concerns Directive 2000/53/EC on end-of-life vehicles (ELVD). With the adoption of the Waste Package in 2018[1], a review clause (Article 10a) was inserted into the Directive that states 'By 31 December 2020, the Commission shall review this Directive, and to that end, shall submit a report to the European Parliament and to the Council, accompanied, if appropriate, by a legislative proposal.'

In order to assess how well the ELVD has been working and to identify potential improvements, this study evaluates the Directive according to the high-level evaluation criteria set out in the Better Regulation Guidelines: effectiveness, efficiency, coherence, relevance and EU added value. Specific questions were developed for this study to evaluate the ELVD according to these criteria as proposed in the evaluation roadmap[2] and in the terms of reference for this study. These questions are presented in summary in chapter three and in more detail in Annex A (i.e. with an explanation of how they have been answered in the evaluation matrix).

This study included a literature review, open public consultation, targeted consultation (including a detailed survey and interviews) and a stakeholder workshop. This report collates and triangulates the findings from all of these methods. The lack of direct input from certain groups such as consumers and vehicle registration experts is a constraint, but we have made efforts to address this via literature review. Another difficulty has been with assessing the economics of the ELV treatment process overall and isolating and attributing ELVD specific aspects.

The ELVD influences and imposes obligations at several stages in the life of a vehicle. At the beginning of the lifecycle, the ELVD affects the design of new cars as it requires Member States (MSs) to encourage car manufacturers to increase the amount of recovered material used, and to create designs that promote recovery and reuse of parts and materials at end of life (EoL). The ELVD also contains provisions to exclude certain hazardous substances from new cars. At the end of the lifecycle, the final owner should dispose of the vehicle at an Authorised Treatment Facility (ATF) free of charge. Once an ELV has been delivered to an ATF to be treated and depolluted, the final owner should receive a certificate of destruction (CoD) for the deregistration of the car. Most of the ELVD relates directly to the treatment and depollution of ELVs. There are targets for the reuse, recycling and recovery of parts and materials (by weight). The ELVD requires MSs to report on the number of ELVs treated. Car manufacturers are obliged to provide information on materials in their products to facilitate their removal and recovery. There are specific requirements to remove certain vehicle components and liquids that are high pollution risks and/or contain materials of high value. ATFs must be registered, comply with minimum technical requirements, and be permitted by MS competent authorities.

[1] Directive (EU) 2018/849 of the European Parliament and of the Council of 30 May 2018 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment, see: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32018L0849

[2] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1912-Legislation-on-end-of-life-vehicles-evaluation

The report contains the following headline numbers regarding ELVs:

- In 2016, the 258 million passenger cars were registered in the EU, and these all fall within the scope of the ELVD. Around 90% of the 34 million lorries registered weigh less than 3.5 tonnes and are also within the scope of the ELVD. Lorries weighing more than 3.5 tonnes are not covered by the ELVD. The remaining 45 million vehicles, including motorcycles, trailers and semi-trailers, road tractors, special vehicles, motor coaches, buses and trolley buses, are not within the scope of the ELVD;
- In 2017, 11.21 million light commercial vehicles below 3.5 tonnes total mass (category M1) and passenger cars (category N1) left the stock of registered vehicles. Of these, 6.57 million were reported as ELVs and 0.87 million were reported as exports of used cars to non-EU countries. Therefore, the whereabouts of 3.77 million vehicles, which left the stock of registered vehicles, are unknown. The vehicles of unknown whereabouts are typically either exported (as used vehicles or ELVs), with this export not being reported, or dismantled but not reported as ELVs within the EU (see Figure 6-8);
- The average weight of an ELV in 2017 was 1088 kg[3]. This means that the 11.21 million vehicles leaving the stock in 2017 represent 12.2 million tonnes of waste;
- Table 6-11 gives an average % material composition of ELVs. Applying the average composition to the 12.2 million tonne total indicates a material flow of 70% (8.5 million tonnes) of ferrous metals, 4% (490 000 tonnes) of non-ferrous metals (excluding wiring harnesses), 3% (365 000 tonnes (glass) and 14.8% (1.48 million tonnes) of mixed plastics. These figures exclude tyres, battery casings and the plastic sheathing of wiring harnesses;
- The amount of plastic used in vehicles has increased over time. For example, as displayed in Figure 6-10 the plastic content of the Volkswagen Golf increased from 10% in the Golf II (1983-92), to 15.3% in the Golf V 2003-08) and 19.5% in the Golf VII (2012-19).
- The average age of ELVs is between 15 and 22 years, therefore the impact on ELV treatment of the increasing amount of plastic in new vehicles will increase in the coming years;
- As displayed in Figure 6-1 in 2017 the vast majority of the Member States reached the 85% target for re-use and recycling of ELVs;
- The share of reuse of parts and components from ELVs varies across the EU, from less than zero to 33% (Figure 6-2). The variation may be caused by different reporting methodologies as well as different conditions in the Member States;
- As displayed in Figure 6-9, metal and metallic components (such as catalytic converters and batteries) are nearly 100% reused and/or recycled, but a significant share of some other materials (e.g. glass, tyres and most plastics) are directed to energy recovery or disposal;
- The ELVD established minimum technical requirements for the treatments used in ATFs and shredders. Europe has approximately 14,000 ATFs and 350 automotive shredding facilities. The number of standard or substandard facilities before the implementation of the ELVD is unknown.

3 Source: Eurostat: unpublished data for 2018 for 16 out of 31 EU and EEA countries

The key findings and conclusions of the evaluation are:

This evaluation shows that the ELVD has largely delivered on its initial objectives (notably elimination of hazardous substances from cars, attainment of the recovery and recycling targets, increase in collection points for ELVs, and OEM provision of dismantling information on components in vehicles).

An important problem in the implementation of the ELVD is the large number of "missing vehicles", which are not reported, and represent about 35% of estimated ELVs each year (approximately 4 million). There is a variety of reasons for these missing vehicles, with some reasons posing a higher environmental risk than others. Furthermore, variation between MSs in vehicle deregistration procedures is an important aspect.

The main challenge for the ELVD today is to ensure better consistency with the objectives of the European Green Deal and the CEAP, notably in: the eco-design of cars to facilitate re-use and recycling; the promotion of more ambitious and specific targets for reuse, distinguished from those of recycling; and targets for recycling (possibly per materials rather than per weight); the use of recycled content materials in the manufacturing of cars; and the role played by producers in financing the costs of ELV management, which does not currently correspond to a fully-fledged Extended Producer Responsibility (EPR) scheme.

There are no minimum standards for inspections of the vehicle repair and scrapping sector. Their introduction could help ATFs improve their ability to compete with unregistered facilities. The scope of the ELVD leaves out about 25% of the number of vehicles (e.g. motorcycles and trucks). Their inclusion could be justified on environmental risk grounds, but the reasons why they were originally excluded remain true and would need to be considered.

The ELVD is also not fully adapted to address the challenges and opportunities posed by the evolution in the production of vehicles since its adoption in 2000 (e.g. increased use of new materials such as plastics and electronics, expected development of the market for electric vehicles).

The ELVD contains general provisions on many aspects, which are directly relevant to building a circular model for the car industry and addressing the challenges of the current car market. However, many of these provisions are not sufficiently detailed, specific and/or measurable. As a result, they have not brought about real improvements at the EU level to match the expectations that the car industry should truly become a circular industry.

The lack of coherence between the ELVD and other Directives also hampers progress towards the transition to a circular economy in the automotive sector. This is notably the case for:

- The definition of recycling, which is wider in the ELVD than in the waste framework Directive;
- The list of prohibited hazardous substances, which is limited to four heavy metals, though additional hazardous substances, prohibited in other legislation (e.g. RoHS) are contained in vehicle components and may hinder material recovery;
- The provisions on the design of vehicles for recycling in the ELVD and in the "3R" type approval Directive;
- The procedure for deregistration of vehicles in the ELVD and in the Directive on the registration documents for vehicles[4].

[4] Council Directive 1999/37/EC on the registration documents for vehicles, OJ L 138 1.6.1999, p. 57

1 Introduction

This final report begins with an introduction that describes the objective and the scope of the work we have completed.

1.1 Structure of the report

Section two of the report includes a brief description of the background to the initiative, including an intervention logic for the ELVD.
Section three lists the evaluation questions. These have been grouped in order to ease presentation and analysis, because there is some overlap between certain questions.
Section four describes the methodology we have followed. This includes a discussion of the strengths and weaknesses of our work and an assessment of the robustness of the findings.
Section five is a summary of the key facts relating to how the directive currently functions.
Section six contains our analysis of literature, data and consultation responses, and provides our answer to each of the evaluation questions. The analysis is presented against groups of evaluation questions.
Section seven presents the conclusion against each of the evaluation headings and questions

The report contains the following annexes:

A – Evaluation Matrix	- shows how each of the evaluation questions have been answered
B – Consultation strategy	– including different questionnaires.
C – Consultation synopsis report	- summary of the responses to all forms of consultation.
D – Public consultation report	- summary
E – Workshop report	- final minutes
F – Bibliography	

1.2 Study objectives and scope

1.2.1 *The objectives of the study*

The ELVD has been in force for 18 years. No substantial changes of the Articles were adopted for 17 years. With the adoption of the Waste Package in 2018, a review clause was established in Article 10a which states 'By 31 December 2020, the Commission shall review this Directive, and to that end, shall submit a report to the European Parliament and to the Council, accompanied, if appropriate, by a legislative proposal.'

In order to assess how well the ELVD has been working and to identify potential improvements, this study evaluates the Directive according to the evaluation criteria set out in the Better Regulation Guidelines[5], as interpreted in the Commission's evaluation roadmap[6] for this work, namely:

- ✓ **Effectiveness:** looking into the extent to which the actions defined under the Directive have been implemented and whether this has resulted in achieving the ELV objectives;

[5] https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
[6] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1912-Legislation-on-end-of-life-vehicles-evaluation

- ✓ **Efficiency:** assessing whether the obligations arising from the implementation of the Directive have been implemented in a cost-effective way and if there is a potential for further synergies to strengthen delivery while minimising costs and administrative burden, including impact on SMEs;
- ✓ **Relevance:** assessing whether the issues addressed by the Directive still match current needs (e.g. developments in terms of e-mobility or new hazardous substances) and contribute to solutions to issues addressed by wider EU policies on circular economy, plastics, resource efficiency, raw materials, etc;
- ✓ **Coherence:** assessing possible inconsistencies and overlaps of the Directive with the circular economy and waste legislation, in particular the Waste Framework Directive, REACH and the Batteries Directive and if the ELVD reflects the aims of this legislation such as the five step waste hierarchy, life-cycle thinking and resource efficiency;
- ✓ **EU added value:** of the Directive compared to what Member States could have reached acting alone at national, regional and international level.

These evaluation criteria are operationalised via questions specific to this evaluation. These questions are presented in summary in chapter three and in more detail (i.e. with an explanation of how they have been answered in the evaluation matrix (see Annex A). The questions were developed from those proposed in the Evaluation roadmap and in the terms of reference for this study.

1.2.2 *The scope of this study*

This study looks at the functioning of Directive 2000/53/EC on end-of-life vehicles, from its adoption in 2000, including all amendments until now and including its implementation in all EU Member States. In order to do this, we cover both the issues deriving from the nature of the legislation itself as well as those deriving from its transposition and implementation in Member States, including monitoring and enforcement. Within the evaluation, attention is also be given to the impacts of the Directive on the environment, raw material use, innovation, future relevance, worker safety and overall social and economic benefits. Additional input on specific aspects that need to be covered in the evaluation process was collected from stakeholder feedback on the evaluation plan. All the aforementioned aspects were taken into account in the evaluation process, but particular attention has been given to the following aspects:

- ✓ The **administrative burden** caused by the Directive (and how this differs among MSs);
- ✓ The existence of **obsolete measures** or **gaps** in the scope of the current Directive;
- ✓ The extent to which the Directive is **future-proof** and prepared for anticipated changes in the automotive sector, with specific attention the Directive's fitness for **the transition to innovative car technologies**, particularly Electric Vehicles (EVs) (including hybrids, Plug-in Hybrid Electric Vehicles (PHEVs), Battery Electric vehicles (BEVs) and Fuel Cell Electric Vehicle (FCEVs). During recent years EV sales have grown exponentially and by 2030 EVs are expected to account for around a quarter of total car sales in Europe;(IEA 2018);
- ✓ The Increasing complexity of material composition in cars will be given special attention;
- ✓ The handling of **ELVs of unknown whereabouts** - the number of ELVs officially treated in the EU is well below the number of ELVs that are generated in the EU, (Oeko 2018) even when accounting for export of used vehicles;
- ✓ The coherence with the EU's waste regulation, the Waste Electrical and Electronic Equipment (WEEE) Directive, the Restriction of Hazardous Substances (RoHS) Directive, Circular Economy

policy (including the plastics strategy), the chemicals legislation, Enhanced Producer Responsibility (EPR) and policies on the functioning of the EU's internal market.

The baseline / counterfactual for the ELVD is discussed in chapter 5 on the existing situation, with a summary of the data that is available on the situation regarding ELVs prior to the ELVD. The assumption on a counterfactual is that it would be the situation prior to the ELVD, where some Member States had their own ELVD type legislation, but others did not. However, there was no formal impact assessment of the ELVD prior to its creation, so no formal baseline was defined, and there is a lack of data to fully recreate this baseline.

2 Background to the initiative

2.1 Intervention logic

The basis of all evaluations is an ***intervention logic***, which shows the intended functioning, desired results and overall rationale of the Directive. The intervention logic should identify:

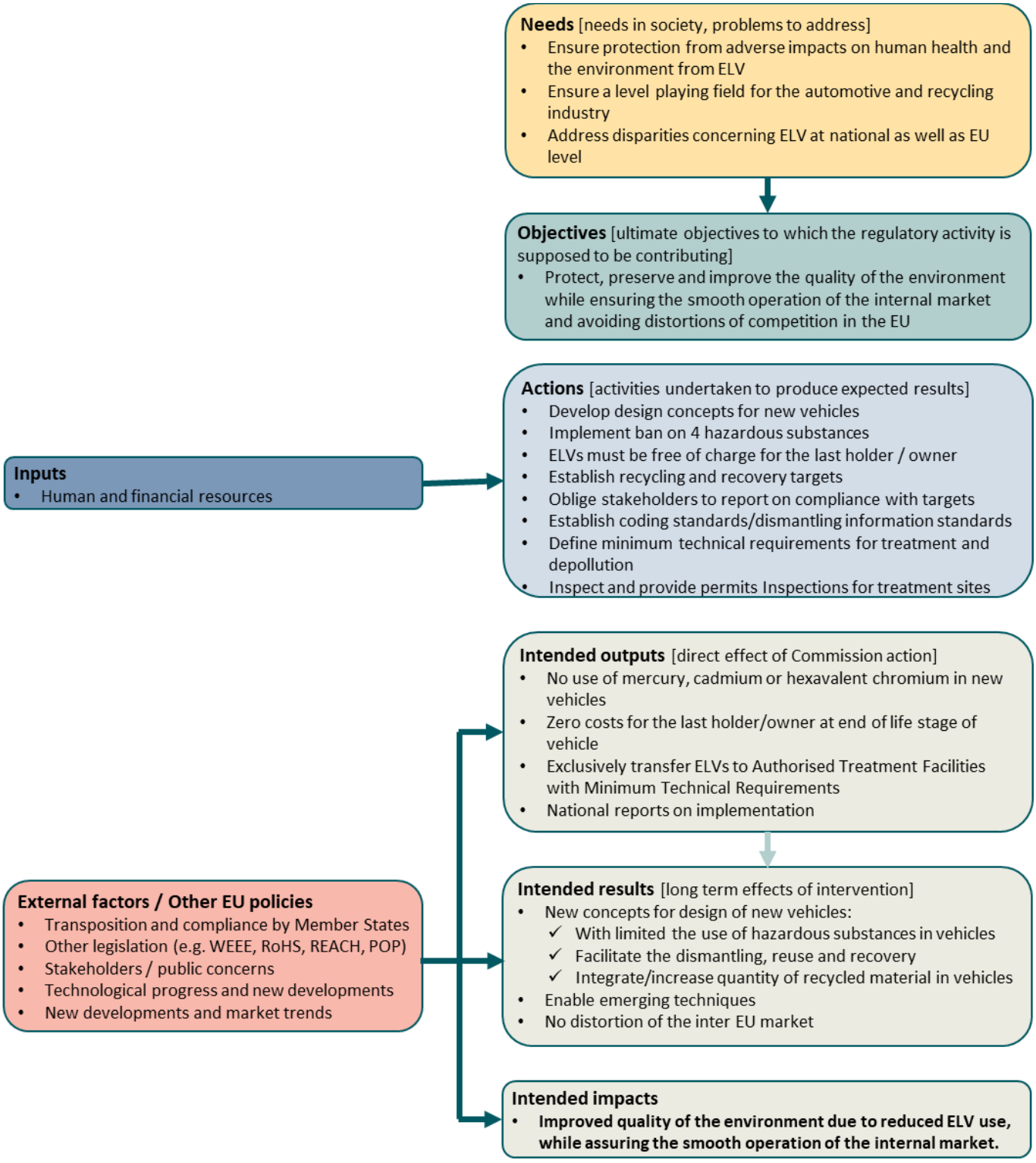
- The **needs** to be addressed;
- The **objectives** to put in place aiming to address the needs;
- The **inputs** to implement the Directive;
- The **actions and measures** undertaken to meet the objectives;
- The **consequences** (expected outputs and results) evolving from the actions; and
- The **expected impacts,** which should fully resolve the needs.

The intervention logic should also identify **external influences** – other factors that influence the expected outputs, results and impacts outside the scope of the ELVD.

Subtask 1.2.1 focuses on the ***verification of all relationships in the intervention logic*** and provides the basis for the evaluation questions that the study seeks to answer and helps define the scope and depth of the analysis. There was no formal intervention logic for the ELVD produced prior to its enactment. This has obliged us to develop our own intervention logic for the Directive. This is presented in Figure 2-1 and has been updated to reflect the comments made in the kick-off meeting for the study by the Commission asking for a more simple and clear structure as well as comments following the inception meeting. It is important to note that the intervention logic should be regarded as an iterative cycle being amended until all the different categories are fully in balance. It is important to stress that for evaluation purposes the intervention logic should be a recreation of the original logic behind the intervention. However, in the case of a legislation as old as the ELVD there is a need to consider the modifications it has undergone during its lifetime.

Note that section five provides further information on how the ELVD functions, its historical evolution and state of play of the current implementation.

Figure 2-1 Intervention logic for the ELVD



3 Evaluation questions

This chapter lists the key evaluation questions according to the five evaluation criteria.

The table below lists the questions from our evaluation matrix (see Annex A). These questions are based on those included in the Terms of Reference (ToR) but they were grouped and refined based on discussions during project inception. The evaluation matrix in Annex A shows which of these questions came from the TOR, which questions were added and the methods we have used to answer them.

We have slightly adjusted the order and grouping (but not the content) of these questions compared to what is in the evaluation matrix. This has been done to match the data, input that we have received and the analysis that we have carried out. It mainly reflects where questions overlap and has been done to avoid repetition of the inputs we have used and the answers.

Table 3-1: Evaluation Questions

Evaluation questions and sub questions
Effectiveness
Have the objectives and targets of the ELVD been met and monitored? To what extent have the objectives of the ELVD been achieved?
To what extent have the targets on ELVs, on reuse/recycling/recovery and on the elimination of the use of hazardous substances been met?
To what extent have the provisions on prevention, collection, treatment, reuse, recovery, coding standards/dismantling information been implemented?
To what extent can the achieved results/effects be credited to the ELVD?
To what extent were the results expected?
To what extent have the results been effectively monitored?
Have the reporting data from Eurostat and the information provided in data accompanying national quality reports been effective for monitoring of the targets?
To what extent does the current cooperation and data exchange between the national services and links with other relevant legislation serve the purpose of the ELVD?
To what extent are the current challenges for the communication of data on ELV for the compilation of statistics and the monitoring of target achievements addressed?
To what extent have the current mechanisms to measure the performance in the implementation of the ELVD and to monitor the results (e.g. challenges with communication of data) been effective?
What other factors contributed to or hampered the achievement of the objectives of the ELVD?
Missing ELVs What and to which extent did MSs implement measures to address the problems of "missing ELV" (e.g. cooperation mechanisms between MSs)?
What measures and criteria were applied by MSs for shipments to distinguish ELVs from used vehicles?
To what extent were implemented national Certificates of Destruction (CoD) systems designed to make sure that ELVs were dismantled at authorised treatment facilities (ATFs)?
To what extent do the incentives adopted by some MSs contribute to ensure that ELVs are treated in legal ATFs and get a CoD?
How effective were inspections in the MSs in the ATFs to identity their legality?
What and to which extent did MSs implement other measures to address the problems of "missing feedback"?

Evaluation questions and sub questions
How efficient is the exchange of information between the car registration and the environmental departments in the MSs?
How efficient has been the exchange of information/notification between the national authorities on re-registration of exported cars?
Extended Producer Responsibility
To what extent are the provisions on Extended Producers Responsibility (EPR) sufficient in the ELVD to contribute to a good implementation of its objectives?
How does the polluter-pays principle, applied as Extended producers Responsibility (EPR), affect the different operators involved and are the costs resulting from the EPR fairly allocated?
Circular Economy Links
To what extent did the dismantling of parts before shredding affect the ELV targets and the quality of recyclates, in view of the objectives of the Waste Framework Directive (WFD) and the Circular Economy Action Plan?
Internet sale of parts removed from ELVs (Added during the course of the study – not explicit in the original question list)
Did the ELVD undermine the achievement of the objectives of the raw materials and innovation policies?
Would the Directive benefit from material specific recovery targets?
Inspections of ELV treatment facilities
How effective were inspections in the MSs of the ATFS to identify their legality
Innovation
Did the ELVD foster or hamper innovation?
Efficiency
Costs and Benefits
To what extent are the costs involved proportionate, given the benefits, which have been achieved?
What are the costs and benefits (monetary and non-monetary) associated with the implementation of the ELVD for different players (e.g. public authorities, consumers?
To what extent are there distributional impacts of the costs and benefits resulting from the ELVD (e.g. on SMEs, different sectors, across MSs)?
To what extent were there (and what caused) differences in costs and benefits between MSs?
To what extent did the ELVD support the EU internal market and the creation of a level playing field for economic operators?
What is the impact of the provisions in the ELVD and its harmonisation of requirements on the competitiveness of the automotive industry within the EU?
Administrative Burden and Simplification Opportunities
Is there any evidence that the implementation of the ELVD has caused unnecessary regulatory burden or complexity?
Are there any good or bad practices that can be identified in terms of efficiency in the achievement of results?
Relevance
Hazardous substances in ELV and Annex II of the ELVD
Are the frequency and motivations for amending Annex II to the ELVD adequate?
Increased use of electric and electronic components in vehicles
To what extent can the ELVD cover new challenges for recycling that will contribute to better implementation of the aims of the ELVD?
Increased use of lightweight materials in vehicles like plastics, carbon-fibre, fibre reinforce (plastics materials and others

Evaluation questions and sub questions
To what extent is the ELVD addressing factors influencing EoL (strategies to reuse/recycling of materials, improved replaceability and repairability, remanufacturing and second use possibilities)?
Increase in sales of electric or hybrid vehicles
To what extent can the ELVD cover technological developments? (e.g. the growing share of electric vehicles)?
Scope (How well do the objectives of the ELVD correspond to the current needs within the EU?)
Is there still a need for the ELVD?
To what extent are the definitions in the ELVD still up to date?
Are there any needs relevant to the management of end-of-life vehicles that were not adequately covered by the ELVD or by any other instrument?
To what extent is the scope of the ELVD still appropriate
Coherence
To what extent is the ELVD internally coherent?
Does the ELVD contain any internal incoherencies?
To what extent is the ELVD coherent with other EU policy instruments and the overall EU and international policy goals?
To what extent are there synergies and overlaps between the ELVD and other EU policy instruments?
To what extent does the ELVD support the overall EU policy goals?
To what extent are the Definitions in the ELVD coherent with other EU policies?
To what extent is the ELVD coherent with international obligations (i.e. from the Basel Convention and Stockholm Convention?
EU Added value
What is the Added value resulting from the ELVD?
What is the Added value of the ELVD compared to what MSs could have been reached without the ELVD?
What would be the most likely consequences of stopping or withdrawing the existing EU intervention?
What is the Added value of the ELVD at EU and a global level (e.g. on the global automotive industry)?

4 Methodology

This chapter provides an overview of the research tools used in this study.

4.1 Evaluation matrix

The evaluation matrix is provided in Appendix A. It sets out the following aspects for each evaluation question, which were used to structure the study approach:

- **Operational sub-questions**: Separate sub-questions have been developed for each of the evaluation questions examined;
- **Judgment criteria:** The judgment criteria indicate how the indicators proposed were used to assess the performance of the Directive. These were used to answer the evaluation questions and form the conclusions;
- **Indicators:** Where possible/relevant quantitative indicators were identified for each sub-question. In other cases, qualitative indicators were used;
- **Method and data sources:** The relevant tool (e.g. literature review, surveys, interviews) and the actual sources were also identified.

4.2 Desk research / Analysis of data

The full list of literature reviewed for this study is given in the references section. In summary, key sources of information and data used were:

- The legal text and documents pertaining to the implementation of the Directive;
- Exemption evaluation reports related to the hazardous substance prohibitions[7];
- End-of-life vehicle statistics from Eurostat [env_waselv][8];
- Relevant studies as mentioned on the home page of the EC[9];
- Other relevant studies and presentations during conferences as available to the contractor.

Sources were selected by the researchers on the basis of keyword searches, as well as taking on board suggestions from stakeholders.

4.3 Targeted stakeholder consultation

We used a combination of survey and targeted interviews to obtain input from relevant stakeholders, which included the following target groups:

- Industry stakeholders: This group of stakeholders included trade associations and individual entities including vehicle manufacturers, authorised treatment facilities (ATF), recyclers, insurers (as vehicles which are damaged beyond repair in accidents typically become end of life vehicles that are owned by insurance companies), material recycling companies and organisations;
- Authorities including national and regional authorities responsible for ELV implementation as well national authorities responsible with vehicles registration;
- Representatives of civic society including environmental and motoring NGOs, consumer representatives and academics.

[7] See consultant final reports published under: https://elv.exemptions.oeko.info/index.php?id=20
[8] https://ec.europa.eu/eurostat/statistics-explained/index.php/End-of-life_vehicle_statistics
[9] https://ec.europa.eu/environment/waste/elv/events_en.htm

4.3.1 *Targeted survey*

We used a targeted online survey to obtain input on the broad range of topics examined in the evaluation. The online questionnaire was developed in consultation with the Commission services and was pilot tested with five stakeholders.

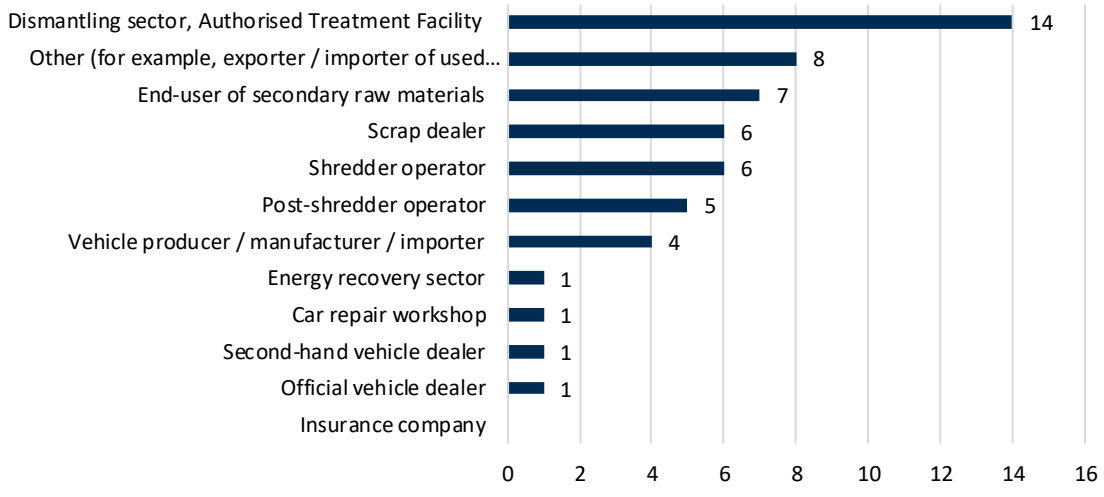
The survey was launched on September 25th 2019 and remained open for 8 weeks, until November 22nd. A total of 72 stakeholders responded to the targeted questionnaire coming from a range of stakeholder groups (table 4-1). Most responses came from authorities (mainly national and regional) followed by individual businesses and business associations. There were fewer responses from representatives of the civic society, including environmental organisations, NGOs, academic experts and trade unions. There were no responses from consumer representatives.

Table 4-1: Respondents to the targeted survey by type

Stakeholder type	Number of responses	Share of total
Authorities	**34**	**47%**
National	20	28%
Regional	10	14%
Local	4	6%
Industry	**21**	**29%**
Individual enterprises	12	17%
Business associations	9	13%
Civic society	**10**	**14%**
Environmental organisations/NGOs	4	6%
Academic/research organisation	2	3%
Trade unions	1	1%
Individual citizens	3	4%
Other/non-identified	**7**	**10%**
Total	**72**	**100%**

In terms of the responses from industry sector, most respondents were from the dismantling sector (ATFs) (see Figure 4-1). However, we obtained input from all parts of the supply chain directly or indirectly affected including both vehicle manufacturers, dealers and importers as well as those involved in the processing stages (end-users of secondary raw materials, scrap dealers and shredder operators). The only gap was the absence of responses from the insurance sector.

Figure 4-1: - Private sector stakeholders' ELV areas of operation



4.3.2 *Stakeholder interviews*

In addition to the survey, 9 interviews with selected stakeholders were conducted. These were intended to supplement the input from the survey. A total of nine interviews were conducted out of the total of 19 organisations contacted. These included four interviews that were conducted during the initial stages that assisted in the development of the survey questionnaire and provide some initial output. A number of stakeholders did not respond to our invitation for an interview despite the multiple requests. Nonetheless, the interviewees do represent a range of stakeholders including business associations, one European EPR organisation, one European ATF company, and one national authority.

Table 4-2: Summary of individual face to face* interviews

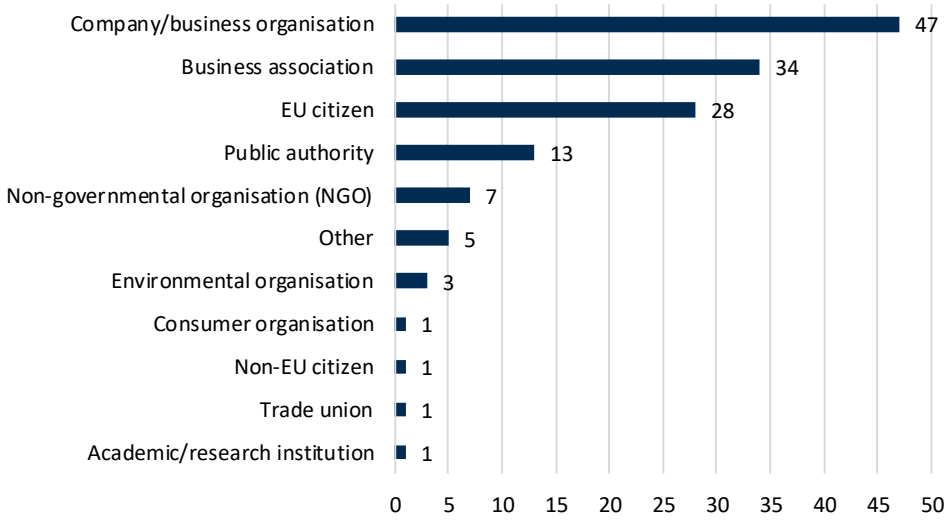
Type of stakeholder	Contacted	Completed (face to face)*
Industry association	14	6 (including 4 initial interviews)
ATF enterprise	1	1
EPR enterprise	2	1
National authority	1	1
Total		**9**

** over 50 representative associations and individual companies responded in writing to the targeted consultation*

4.4 Open Public Consultation (OPC)

In addition to the targeted consultation and open public consultation was conducted by the Commission, running from 6 August 2019 – 29 October 2019 (12 weeks). In total, 141 responses were received. The breakdown by stakeholder type is presented in Figure 4-2.

Figure 4-2 – Responses to the OPC by type (n=141)



More information is provided in the consultation synopsis report (Annex C).

4.5 Stakeholder workshop

In order to supplement the input of the stakeholder consultation, we organised a stakeholder workshop on February 5th 2020. The workshop took place after all the consultations (surveys and interviews) had been completed and once we have had developed a first analysis of the findings. The objective of the

workshop was to present the results of the OPC and targeted consultations to stakeholders, present our initial/emerging findings and receive input that could help us fill in information gaps.

A total of 71 stakeholders from authorities, industry representatives (economic operators and their representatives at EU and national level) and other stakeholders, including NGOs and academic experts participated.

Table 4-3: Stakeholder workshop participants by type

Stakeholder type	Number of participants	Share of total
National Authorities	**20**	**28.2%**
Industry	**50**	**61.9%**
Individual enterprises	16	22.5%
Industry associations	28 (14 EU and 14 national)	39.4%
Civic society	**4**	**5.6%**
Environmental organisations/NGOs	3	4.2%
Academic/research organisation	1	1.4%
Other/non-identified	**3**	**4.2%**
Total	**71**	**100%**

The following topics were covered during the workshop:

- Introduction to the purpose of the evaluation, as well as an overview of the evaluation roadmap and the expected timeframe (presented by DG ENV);
- Presentation by the study team on the analysis of the implementation of the Directive and the preliminary findings by evaluation question, followed by a Question & Answer session;
- Initial summary of the feedback received from stakeholders during the interactive session, followed by conclusions and closing remarks.

The workshop participants were invited to contact the study team to provide further feedback on the evaluation and were encouraged to reflect on what may be needed in the future. We used this input to validate and revise the findings in the preparation of the Final Report. The detailed report of the workshop can be found in Annex D.

4.6 Limitations and mitigating actions

There were a few challenges to the study and limitations inherent to the methodology, as discussed with the Commission during project meetings. The main limitations are described below, together with the measures taken to mitigate the impacts.

Stakeholder consultation

The stakeholder engagement task aimed to involve all affected stakeholders via the most appropriate methods. As such, a variety of tools were used to collect the evidence required for the evaluation, including the targeted survey and interviews, the Open Public Consultation and the stakeholder workshop. There were however a few limitations in the capacity to obtain relevant input:

- Input from targeted interviews was relatively limited. Despite our multiple contacts, a number of stakeholders declined our invitations for various reasons (preference to provide responses in written through the survey, no availability). As such, the number of individual responses was less than initially planned. However, in view of the participation of most of those contacted to the targeted survey and the stakeholder workshop, we consider that the impact to the validity of the conclusions was limited;

- We received no input from certain stakeholder groups, including insurers, consumer representatives and vehicle registration experts. This was despite our efforts in the context of both the surveys and the interviews. We partially mitigated this gap by tailored desk research aiming to reflect their viewpoints;
- We were conscious of the risk of consultation fatigue for stakeholders, especially those of EU associations consulted several times across this and other studies. We tailored stakeholder engagement activities in a way that minimised the time requirements for individuals and we piloted the survey to ensure that the questions included are appropriate and clearly stated.

Data collection

To fill the identified data gaps, internet keyword searches were performed to find additional literature sources. Following the initial methodology, further information was collected in the context of stakeholder workshop by some stakeholders. The existence of relatively recent studies on specific aspects, such as missing ELVs and registration issues was useful.

Cost and other data collection

The collection of data on costs associated with the ELV was rather challenging. Input from stakeholders was relatively limited and in many cases the responses/estimates provided differed greatly. In some cases respondents were unable to disentangle the costs associated with the Directive from other costs. This posed limitations to the capacity to estimate the costs. Where available, we used data from relevant studies/reports that helped us fill relevant gaps and cross check the input from stakeholders. In some other areas we had to apply our expert judgment or make a qualitative judgment.

The cross over with other Directives has meant that we have needed to retain focus on ELVs and avoid getting drawn into evaluations of related Directives (such as the Batteries Directive, and chemical legislation). There have also been difficulties associated with the complexity of isolating costs solely caused by the Directive. This is particularly difficult on the efficiency question. There is no impact assessment of the original Directive to draw upon (as it is an old Directive, and they were not required when it was formulated). This means there is no original estimate of costs of defined counterfactual. The counterfactual is hard to define as the Directive is old, and it is hard to predict what would have happened without it.

There are conflicting views and data available regarding the costs associated with dealing with ELVs. Many of the differences relate to where the boundaries of the costs and incomes are drawn, for example the incomes from parts removed and sold from ELVs are always included. There are also different approaches to the public administration of these issues between MSs. This has made it impossible to draw detailed conclusions on the costs associated with the ELV. We have presented the best data we have been able to collect and identify but it should be treated with caution.

Validity of analysis and conclusions

The information and data gaps due to the low level of participation could have had an impact on the validity of some of the conclusions. We used the stakeholder workshop that took place after the completion of the other consultation activities to present our initial findings and test them against a broad range of stakeholders that attended the workshop. We used their input to refine and, where needed, to revise our analysis. This gives us confidence that our findings and conclusions are valid.

5 Current situation

This chapter of the report contains a summary of the current situation. This includes a description of the history of the Directive, its main features and how it has been implemented in practice.

5.1 Introduction and historic background

5.1.1 *Historic background and baseline*

Waste management and waste legislation started at the EU level in 1975 with Directive 75/442 on waste and Directive 75/439 on waste oil.

Discussions on waste from ELVs go back to the 1970s. Illegal disposal of hazardous waste and the increasing share of plastic in the Light Shredder Residues (LSR) caused concerns. LSR are not easy to compact and they therefore used a large amount of volume within landfills. It is also not easy to incinerate LSR as it needs pre-treatment before incineration. The exhaust treatment of waste incinerators was less developed at that time and this risk also raised public concerns. Contamination of the metal scrap with heavy metals was another issue of concern at that time.

In 1996, Tuddenham et al. (1996) estimated in a study for the European Commission that on average, in the period between 1990 to 1994, approximately 8.9 million ELVs were generated in the EU-15 MS. The numbers were based on surveys of national deregistration. At the time, the number of domestically treated ELVs could be estimated for several MSs, but not for all and the issue of unknown exports to non-EU-countries was mentioned. Zoboli et al. (2000) estimated in their JRC-IPTS report between 7.6 and 10.3 million ELVs were available for domestic dismantling in the EU 15.

In 2000, the JRC-IPTS report (Zoboli et al. 2000) described the legislative situation in the EU, before the ELVD entered into force. This report is the closest thing which exists to a pre ELVD baseline. However, it does not cover all of the issues and requirements of the ELVD. At the time the ELVD was drafted there was no requirement to produce formal impact assessments including a baseline / counter factual of no intervention. The report contains the following summary:
'At end of1999, 10 EU member countries (AT, BE, FR, DE, IT, NL, PT, ES, SE and the UK) had specific regulations and/or industrial voluntary agreements (VAs) for ELV. Another three countries were discussing industrial agreements (FI and IE) or introducing legislation (DK). Six countries (AT, BE, DE, IT, NL and SE) combine VAs with legislation directly addressing ELV. AT, FR, IT and NL introduced VAs or countrywide initiatives before the drafting of the EU directive proposal. The VAs and legislation in other countries (BE, DE, PT, ES and SE) were developed in 1997-99 during the debate on the EU directive proposal. A process of integration between industrial agreements and legislation occurred in DE and SE after a long confrontation between industry and environmental policy-makers. In other large countries (FR, IT and the UK), ELV policy is mainly based only on VAs promoted by the car industry and involving a number of other industries. One major feature of these VAs is the absence of specific economic instruments of the free take-back (FTB) type and the prominence of free-market relationships. The agreement implemented in NL represents a specific approach for both its organisational framework and its economic incentives. A recycling fee is levied on new car prices and redistributed to dismantlers and recyclers to pay incremental recycling costs. Specific mechanical recycling targets are established. Most national voluntary agreements and/or legislation established a

recovery target rate of 85 % of car weight by 2002 and a total recovery target rate of 95 % by 2015. Most countries specify the targets only in terms of recovery rates (not recycling rates, as in the EU directive) thus allowing unconstrained energy recovery of ASR.'

The ELVD in 2000 addressed the management of ELVs at the European level for the first time.

5.1.2 *General purpose of objectives of the ELVD*

According to Article 1 of the ELV-Directive the Directive '*lays down measures which aim, as a first priority, at the prevention of waste from vehicles and, in addition, at the reuse, recycling and other forms of recovery of end-of-life vehicles and their components so as to reduce the disposal of waste, as well as at the improvement in the environmental performance of all of the economic operators involved in the life cycles of vehicles and especially the operators directly involved in the treatment of end-of-life vehicles.*'

The legal basis for the ELVD is Article 175(1) of the Treaty establishing the European Community (now Article 192 of the Treaty on the Functioning of the European Union, "TFEU"). The Directive establishes minimum requirements and Member States can establish more stringent national requirements, in accordance with Article 193 TFEU.

Recital (1) states: '*The different national measures concerning end-of life vehicles should be harmonised in order, first, to minimise the impact of end-of life vehicles on the environment, thus contributing to the protection, preservation and improvement of the quality of the environment and energy conservation, and, second, to ensure the smooth operation of the internal market and avoid distortions of competition in the Community.*'

While harmonising environmental requirements the Directive also aims to ensure the smooth operation of the internal market and to avoid distortions of competition in the Community by a Community-wide framework in order to ensure coherence between national approaches considering '*the principle of subsidiarity and the polluter-pays principle*' (recital (2).[10]

The ELVD establishes minimum requirements for the waste management of ELVs and reuse / recycling and recovery targets. Article 4 of the ELVD on 'Prevention' explicitly calls for design for reuse and recycling and establishes the prohibition of hazardous materials namely lead, mercury, cadmium or hexavalent chromium other than in cases listed in Annex II under the conditions specified therein. Criteria for the Commission to adopt delegated acts amending Annex II in order to exempt certain materials or components from these prohibitions are specified in the same Article.

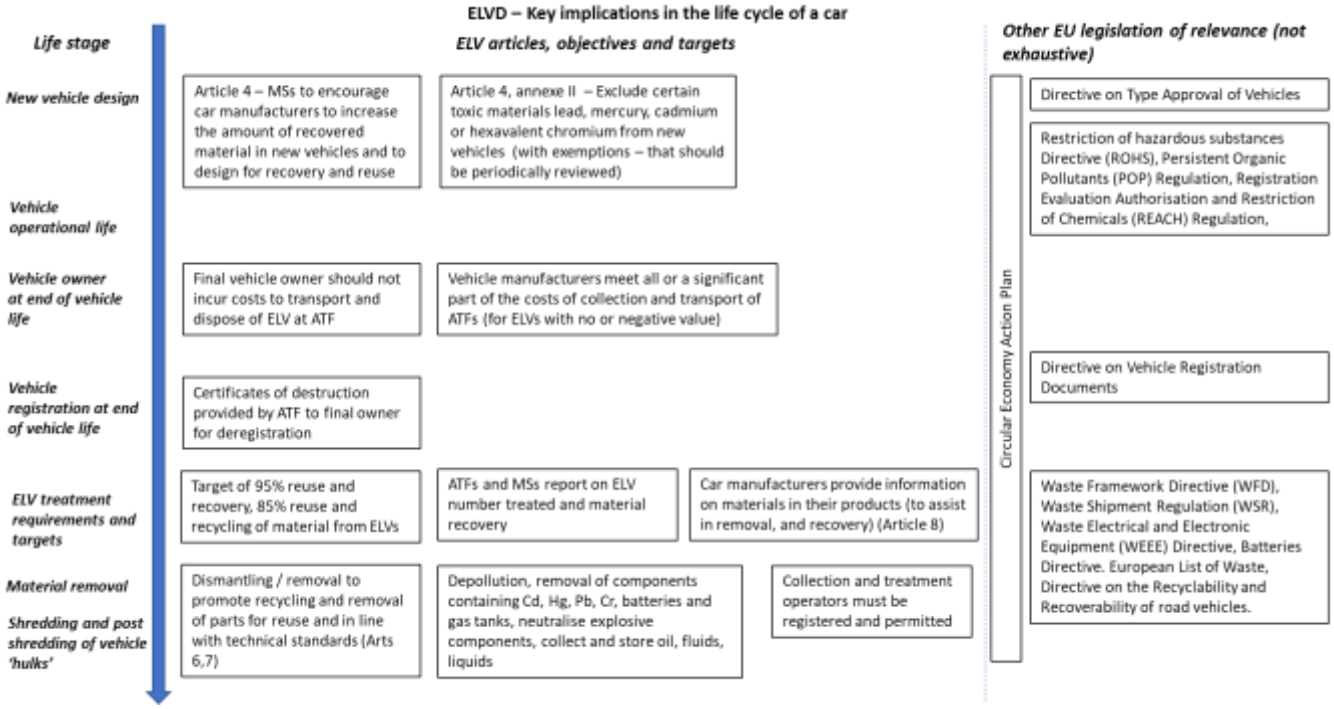
The justification for the ELVD includes ensuring that harmonised minimum environmental requirements for the design of vehicles and treatment of ELVs are established (recital (2)) and, second, 'to ensure the smooth operation of the internal market and avoid distortions of competition in the Community (recital (1)).

[10] The ELV-Directive does not explicitly refer to the term 'extended producer responsibility', as established by the Waste Framework Directive (2008/98/EC). Instead, the ELVD says in Article 5(4) that '*Member States shall take the necessary measures to ensure that the delivery of the vehicle to an authorised treatment facility in accordance with paragraph 3 occurs without any cost for the last holder and/or owner as a result of the vehicle's having no or a negative market value. Member States shall take the necessary measures to ensure that producers meet all, or a significant part of, the costs of the implementation of this measure and/or take back end-of life vehicles under the same conditions as referred to in the first subparagraph.*'

5.1.3 *Main provisions of the ELVD*

The principle scope of the ELVD is displayed in Figure 5-1 below which gives an overview of the provisions of the ELVD.

Figure 5-1: Summary of the ELVD



As the figure shows, the ELVD has influence / force at several stages in the life of a vehicle. The figure also shows that ELVD has some cross over with a variety of other EU legislation.

The ELVD affects the design of new cars, in that it requires MSs to encourage car manufactures to increase the amount of recovered material used, and to design in such a way as to promote recovery and reuse.

The ELVD also contains provisions to exclude certain toxic materials from new cars. The key legislative cross overs here are with the Type Approval of new vehicles, legislation related to the restriction and control of chemicals in general and the design aspects of the Circular Economy Action Plan.

The next stage of a vehicle's life when the ELVD has a significant effect is when the car comes to the end of its life. At this point, the final owner should not incur costs to dispose of the vehicle at an ATF. The costs of collection and transport to an ATF should be met/subsidised by the car manufacturers.

Once an ELV has been treated and depolluted by an ATF the final owner should receive a certificate of destruction (COD). This if often linked to legislation related to vehicle registration, as certain vehicle taxes can (in certain MSs) only be stopped for a vehicle owner when a COD has been supplied for it.

Much of the ELVD relates to the treatment and depollution of ELVs. There are targets on the reuse and recovery of materials (by weight). The ELVD also requires MSs to report on the number of ELVs treated. Car manufacturers are obliged to provide information on materials in their products to facilitate their

removal and recovery. There are specific requirements to remove certain vehicle components and liquids that are high pollution risks and/or contain materials of high value. ATFs must be registered, comply with minimum technical requirements and permitted by MS competent authorities. The aspect of the ELVD crosses over with both general waste legislation (e.g. the Waste Framework Directive and the Waste Shipment Regulation), and waste stream specific legislation, e.g. the Batteries Directive.

5.1.4 *Key figures describing the current situation*

Section 6 include the following key figures about ELVs and the ELVD.

- In 2016, 258 million passenger cars were registered in the EU, and these all fall within the scope of the ELVD. Around 90% of the 34 million lorries registered weigh less than 3.5 tonnes and are also within the scope of the ELVD. Lorries weighing more than 3.5 tonnes are not covered by the ELVD. The remaining 45 million vehicles, including motorcycles, trailers and semi-trailers, road tractors, special vehicles, motor coaches, buses and trolley buses, are not within the scope of the ELVD;
- In 2017, 11.21 million light commercial vehicles below 3.5 tonnes total mass (category M1) and passenger cars (category N1) left the stock of registered vehicles. Of these, 6.57 million were reported as ELVs and 0.87 million were reported as exports of used cars to non-EU countries. Therefore, the whereabouts of 3.77 million vehicles which left the stock of registered vehicles are unknown. The vehicles of unknown whereabouts are typically either exported (as used vehicles or ELVs), with this export not being reported, or dismantled but not reported as ELVs within the EU (see Figure 6-8);
- The average weight of an ELV in 2017 was 1088 kg[11]. This means that the 11.21 million vehicles leaving the stock in 2017 represent 12.2 million tonnes of waste;
- Table 6-11 gives an average % material composition of ELVs. Applying the average composition to the 12.2 million tonne total indicates a material flow of 70% (8.5 million tonnes) of ferrous metals, 4% (490 000 tonnes) of non-ferrous metals (excluding wiring harnesses), 3% (365 000 tonnes (glass) and 14.8% (1.48 million tonnes) of mixed plastics. These figures exclude tyres, battery casings and the plastic sheathing of wiring harnesses;
- The amount of plastic used in vehicles has increased over time. For example, as displayed in Figure 6-10 the plastic content of the Volkswagen Golf increased from 10% in the Golf II (1983-92), to 15.3% in the Golf V 2003-08) and 19.5% in the Golf VII (2012-19). The average age of ELVs is between 15 and 22 years, therefore the impact on ELV treatment of the increasing amount of plastic in new vehicles will increase in the coming years;
- As displayed in Figure 6-1 in 2017 the vast majority of the Member States reached the 85% target for re-use and recycling of ELVs;
- The share of reuse of parts and components from ELVs varies across the EU, from less than zero to 33% (Figure 6-2). The variation may be caused by different reporting methodologies as well as different conditions in the Member States;
- As displayed in Figure 6-9, some metal and metallic components (such as catalytic converters and batteries) are nearly 100% reused and/or recycled, but a significant share of some other materials (e.g. glass, tyres and most plastics) are directed to energy recovery or disposal;
- The ELVD established minimum technical requirements for the treatments used in ATFs and shredders. Europe has approximately 14,000 ATFs and 350 automotive shredding facilities. The number of standard or substandard facilities before the implementation of the ELVD is unknown.

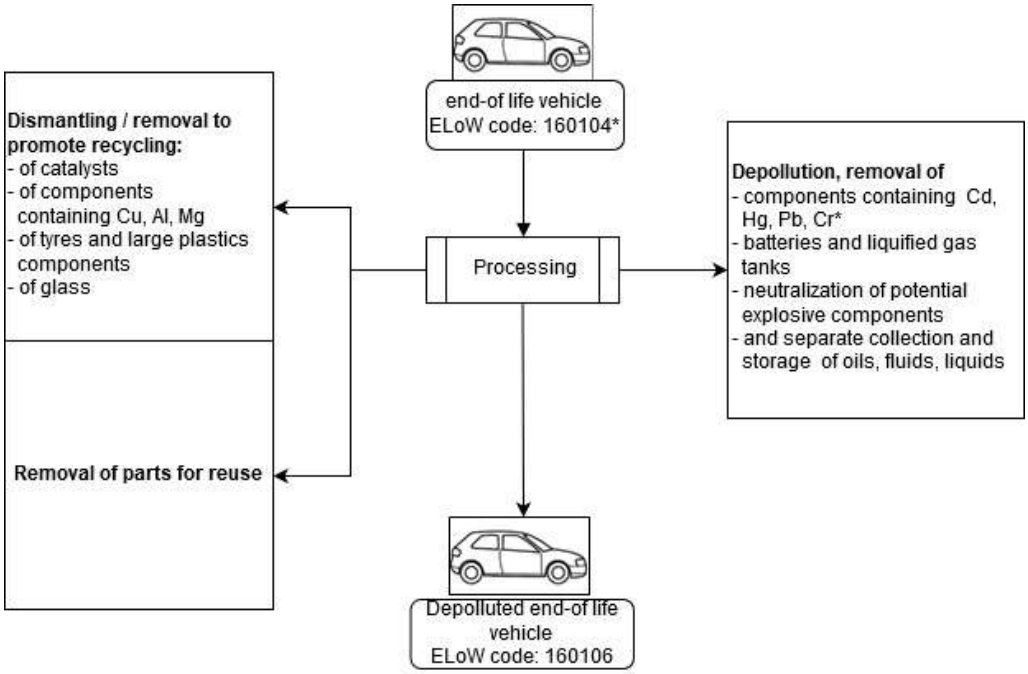
11 Source: Eurostat: unpublished data for 2018 for 16 out of 31 EU and EEA countries

5.2 ELV treatment: technical background

The following text gives an insight into the processes involved in depollution of end-of-life vehicles, dismantling components and shredding (+ post-shredding, which is not explicitly mentioned in the ELVD).

The typical treatment of end-of-life vehicles is separated into different steps. The first step is the treatment in an Authorised Treatment Facility (ATF) as required by the ELVD and displayed in figure 5-2 below. Minimum requirements for installations for storage and treatment of ELVs in such ATFs are described in Annex I to the ELVD. Additional national requirements might also be established.

Figure 5-2 Operations in an authorised treatment facility (ATF)



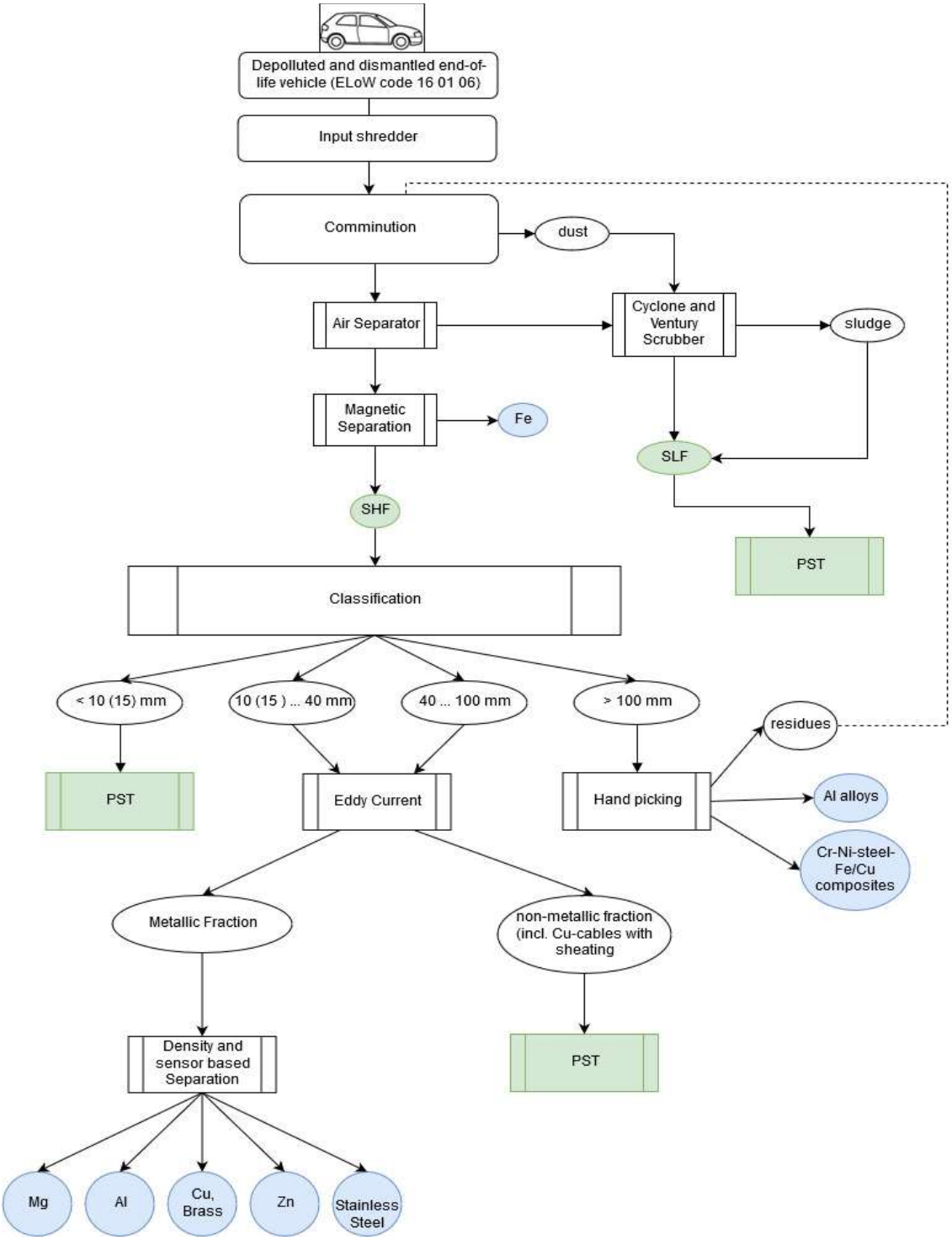
Source: Oeko-Institut

The second step is shredding the depolluted ELV as displayed in Figure 5-3. Shredders for ELVs are regulated by the best available techniques (BAT) reference document for waste treatment (Pinasseau et al. 2018).

Some, but not all, shredders have integrated PST or separate PST on site; other shredders send residues of the shredding process to offsite PST plants, while some operators send shredder residues without PST for disposal e.g. at landfills (not displayed below) where it is allowed.

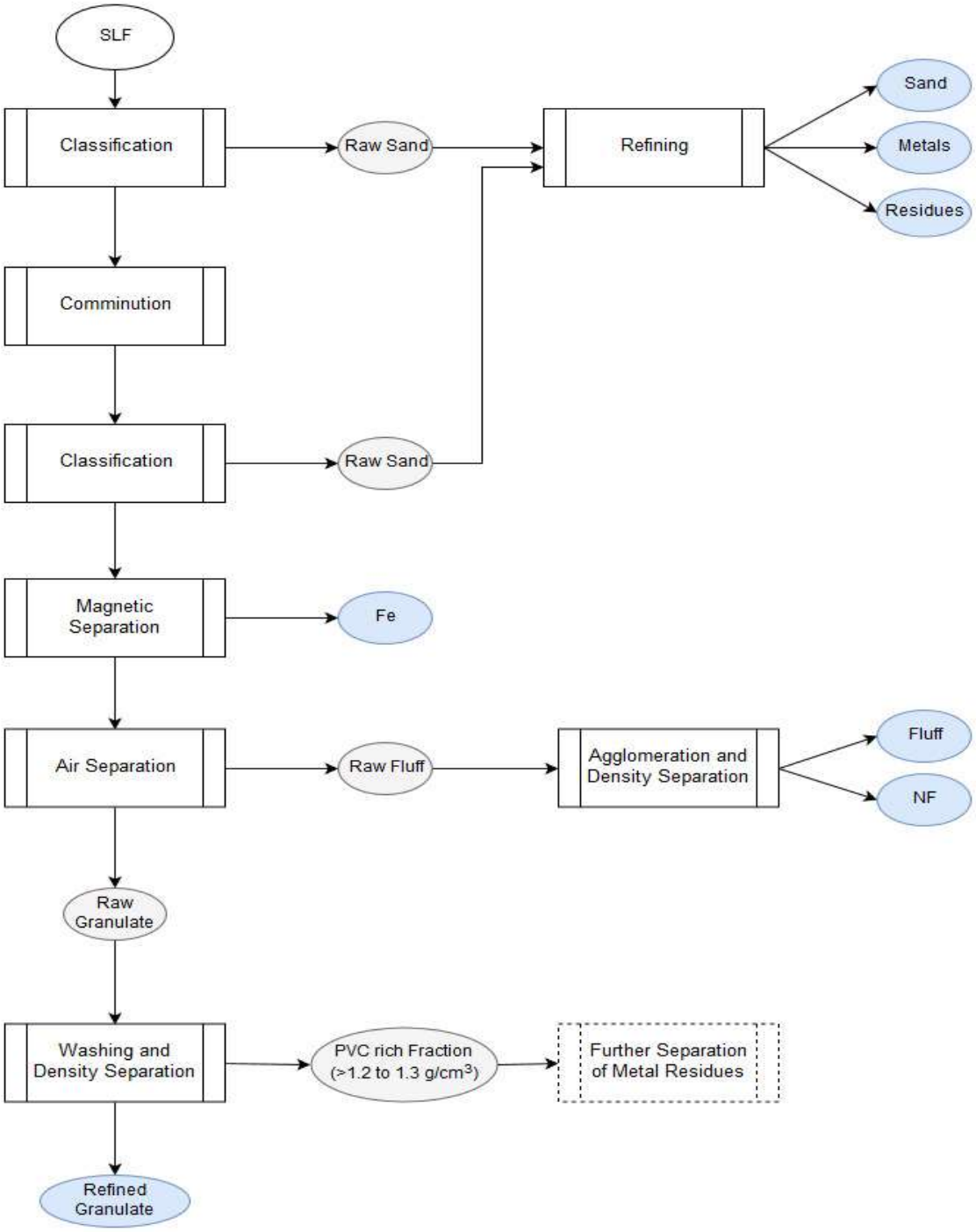
The main outputs of the shredding process (considered as a sorting process not a recycling process) are ferrous metals, aluminium and other metallic fractions. The shredder light fraction (SLF) and some parts of the shredder heavy fraction (SHF) are either disposed of or treated in so-called post-shredder technology (PST) facilities as displayed in the figure below. Post-shredder technology is the further reprocessing of shredder residues. Some, but not all, shredders have integrated PST or separate PST on site; other shredders send residues of the shredding process to offsite PST plants while some operators send shredder residues without PST for disposal e.g. at landfills (not displayed below). Typical operations of PST are displayed in figure 5-3 below. PST is considered as a necessary operation to fulfil the recycling targets set by the ELVD.

Figure 5-3: Typical shredding process for ELVs, details might differ regarding dust treatment or sieve cut



Source: Oeko-Institut

Figure 5-4: Typical PST operations, details might differ for specific plants, details might differ regarding agglomeration or density cut



Source: Oeko-Institut

6 Evaluation results

This chapter is the core of the evaluation report as it provides answers to each evaluation question. Most of the evaluation questions have been grouped, in order to present data, literature and consultation findings that help answer more than one question. Each individual question is specifically addressed in the conclusion section of each group of questions. The question groups are as presented in the table of evaluation questions in section three, which is an updated version of the evaluation matrix included in in Annexe A of this report.

For each group of questions, we present our analysis drawing on each of the research methods as literature and data review, Online Public Consultation (OPC) and targeted surveys and targeted consultation in the form of interviews and the workshop. Subheadings are used in order to group the analysis by subject.

There is a detailed description of all the responses to the surveys, a longer summary of the interviews and notes from the workshop in the annexes to this report.

The sub questions covered by each group of questions (see section 3) are listed at the start of each section.

6.1 (Effectiveness) Have the objectives and targets of the ELVD been met and monitored

The questions addressed in this section are:

To what extent have the objectives of the ELVD been achieved?

To what extent have the targets on ELVs, on reuse/recycling/recovery and on the elimination of the use of hazardous substances been met?

To what extent have the provisions on prevention, collection, treatment, reuse, recovery, coding standards/dismantling information been implemented?

To what extent can the achieved results/effects be credited to the ELVD?

To what extent were the results expected?

To what extent have the results been effectively monitored?

Have the reporting data from Eurostat and the information provided in data accompanying national quality reports been effective for monitoring of the targets?

To what extent does the current cooperation and data exchange between the national services and links with other relevant legislation serve the purpose of the ELVD?

To what extent are the current challenges for the communication of data on ELV for the compilation of statistics and the monitoring of target achievements addressed?

To what extent have the current mechanisms to measure the performance in the implementation of the ELVD and to monitor the results (e.g. challenges with communication of data) been effective?

What other factors contributed to or hampered the achievement of the objectives of the ELVD?

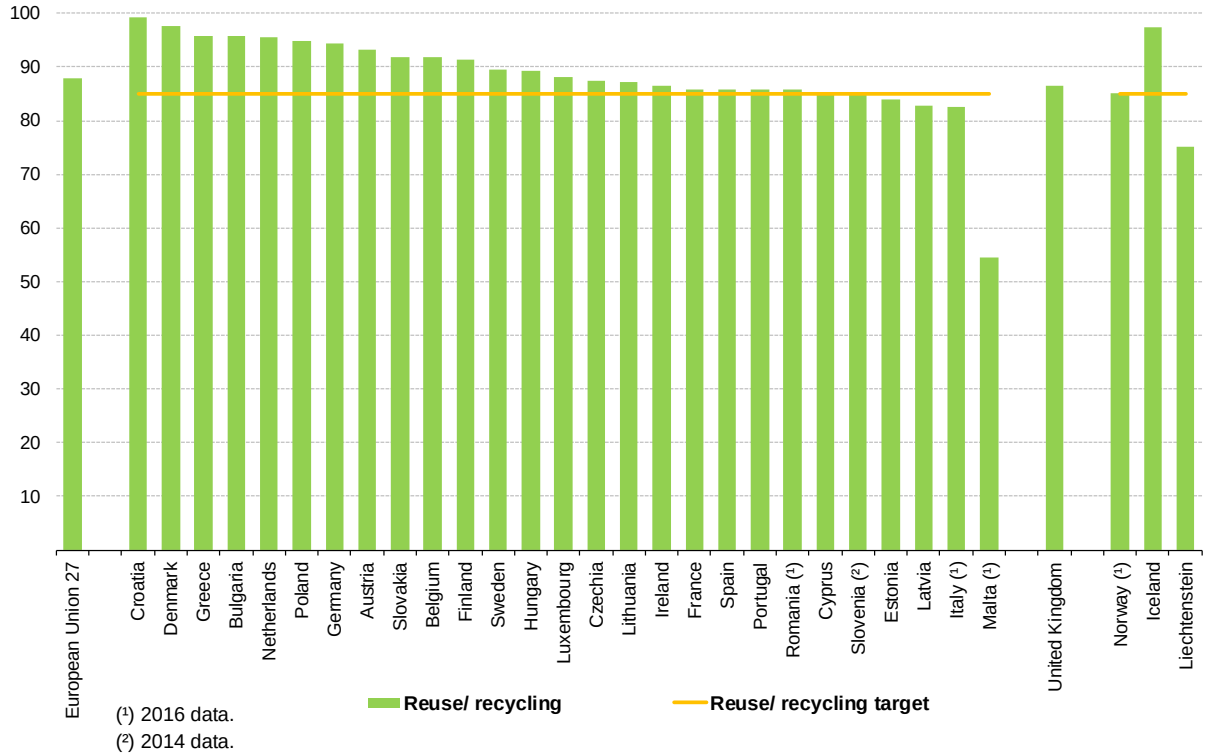
6.1.1 *Analysis*

ELV reuse and recycling targets

As displayed in the figure below, in 2017, almost all Member States achieved recycling and reuse rates beyond the Directive's target of 85%. As can be seen in the data for previous years, some problems occur for the monitoring as stock effects might cause artificial recycling rates as observed for Greece in 2016 and for Germany in the years 2009 – 2015. For countries with a high share of export, the procedure to demonstrate the effective recycling in the foreign country are not clearly defined.

Most stakeholders in the targeted consultation agree that the Directive has led to the reduction of uncontrolled disposal and increased reuse and recycling of ELVs.

Figure 6-1 Reuse / recycling rate for ELVs in 2017 (% of weight of vehicles)

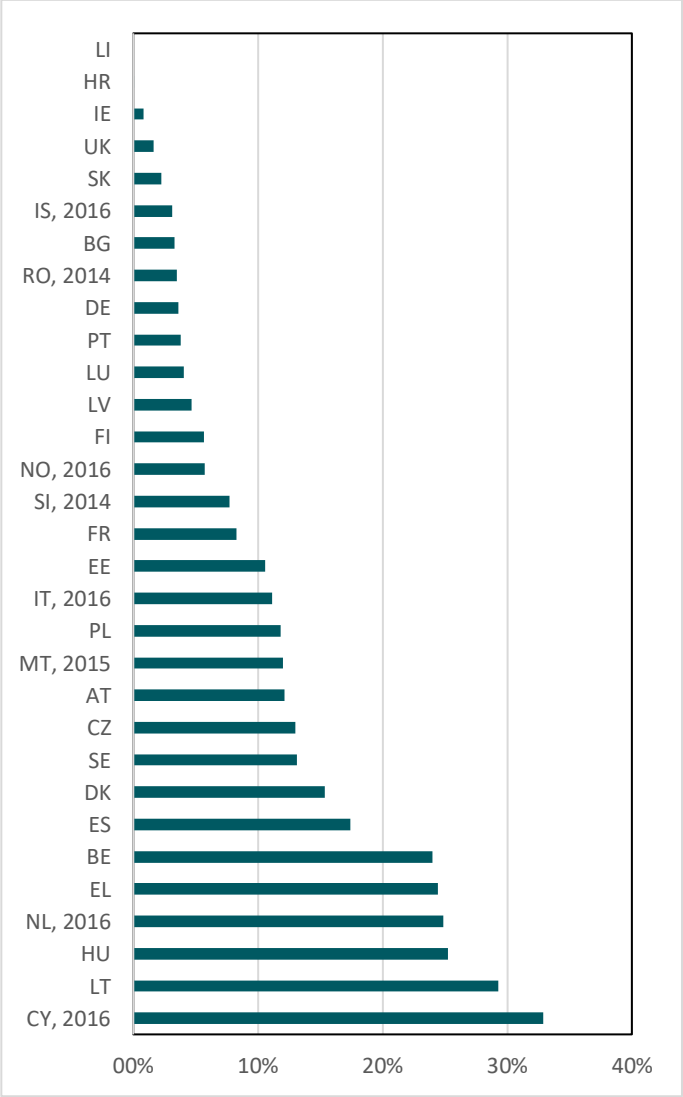


Source: Data: Eurostat; Compilation: Oeko-Institut

Figure 6-2 displays the share of reuse, compared to the total volume of reported reuse, recovery and disposal operations as reported by the Member States for the year 2017, (or for the year indicated). The level of reuse varies across the EU.

Other (more systematic) aspects on reuse and recycling are addressed in section 6.3 and 6.4 and elsewhere. It is important to point out that the ELVD does not establish a separate target for reuse. The recycling definition established in the ELVD differs from that used in the Waste Framework Directive (WFD) as the ELVD allows backfilling or material to be counted as recycling.

Figure 6-2 Share of reuse, compared to the total volume of reuse, recovery and disposal, 2017



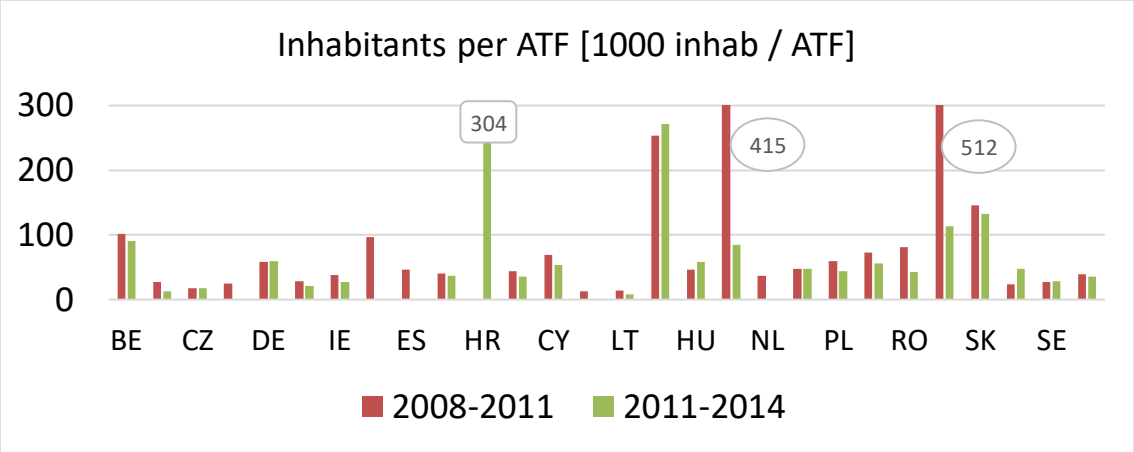
Source: Data: Eurostat; compilation: Oeko-Institut e.V.

Establishment of Authorised Treatment Facilities ATFs as required by the ELVD

The ELVD established the need to provide Authorised Treatment Facilities (ATFs) for depollution and dismantling of ELVs. It also defined minimum technical standards for ATFs. In the period 2011- 2014 the Member States informed the EC of the existence of approximately 13 000 ATFs, each of which treat an average of around 500 ELVs per year (minimum 69 in LT and maximum 2295 in HU) (ARGUS 2016). The total number of ATFs increased during the period 2014 – 2017 to about 14 000 although the development of ATF capacity varies between Member States (Elliott et al. 2019). Details of the developments in the Member States are displayed in figures 6-3 and 6-4 below

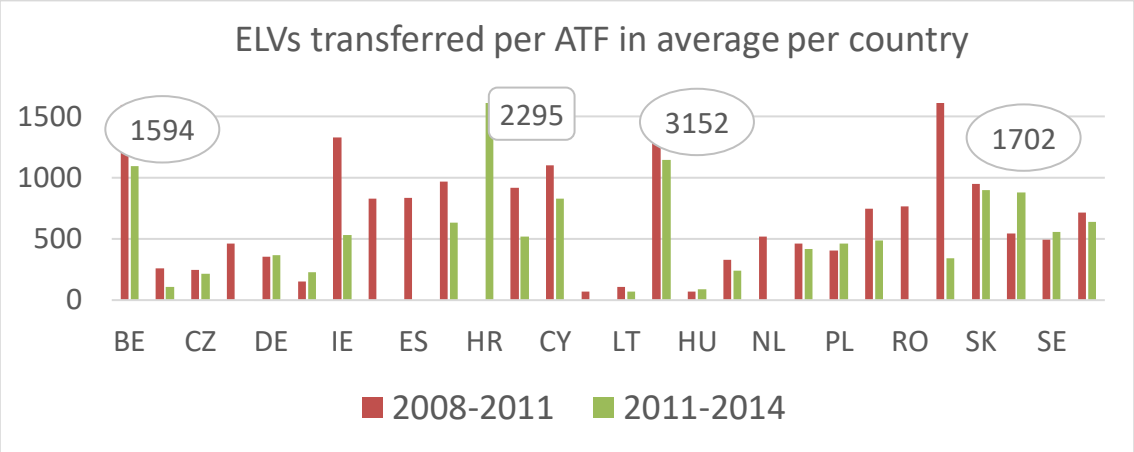
The term ATF was established and defined by the ELVD, so it is not possible to accurately measure how many ATFs existed prior to the ELVD. The first two triannual reports on ELVD implementation (prior to 2011) do not contain data on the number on ATFs. The oldest report with data on ATF numbers is (Argus 2016). It is therefore not possible to report ATF numbers prior to 2011.

Figure 6-3 1000 Inhabitants per ATF for the period 2008 - 2011 and 2011 - 2014



Source: ARGUS – Statistics and Information Systems in Environment and Public Health GmbH November 7th, 2016; Elliott et al. 2019

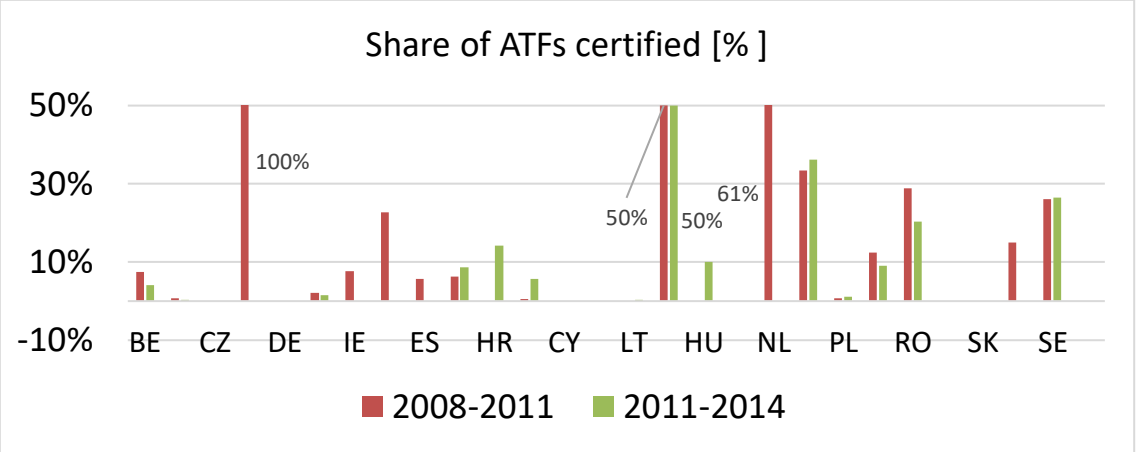
Figure 6-4 ELV transferred per ATF in average per country for the period 2008 - 2011 and 2011 - 2014



Source: ARGUS – Statistics and Information Systems in Environment and Public Health GmbH November 7th, 2016; Elliott et al. 2019

Article 6 (5) of the ELVD states: "*Member States shall encourage establishments or undertakings which carry out treatment operations to introduce, certified environmental management systems*"
There is no definition of what certified environmental management system should be used, but the two most commonly used systems of relevance are the EU Eco-Management and Audit Scheme (EMAS) and the arguably less demanding ISO 14001. ATF registration under these systems has been used as measure of compliance with this Article. The reporting on the implementation of EMAS for ATFs varies across the Member States. The implementation of EMAS at a site can be regarded as a good indicator that the site follows good environmental management procedures and practices. Relatively few Member States report a large number of EMAS certified ATFs. No conclusions can be drawn with regard to this aspect from the reports mentioned above. Details for the developments in the Member States are displayed in figure 6-5. According to (ARGUS 2016) certification to the less demanding ISO 14001 (an alternative environmental management system) is much more common than EMAS certification.

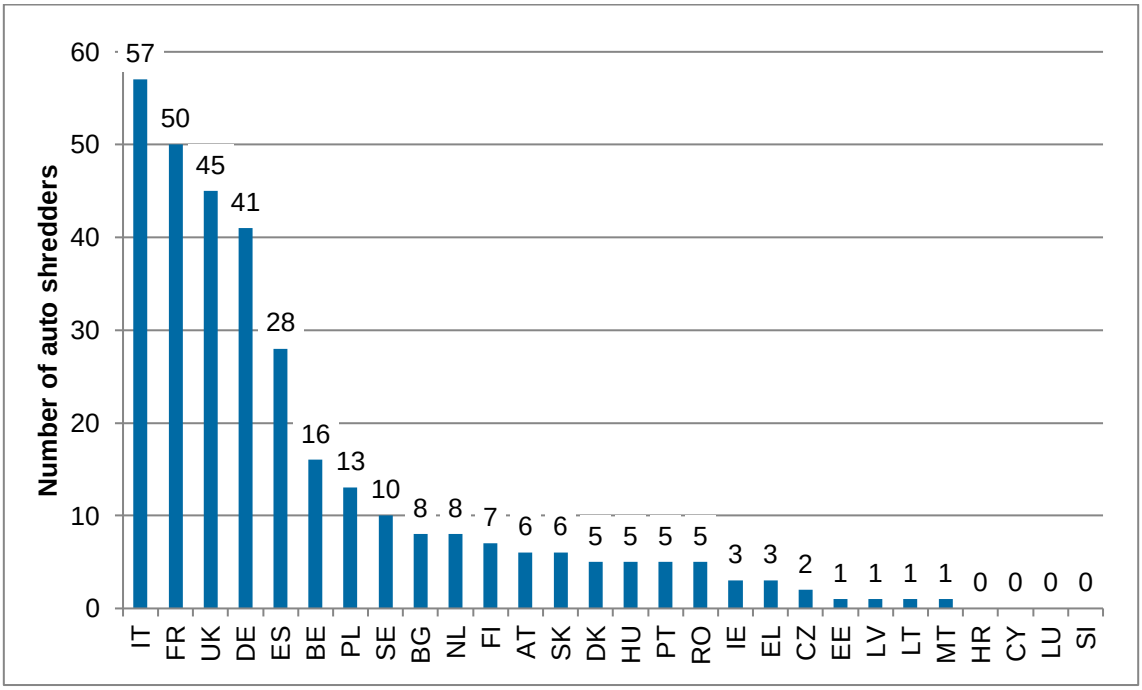
Figure 6-5 Share of ATFs certified for EMAS per country for the period 2008 - 2011 and 2011 - 2014



Note: Not all Member States reported on the number of certified ATF
Source: ARGUS – Statistics and Information Systems in Environment and Public Health GmbH November 7th, 2016

According to (Mc Kenna 2014) a total of 352 "automotive shredders" were operating in the EU and Norway in 2014. Most of these were in Italy (62), France (50), UK (47), Germany (43) and Spain (31). The remaining 33% of this type of shredder are distributed across 20 countries. Almost all Member States have at least one shredder for ELVs. The findings of (Mc Kenna 2014) are not fully in line with the reporting of the MS to Eurostat: Only Malta and Luxembourg report to Eurostat not having a national shredder (source: Statement of Eurostat, 18 April 2020). Compliance with BAT[12] and capacity for post-shredder treatment are unknown.

Figure 6-6 Number of auto shredders per country



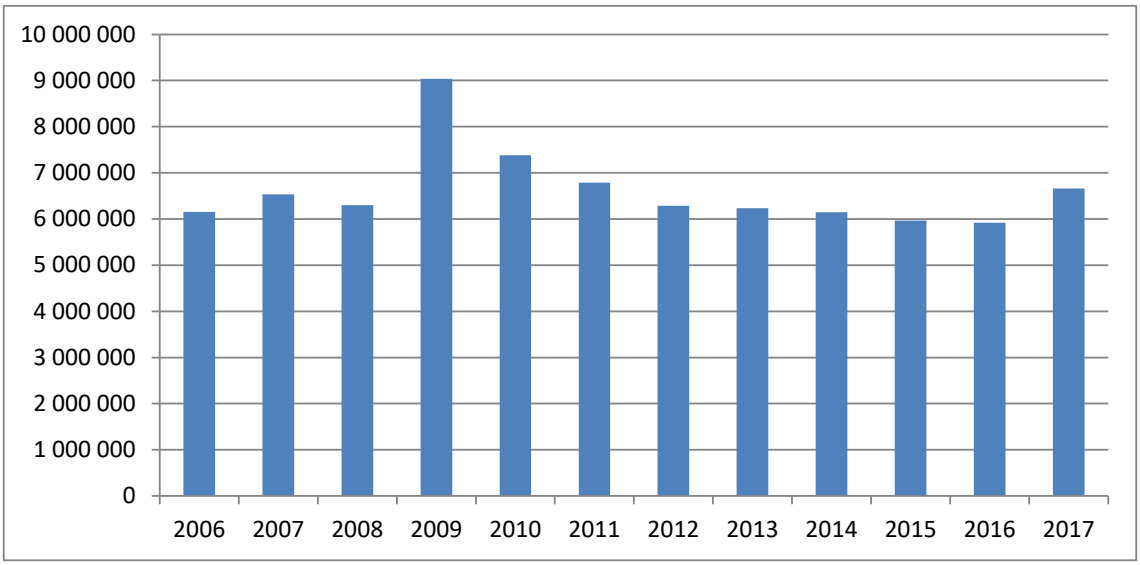
Source: Mc Kenna 2014

[12] Best Available Techniques (BAT) Reference Document for Waste Treatment. Commission Implementing Decision (EU) 2018/1147 of 10 August 2018 establishing best available techniques (BAT) conclusions for waste treatment, under Directive 2010/75/EU of the European Parliament and of the Council (notified under document C(2018) 5070) (Text with EEA relevance.

Data on number of ELVs

According to Commission Decision 2005/293/EC, Member States are obliged to report on the total number of ELVs arising and treated. The reported numbers of ELVs generated in EU-28 are displayed in figure 6-7.

Figure 6-7 Number of ELVs generated in EU-28



Source: Eurostat (download 2nd October 2019)

The 2009 peak in figure 6-7 is caused by scrappage schemes (including pay out to the last owner) in the context of the financial crisis 2008/2009. The slight peak in 2017 may be caused by incentives to scrap old diesel vehicles as a consequence of diesel exhaust gas treatment fraud. The figures above refer to the numbers of ELVs as reported by the Member States to Eurostat. For more details regarding the 'unknown whereabouts' please refer to section 6.2.

6.1.2 *Conclusions*

To what extent have the targets on ELVs, on reuse/recycling/recovery and on the elimination of the use of hazardous substances been met?

Formally, the Member States report compliance with the reuse and recycling as well as the recovery targets and virtually all are meeting the 85% reuse and recycling target (as of 2017).

The elimination of the hazardous substances mentioned in Article 4 of the ELVD are met to a broad extent with several, well-reasoned exemptions. The exemption for lead-acid batteries regarding in terms of the volume of hazardous substance applied is the most significant. The issue of hazardous substances is addressed in more detail elsewhere in this report, mainly in section 6.9 (relevance hazardous substances), but also in section 6.14 (coherence).

Most of the stakeholders surveyed and interviewed for the evaluation of the ELVD indicated that the objectives of the Directive in relation to the reduction of uncontrolled disposal and increased reuse and recycling of ELVs have largely been met. Some stakeholders indicated that the proper recovery of environmentally damaging materials such as used oil was a positive result of the Directive. A few stakeholders also noted that the ELVD has led to a slight decrease in illegal operations in the ELV sector.

In terms of the factors that hamper the achievements of the Directive, some stakeholders indicated that there is a lack of enforcement to prevent illegal activities, which is enhanced by the lack of traceability of ELVs and the unclear legal distinction between a used car and ELV. Financial factors were also mentioned as a constraint on achieving the objectives of the ELVD, such as the lack of incentives for the last vehicle owners.

To what extent have the provisions on prevention, collection, treatment, reuse, recovery, coding standards/ dismantling information been implemented?
To what extent can the achieved results/ effects be credited to the ELVD?
To what extent were the results expected?
When interpreting prevention as reuse of components from ELVs the situation is quite different across the Member States and the reporting on reuse is hampered by the lack of an explicit target (separate from recycling) and the different options available to the Member States on how to report reuse.

The ELVD established harmonised minimum requirements for ATFs across Europe and 14 000 ATFs are established across the EU which is clearly an effect of the ELVD. The establishment of the International Dismantling Information System (IDIS), which provides the dismantling information to the ATFs, could be also seen as a result of the ELVD. 26 manufacturers with 77 brands and 3161 models and variants use IDIS to provide dismantling information to 6 476 registered users. At the same time repair and maintenance information (RMI) might also be required for reuse. The Directive does not oblige the producers to provide such information for free, however, the producers provide the dismantling information free of charge but access to the repair and maintenance information (RMI) may incur a fee. Dismantlers have commented that it is challenging for them to obtain this information, which makes it more complicated or costly for them to reuse spare parts from ELVs.

There may be a potential conflict of interests between the OEMs and the dismantlers in this regard. Intellectual property rights concerns and concerns about security (regarding protection from theft) of components with unique identification numbers might apply if the information in RMI is provided free of charge. This issue is beyond our scope and could be explored in further detail via future studies, involving consultations with the relevant stakeholders.

Regarding the obligatory treatment operations for the depollution of ELVs, most of the stakeholders surveyed indicated that the removal of batteries, the removal of ELV fluids, and removal of potentially explosive components have been established to a large extent in their country.

The issue of ELVS of unknown whereabouts is covered in detail in section 6.2.

Have the reporting data from Eurostat and the information provided in data accompanying national quality reports been effective for monitoring of the targets?
To what extent are the current challenges for the communication of data on ELV for the compilation of statistics and the monitoring of target achievements addressed?
To what extent have the current mechanisms to measure the performance in the implementation of the ELVD and to monitor the results (e.g. challenges with communication of data) been effective?
Member States report on the ELV targets filling the template provided in Commission Decision 2005/293/EC laying detailed rules on monitoring of the reuse/recovery and reuse/recovery targets set out in the ELVD. However, the quality report that accompanies the Eurostat standard questionnaire for

Member States on the quality and validity of the data is voluntary. As a result, the content of the quality reports accompanying the data varies across the Member States and, for several Member States, it is not possible to validate the data submitted to Eurostat. For example, there is often no information available on the existence of capacity in specific stages in ELV treatment capacities (like PST) or information on how Member States provide evidence that exported ELVs or parts of ELVs are effectively recycled (respectively to what extend).

To what extent does the current cooperation and data exchange between the national services and links with other relevant legislation serve the purpose of the ELVD?

As demonstrated (Mehlhart et al. 2017) a coherent registration approach, which makes it difficult or nearly impossible for a vehicle to 'disappear', would improve the implementation of the ELVD in the Member States. Such approach would require adjustment in the vehicle registration / deregistration procedures in many Member States. (*This issue is covered in more detail in the next section*).

6.2 (Effectiveness) Missing ELVs

The questions covered in this section are:

What and to which extent did MSs implement measures to address the problems of "missing ELV" (e.g. cooperation mechanisms between MSs)?

What measures and criteria were applied by MSs for shipments to distinguish ELVs from used vehicles?

To what extent were implemented national Certificates of Destruction (CoD) systems designed to make sure that ELVs were dismantled at authorised treatment facilities (ATFs)?

To what extent do the incentives adopted by some MSs contribute to ensure that ELVs are treated in legal ATFs and get a CoD?

What and to which extent did MSs implement other measures to address the problems of "missing feedback"?

How efficient is the exchange of information between the car registration and the environmental departments in the MSs?

How efficient has the exchange of information/notification between the national authorities on re-registration of exported cars been?

6.2.1 *Analysis*

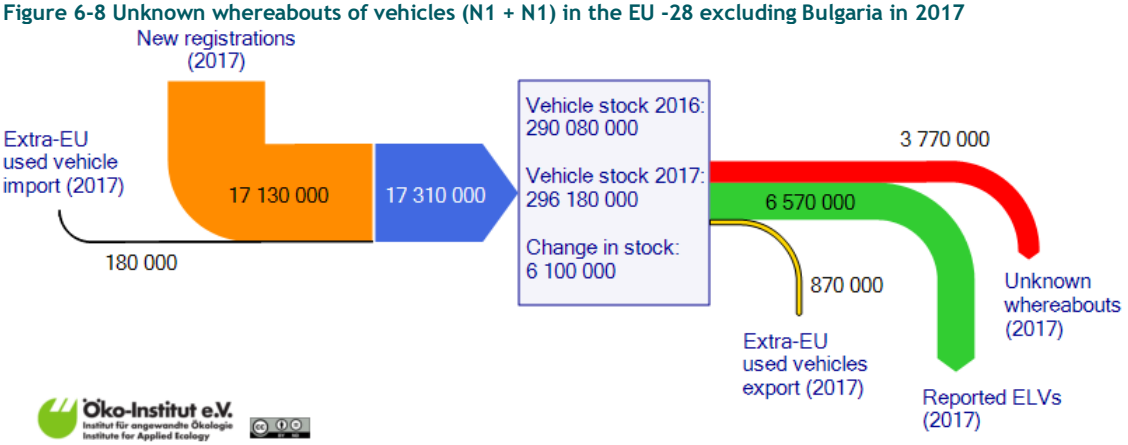
A number of studies have assessed the issue of ELVs of unknown whereabouts. Each of these studies have a different focus:

- 'End of life vehicles: Legal aspects, national practices and commissioned recommendations for future successful approach' (Schneider et al. 2010), commissioned by the European Parliament;
- 'European second-hand car market analysis', (Mehlhart et al. 2011), commissioned by the European Commission (DG CLIMA);
- 'Compliance promotion initiative to assess the implementation of Directive 2000/53/EU on end-of-life vehicles with emphasis on the end of life vehicles of unknown whereabouts' (Mehlhart et al. 2017), commissioned by the European Commission (DG ENV) .

All these studies identified shortcomings in the registration and de-registration procedures in several countries, making it difficult to identify the correct number of ELVs generated in each Member State.

In line with the methodology applied in a previous study for the Commission (Mehlhart et al. 2017) we have updated the detailed input-output flows for 2017. As displayed in figure 6-8, 11.21 million vehicles exited the stock of registered vehicles in EU28 (sum of the red, green and yellow arrows to the right of the figure), therefore 6.57 million were treated within the EU, 0.87 million were exported to non-EU countries and the whereabouts of 3.77 million vehicles is unknown.

Figure 6-8 Unknown whereabouts of vehicles (N1 + N1) in the EU -28 excluding Bulgaria in 2017



Source: Oeko-Institut, update for this report

The table below displays estimates of how many vehicles are of unknown whereabouts each year in the EU. It is apparent that the situation did not substantially alter from 2008 to 2017.

Table 6-1 Results of the calculations for unknown whereabouts of vehicles for EU-28

	2008	2009	2010	2011	2012	2013	2014	2015*	2016*	2017*
Unknown whereabouts (million vehicles)	4.1	3.4	3.4	3.8	3.5	3.7	4.7	3.8	3.9	3.8

** EU-28, excluding Bulgaria*

Source 2008 - 2014: (Mehlhart et al. 2017); 2015 - 2017: Oeko-Institut, update for this report

Efforts were made to model the amount of 'missing ELVs' per Member State (Mehlhart et al. 2017). This analysis would potentially be very interesting as it would show if Member State specific approaches on vehicle deregistration and export, such as those pursued by the Netherlands (online deregistration of ELVs (post CoD), by ATFs and no export without a roadworthiness certificate) were effective. However, the approach was a model calculation, which required multiple assumptions (on vehicle stock and age of removal etc.) to be made. The results were not felt to be robust enough to demonstrate the effectiveness of measures such as those established in the Netherlands and Denmark.

From this analysis, it appears that the ELVD does not deliver the expected result of ensuring that all ELVs are treated according to the minimum requirements established by the Directive. To what extent this is an 'administrative issue' only and to what extent hazardous liquids and components escape to the environment is not known. A number of measures to overcome these shortcoming are listed in previous Commission study (Mehlhart et al. 2017).

Article 5(3) of the ELVD does not effectively ensure that the last owner of the end-of-life vehicle has to deliver it to an ATF in exchange for a Certificate of Destruction (CoD). Neither the ELVD nor any other EU regulation provides a definitive and exhaustive list of possibilities for deregistering a vehicle. This results in MSs being free to establish options, which effectively bypass the need to get a CoD. More

details on the issues surrounding registration / deregistration and proposals on how to address some of the problems are provided in Mehlhart (2017).

Many stakeholders are of the opinion that better regulation for registrations/ de-registrations and an improvement in the exchange on deregistration information between MSs, are both important ways in which the relevance of the Certificate of Destruction (CoD) could be improved, which would improve the situation.

ELVs of unknown whereabouts can occur for a number of different reasons, including export or non-reported treatment as displayed in Table 6-2. For each of the reasons the legal situation and the environmental concerns are assessed in the following table.

Table 6-2 Different reasons for ELVs of unknown whereabouts

Reason for unknown whereabouts ELV	Legal situation	Environmental concern
Non-reported export of used vehicle to non-EU-countries	The export of second-hand vehicles is permitted under European law, but failure to declare is a breach of the obligation to report to the customs authorities. In some importing countries, import bans apply to used vehicles with different characteristics. Thus, undeclared exports could also violate the regulations of the destination country.	If the used vehicle is near to EoL, hazardous components might be harming the environment in the near future if not treated according to the minimum requirements applicable in the EU.
Non-reported export of used vehicle to other EU Member State	Currently there is no obligation in force to report to the vehicle register of origin the re-registration in the country of destination. In the context of the car registration procedure there is a request to the register of origin if the car is stolen or other police information is registered. However, this communication is not necessarily introduced in the register of the country of origin.	No direct environmental concern
Export of ELVs to non-OECD countries	Clear infringement of European law (Waste Shipment Regulation).	Not appropriate treatment of hazardous waste might cause environmental harm. Illegal transfer might cause clean-up cost and compensation to the receiving country by the country of origin
Non-reported export of ELVs to other EU Member State. Treatment in the receiving MS in ATF or non-ATF. (Even if a CoD is issued, it is not forwarded to the country of origin.)	Legal situation in EU differs by MS. For most MSs the export is not illegal.	No concern, if the ATF operates according its permits. The risk of environmental pollution is higher in non-ATFs compared to ATFs
Non-reported treatment in ATFs (While it would be possible no CoD is issued)	Not currently illegal	No concern, if the ATF operates according its permits
Treatment in non authorised treatment facilities	Illegal according to ELVD	The risk of environmental pollution is higher compared to ATFs
Increase of ELVs / de-registered vehicles on stock	Unlikely option as the number of vehicles of unknown whereabouts is simply too high, vehicles would be visible.	

6.2.2 *Conclusions*

What and to which extent did MSs implement measures to address the problems of "missing ELV" (e.g. cooperation mechanisms between MSs)?

It appears that the ELVD does not fully deliver the expected results in terms of ensuring that all ELVs are treated according to the Directive's requirements, as around 35% of vehicles are still of unknown whereabouts. A detailed overview of specific measures in the Member States and its assessment on effectiveness has not been carried out in this study as it would exceed its scope. What can be said, is that at least until 2017 – where figures for the unknown whereabouts can be calculated – the situation did not alter for the total figures at EU level. The social and environmental implications of this cannot be easily quantified as it is not known to what extent these vehicles are exported outside the EU, or unregistered treated within the EU and if the latter what environmental harms occur if the vehicles are treated but not registered.

Regarding the cooperation between the MSs it is reported the MS do not systematically report to the country of origin if an imported used vehicle is re-registered in the importing country or if an imported used vehicle is scrapped.

What measures and criteria were applied by MSs for shipments to distinguish ELVs from used vehicles?

We have not assessed this aspect at the level of the Member States. Past efforts indicate that customs authorities will not support any approach to assess each export of a used vehicle as the number of (officially) exported used vehicles of around 1 million is simply too high and inspection for each of these cars – *inter alia* supported by guidance like the CORRESPONDENTS' GUIDELINES No 9 (to the Waste Shipment Regulation), is challenging with the available staff capacity and multiple priorities for enforcement and customs officers.

The Netherlands is a best practice example for distinguishing ELVs from used vehicles in shipment. The stakeholders noted that a vehicle becomes an ELV when it cannot be repaired for realistic costs in the country of export. Ireland and Italy are also adopting this approach.

To what extent were implemented national Certificates of Destruction (CoD) systems designed to make sure that ELVs were dismantled at authorised treatment facilities (ATFs)?

The COD is only one of multiple conditions to deregister a vehicle from the national register. Other conditions include that a vehicle is exported to another country or stolen. The ELVD does not limit what other conditions make it possible to deregister a vehicle, so the declaration that the vehicle is used exclusively on private grounds can also be a condition for deregistration. For example, Germany maintains procedures of automatic deregistration if a vehicle is temporarily deregistered for a particular length of time and not reregistered.

The approach in Portugal where vehicle tax is levied until an ATF provided COD is provided for the vehicle appears the most comprehensive approach to this. It appears that this would work in some other Member States but would be difficult to implement in those Member States where vehicles can be registered as no longer 'on the road' and exempted from vehicle tax.

To what extent do the incentives adopted by some MSs contribute to ensure that ELVs are treated in legal ATFs and get a CoD?

What and to which extent did MSs implement other measures to address the problems of "missing whereabouts"?

Effective financial incentives are established for instance in Denmark (pay out scheme). The Netherlands have since many years a different registration system where the whereabouts of vehicles is very strictly followed[13], in addition ARN in the Netherlands is the only Producer Responsibility Organisation for ELVs in the EU. Other Member States established only recently systems to control the whereabouts of vehicles and it is too early to assess the effects of such national measures. The suggestion of collecting funds (to support an ELV collection fund) via a car insurance levy was made by one stakeholder.

How efficient is the exchange of information between the car registration and the environmental departments in the MSs?

Environmental departments in the EU Member States claim that the car registration legislation, which is often under the responsibility of the ministry of interior or the ministry of transport, does not support the aim to ensure that ELVs are treated in ATFs and get a COD accordingly. Apparently, there is a need for cooperation between different national authorities within the Member States to tackle the issue of registration/de-registration and the related link to the unknown whereabouts.

How efficient has the exchange of information/notification between the national authorities on re-registration of exported cars been?

Regarding the cooperation between the MS, MS do not systematically report to the country of origin if an imported used vehicle is re-registered in the importing country or if an imported used vehicle is scrapped. Therefore, more cooperation between Member States (national authorities on registration and environmental authorities) is needed to overcome the problem of unknown whereabouts.

6.3 (Effectiveness) Extended Producer Responsibility (EPR)

The questions covered in this section are:

To what extent are the provisions on Extended Producers Responsibility (EPR) sufficient in the ELVD to contribute to a good implementation of its objectives?

How does the polluter-pays principle, applied as Extended Producers Responsibility (EPR), affect the different operators involved and are the costs resulting from the EPR fairly allocated?

6.3.1 *Analysis*

The clauses in the ELV-Directive addressing extended producer responsibility are, compared to those in the Waste Framework Directive and several Directives on specific waste streams (e.g. WEEE Directive, Directive on packaging and packaging waste), relatively basic. The ELVD does not use the term

[13] *In principle, the Dutch licensing system is based on ownership. Around 660 000 vehicles are removed from the vehicle register every year. Vehicle owners must actively deregister their vehicles. If they fail to do so, they remain liable for the vehicle obligations. In this way the register is kept up to date. Deregistration can take place through an official export or destruction procedure. In case of export, the owner must report the vehicle as exported to RDW and have the documents stamped accordingly. In case of destruction, the owner must deliver the vehicle to an RDW-accredited destruction firm. The destruction firm reports the vehicle as destroyed to the RDW vehicle register; this is done electronically. The owner then receives a warranty against liability. Temporary suspension (for use on private ground is possible for up to 3 years. The average cost of such a transaction is € 121. The Tax Department of the Ministry of Finance checks compliance with the regulations concerning the non-use of suspended vehicles. (source: https://www.vehicle-chain.eu/report.aspx, accessed 20200625 16:00)*

'extended producer responsibility', it does not clearly spell out that car producers should bear financial responsibility for the waste stage of the car's life cycle[14] and does not take account of the "general minimum requirements for extended producer responsibility schemes" as defined in Article 8a the Waste Framework Directive. The ELVD establishes the following requirements on vehicle producers:

Article 2(13):
'dismantling information' means all information required for the correct and environmentally sound treatment of end-of life vehicles. It shall be made available to authorised treatment facilities by vehicle manufacturers and component producers in the form of manuals or by means of electronic media (e.g. CD-ROM, on-line services).

Article 8(3)
Member States shall take the necessary measures to ensure that ***producers*** *provide dismantling information for each type of new vehicle put on the market within six months after the vehicle is put on the market. This information shall identify, as far as it is needed by treatment facilities in order to comply with the provisions of this Directive, the different vehicle components and materials, and the location of all hazardous substances in the vehicles, in particular with a view to the achievement of the objectives laid down in Article 7.*

Article 8(4)
Without prejudice to commercial and industrial confidentiality, Member States shall take the necessary measures to ensure that manufacturers of components used in vehicles make available to authorised treatment facilities, as far as it is requested by these facilities, appropriate information concerning dismantling, storage and testing of components which can be reused.

To comply with the requirements of Article 2(13) and 8(3) the car industry established the International Dismantling Information System (IDIS) which provides the dismantling information to the ATFs. 26 manufacturers with 77 brands and 3 161 models and variants use IDIS to provide dismantling information to 6 476 registered users.[15] Repair and maintenance information (RMI) might also be required for reuse. The Directive does not oblige the producers to provide such information for free. In fact, the producers provide the dismantling information free of charge and access to RMI may incur a fee.

Article 5(4):
Member States shall take the necessary measures to ensure that the delivery of the vehicle to an authorised treatment facility in accordance with paragraph 3 occurs without any cost for the last holder and/or owner as a result of the vehicle's having no or a negative market value.
Member States shall take the necessary measures to ensure that ***producers*** *meet all, or a significant part of, the costs of the implementation of this measure and/or take back end-of life vehicles under the same conditions as referred to in the first subparagraph.*

Article 9(2):
Member States shall require in each case the ***relevant economic operators*** *to publish information on:*

- *the design of vehicles and their components with a view to their recoverability and recyclability,*

[14] See Article 3(21) of the Waste Framework Directive
[15] https://idis2.com: Accessed: 13.01.2020

- *the environmentally sound treatment of end-of life vehicles, in particular the removal of all fluids and dismantling,*
- *the development and optimisation of ways to reuse, recycle and recover end-of life vehicles and their components,*
- *the progress achieved with regard to recovery and recycling to reduce the waste to be disposed of and to increase the recovery and recycling rates.*

*The **producer** must make this information accessible to the prospective buyers of vehicles. It shall be included in promotional literature used in the marketing of the new vehicle.*

According to (ARGUS –2016) '*All Member States without exception have transposed the provision that the delivery of the vehicle to an ATF has to occur without any costs for the last holder/owner.*'

According to (ARGUS –2016) '*For the period 2008-2014, all Member States except Sweden claimed that the necessary measures had been transposed. Sweden stated: "The legislation is directed towards producers, not towards the economic operators. This is included in an ongoing overview of the legislation." The remark that this aspect is included in an ongoing overview was made in both implementation reports in the period 2008-2014 and was already mentioned in the second Commission report for the period 2005-2008.*'

While the formal transposition of the clauses of the ELVD addressing producers' responsibilities is reportedly completed, the discussion whether the producers and the ATFs bear a fair share of the costs incurred is less clear. For instance, it is known that the glass from ELVs is removed to be recycled, as required by Annex I to the ELVD, but dismantling of glass is rarely done by ATFs as the effort is not compensated by the revenues for the separated glass and glass is recycled after shredding. At the same time glass producers claim that glass from vehicles can be used for high quality recycling if removed before shredding (Bartels 2016, 2016). As the vehicle producers do not compensate ATFs for the economically not viable effort, in almost all MSs glass is not separated and instead directed to the shredder heavy fraction (SHF) which is (in the best case) used for construction purposes or for backfilling (not considered as recycling by the WFD, but it is by the ELVD) or in the worst case this fraction is disposed of in landfills.

Similar shortcomings are addressed by (Sander et al. 2017) for other materials where the current cost for dismantling and subsequent separation and recycling are not compensated by the revenues. As a result, environmentally meaningful recycling of glass, large plastic parts and larger electronic components or the separation of the main wire harness is not carried out for economic reasons, and the ELVD does not effectively support such separation/recycling.

The targeted survey included a question on the extent to which vehicle producers currently bear the cost of the ELVD implementation according to EPR provisions. Public authorities (national, regional and local) were generally more likely to agree that vehicle producers bear the costs of the Directive. Companies were the most likely to disagree (n=5) and strongly disagree (n=1). Many of these company stakeholders were recyclers or ATFs. If they answered that they disagreed that vehicle producers bear the costs, stakeholders were asked to indicate who they consider does bear the costs of the ELVD. Dismantlers (n=29) and shredders (n=21) were perceived by most stakeholders as bearing the main costs of the implementation of the Directive. With another large group believing vehicle producers do (n=25).

A number of stakeholders (n=8) (three companies, two business associations, a national government, an EU citizen and "four Others"; were of the opinion that the current additional costs are shared among several stakeholders, most importantly that these costs are, in most cases, borne by dismantlers as well as shredders. Five stakeholders responded that the treatment of ELVs is sustainable/self-supporting, with the costs of the entire ELV treatment process covered by the value of the recovered material and/or the sale of recovered parts.

Stakeholders were also asked if shredders and dismantling companies meet the implementation costs of the ELVD, what effect does this have on them. There was a high rate of "I do not know/no opinion" responses (32% - 42%). The reduced financial viability of shredding and dismantling companies was noted as a likely scenario by 34% and 36% respectively. Five responses pointed out that legal ATFs will become less profitable in comparison to informal/fraudulent companies that purchase and dismantle ELVs. One response (from a Belgian NGO) was not related to unauthorised dismantlers but states that the current economic model encourages down-cycling rather than recycling. They suggest that there is a danger that only materials with an economic value will be properly recycled and those without such value will be 'dealt with' at the lowest possible cost, which could have an impact on how some (potentially dangerous waste) may be treated.

The opinions heard during the interviews regarding the **EPR systems implemented by Member States** were split between two overarching categories. The first states that manufacturers do not bear the cost for the delivery of all ELVs to an ATF without any cost to the last holder and/or owner. The second view on this issue was that vehicle producers do pay for the delivery of the ELVs to the ATFs' gate.

On the first issue, one stakeholder claimed that the cost of the ELVD is incurred where the depollution takes place, which takes place in ATFs dismantling and shredding companies. An ATF claimed that the legal ATFs are the ones who bear the cost of the Directive, since ATFs pay various indirect costs, such as awareness raising to inform people about what should be done when their vehicle reaches its end of life.

The second overarching view, which was heard from several stakeholders, claims that vehicle producers do pay for the delivery of the ELVs to the ATFs' gate. The common denominator of all those that expressed this view is that the ELV still has some value when it enters an ATF, and thus, it is reasonable that dismantlers and shredders have to pay some money for receiving an ELV.

6.3.2 *Conclusions*

To what extent are the provisions on Extended Producers Responsibility (EPR) sufficient in the ELVD to contribute to a good implementation of its objectives?

All Member States without exception have transposed the provision that the delivery of the vehicle to an ATF must occur without any costs for the last holder/owner.

However, compared to the WFD and the Packaging and Packaging Waste Directive, the ELVD does not establish a full EPR system. As a result, it is unclear whether the producers and the ATFs bear a fair share of the costs.

The options expressed by the stakeholders during the stakeholder involvement reflect their interests: Producers argue that the costs for depollution and dismantling are covered by revenues from the reuse of components and recycling of materials. Producers feel that it is not their responsibility to combat

illegal activities. ATFs argue that they are exposed to illegal competitors who do not have to cover (inter alia) all depollution and disposal efforts. Others, including Member States, are concerned that the environmental benefits of recycling glass, large plastic parts and copper from the wiring harness and the separation of electronic components is hampered by unprofitable economic conditions and costs to ATFs are not recovered by the producer. In addition, Member States, which carried out comprehensive compliance inspections in the sector, are concerned about the costs of such inspections and would like compensation for these costs.

Stakeholders also mention that additional burdens for the ATFs (e.g. the obligation to carry out more intensive dismantling for better quality recycling) will result in a shift to the illegal sector as long as the costs of the additional effort are not recovered e.g. from the producers.

How does the polluter-pays principle, applied as Extended Producers Responsibility (EPR), affect the different operators involved and are the costs resulting from the EPR fairly allocated?

The opinions of the stakeholders regarding how the Extended Producers Responsibility (EPR) affect the different economic operators were split between two opposing views. 32% of stakeholders believed that vehicle producers bear the cost of the ELVD implementation, while 27% thought that another economic operator bears this cost. It was pointed out by the majority of the stakeholders that if vehicle producers do not bear most costs of the Directive then dismantlers (30% of respondents) and shredders (22%) do.

There is no clear conclusion regarding the question if the costs are fairly allocated in the existing systems put in place to apply the EPR principle. There is evidence that indicates that dismantlers and shredders cannot always cover their costs and operate at a loss. However, this cannot be directly linked to the EPR systems, as several other issues also contribute to it (see efficiency questions). This issue is discussed further under the efficiency questions.

6.4 (Effectiveness) Circular Economy Links

The questions covered in this section are:

To what extent did the dismantling of parts before shredding affect the ELV targets and the quality of recyclates, in view of the objectives of the Waste Framework Directive (WFD) and the Circular Economy Action Plan?

Did the ELVD undermine the achievement of the objectives of the raw materials and innovation policies?

Would the Directive benefit from material specific recovery targets?

How effectively is the internet sale of parts removed from ELVs regulated. (Added during the course of the study)

6.4.1 *Analysis*

In the circular economy model, one seeks to maximise the reduction of waste and reuse of materials. The European Commission has recently adopted a new Circular Economy Action Plan[16] - one of the main blocks of the European Green Deal[17] - Europe's new agenda for sustainable growth. The new Action Plan announces initiatives along the entire life cycle of products, targeting for example their design, promoting circular economy processes, fostering sustainable consumption, and aiming to ensure that the resources used are kept in the EU economy for as long as possible.

[16] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1583933814386&uri=COM:2020:98:FIN
[17] https://ec.europa.eu/info/node/123797

In principle, the implementation of certain requirements of the ELVD can contribute to the development of a more circular economy. These include:

- Use of recycled materials in new vehicles;
- Recovery of materials pre shredder and material specific recovery targets;
- Regulation of recovery and sale of parts from ELVs.

These are examined, in turn, in the following paragraphs.

It should also be noted that the Circular Economy Action Plan indicates that the Commission "*will propose minimum mandatory green public procurement (GPP) criteria and targets in sectoral legislation*". There are currently no provisions relating to public procurement in the ELVD.

Use of recycled materials in new vehicles

According to Article 4(1)(c) on prevention, '*Member States shall encourage […] vehicle manufacturers, in liaison with material and equipment manufacturers, to integrate an increasing quantity of recycled material in vehicles and other products, in order to develop the markets for recycled materials.*

However, the ELVD does not include a specific target on how much recycled materials should be incorporated in vehicles. As such, it appears that any action taken in this direction has been mainly voluntary, driven by other considerations.

Several car manufacturers have taken action to increase the use of secondary materials in the production of new vehicles (table 6-3 below). According to the information collected, in 2009 Volkswagen reported that 40% of vehicle weight of its Golf model was from recycled material. Other manufacturers also reported that they achieved, or aim to achieve, an increase in the share of recycled content in their vehicles (total or plastic).

Table 6-3 Manufacturer data on recycled content in vehicles

Manufacturer and model	Type of recycled content	Year	Share of recycled material
Volkswagen, Golf	total recyclate	2009	Secondary raw materials ca. 40% of vehicle weight (501 kg metal recyclates, 15 kg plastics recyclates, 9 kg glass and 2 kg operating fluids)[18]
Daimler, general	total recyclate	2015	The specifications for Daimler vehicles stipulate that the proportion of so-called secondary raw materials, including recycled materials, is to be increased continuously. The planning therefore provides for an annual review until 2020. As an interim target, 25 percent more renewable raw materials and recyclates should be used by 2015 compared with the base year 2010. The target was even exceeded with a 39% increase in use of recyclates and 28% in renewable raw materials in comparison to 2010 by 2015 (exceeded target of 25% increase).[19]

[18] https://www.recyclingmagazin.de/2009/02/20/ueber-500-kg-rezyklate-im-neuen-golf/; accessed: 23 March 2020
[19] https://www.globalcompact.de/de/themen/Good-Practices/Umweltschutz/Best-Practice-Kreislaufwirtschaft-bei-Daimler.php; accessed: 23 March 2020

Manufacturer and model	Type of recycled content	Year	Share of recycled material
Daimler Mercedes S Class,	plastic recyclate	?	total weight of components made of recycled plastics: 49.7 kgs All black plastic parts of the Mercedes S-Class's outer skin are made of recycled materials.[20]
Daimler Mercedes B Class	plastic recyclate	?	13% increase in recycled material compared with the predecessor model. Typical areas of application are wheel arch linings, cable ducts and underbody panelling.[21]
Daimler Mercedes A Class	plastic recyclate	?	118 components plus small parts with a total weight of 58.3 kilograms from resource-saving materials.[22]
Opel Adam	?	2015	170 components with recyclates; Error! Bookmark not defined.
BMW, 7er	plastic recyclate	?	15-20% by weight of a vehicle's total plastic volume[23]
BMW i3	plastic recyclate	?	ca. 25% of the thermoplastics used in the production of the car consist of recycled materials.
Volvo	plastic recyclate	?	at least 25% recycled plastics in every new car from 2025 onwards (Kilberg 2019)
Renault Espace	plastic recyclate	?	50 kg recycled plastic content.[24]

Similarly, even though motorcycles are not within the scope of the ELVD, the motorcycle trade association also indicated that manufacturers try to make motorcycles more recyclable. As suggested, even though there is no obligation, they do so because of their Corporate Social Responsibility commitments and their customers asking for such changes. This possibly suggests that consumer pressure has encouraged such changes even in the absence of the ELVD.

A discussion on this issue during the workshop revealed that there may be an issue with a lack of recovered plastic of suitable quality and volume for car manufacturers to incorporate larger amounts in new vehicles. A business association from the dismantling sector mentioned the potential extra costs involved in increasing the plastics reuse in car manufacturing. The cost of production of virgin plastics is estimated at around 60-90 cts/kg, while production with recycling costs around 50% more (90-120 cts/kg) and have more limited use than the virgin. Moreover, manual separation (at the source) of different plastics is necessary, which increases the costs of using secondary plastics in cars even further. There is a lack of evidence to conclude on this point and it could be further investigated.

The Circular Plastics Alliance was launched in December 2018 to 'take action to boost the EU market for recycled plastics up to 10 million tonnes by 2025'. A working group has been created to work on this objective for the automotive industry, which could be of relevance to assess the potential for a higher uptake in recycled plastics in new cars.

[20] https://www.tagesspiegel.de/mobil/recycling-bei-der-automobilproduktion-wiederverwendung-spart-nicht-nur-geld/12044148.html; accessed: 23 March 2020
[21] https://www.daimler.com/nachhaltigkeit/umweltzertifikate/b-klasse.html; accessed: 23 March 2020
[22] https://www.daimler.com/nachhaltigkeit/umweltzertifikate/a-klasse.html; accessed: 23 March 2020
[23] https://www.bmw.de/de/topics/service-zubehoer/bmw-service/recycling.html; accessed: 23 March 2020
[24] https://group.renault.com/en/news-on-air/news/renault-actively-developing-circular-economy-throughout-vehicles-life-cycle/; accessed: 23 March 2020

Removal of materials (pre-shredder)

An important issue in maximising the recovery of material from ELVs is the removal of materials from ELVs prior to shredding. This means that the removed materials are not mixed with other materials (as is inevitable in shredding) so they are of higher value and are easier to recycle, or even reuse. The ELVD contains provisions on the removal of parts to promote reuse and recycling (see Article 6(3) and Annex I(4)). These provisions, however, only mention a limited number of parts and, more importantly, are not specific. For example, these provisions mention the removal of glass but do not specify at which stage of the treatment this removal should take place, and do not include a definition of what constitutes 'high quality' recycling (e.g. glass recycled to glass, rather than used for construction purposes). In practice, this means that the removal of glass is rarely performed before shredding, which seriously undermines the possibility to recycle glass.

The targeted survey confirmed that ATFs are most likely to remove materials pre-shredding when there is an established and profitable market for them. According to eight stakeholders, including experts and business organisations not all parts/materials are economically profitable to dismantle due to dismantling time and cost and high costs for logistics due to small amounts per ATF. According to three stakeholders, including administrative organisations, the reason why materials are currently not removed is the lack of obligation to do so in the Directive.

During the workshop, discussion of why some treatment operations before shredding were not equally established in Europe, revealed the following:

- **Glass**: A glass association noted that every Member State has the facilities/capacity to recycle, a lack of recycling could therefore be due to the higher price of recycled material (vs. virgin material);
- **Plastic components**: an EPR organisation noted that they are not removed due to the costs and low value of recycled materials;
- **Copper**: such as that found in wiring (removal requiring precise recycling practices) has a high extraction cost and it is therefore not economically viable for an ATF to extract it.

The operations that were perceived as promoting the most recycling pre-shredding were: removal of catalysts (65%), removal of tyres (60%), removal of metal components (34%). The survey also confirmed a mixed picture in the removal of plastics and glass pre shredding, although both were reported as being removed much less frequently.

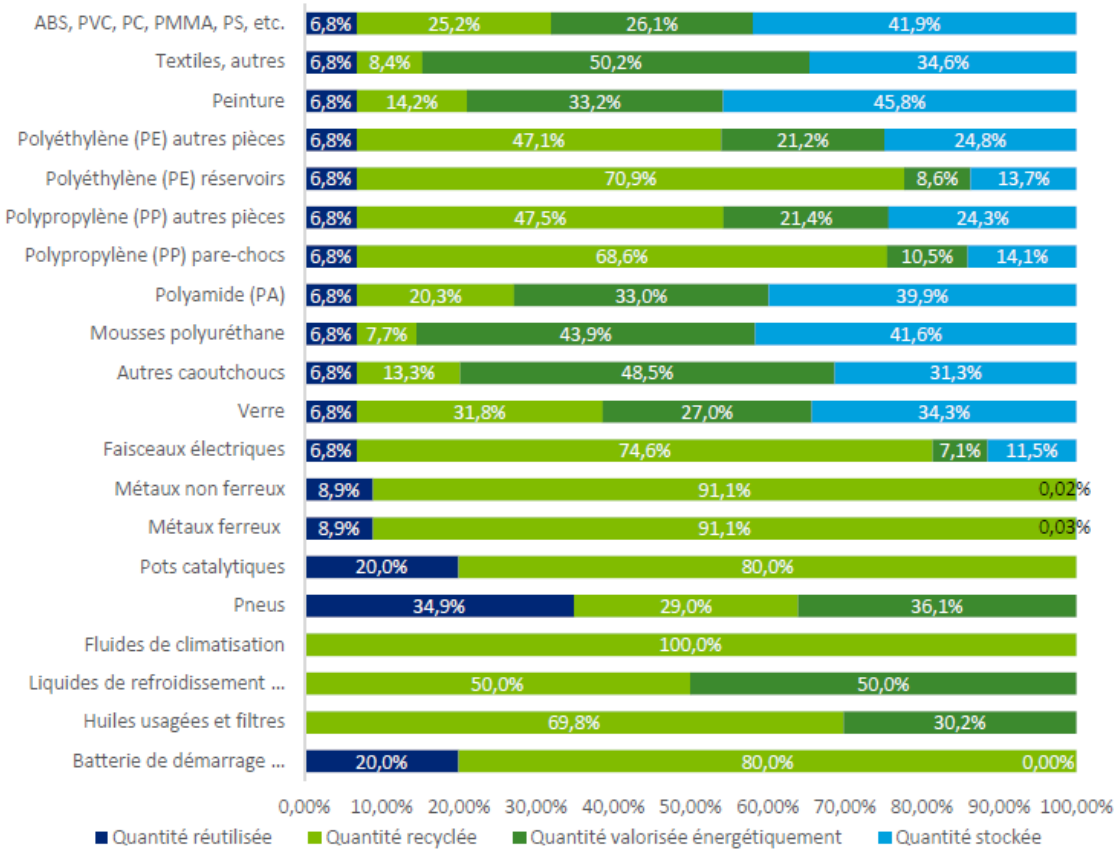
A number of industry stakeholders pointed out that extensive material separation and recovery is carried out post-shredder, so pre-shredder removal is not the only answer. However, a majority of the targeted stakeholders, including branch organisations, recyclers, national and regional administration organisations, a trade union and environmental organisations, believed it is important to remove other parts before shredding, to promote a higher rate of recycling (53%), with only 23% saying this was not important (23% did not know).

The top responses on which materials should be removed before shredding included batteries, oils and fluids, and electrical and electronic equipment. Two stakeholders (a Belgian NGO and a Belgian business association) also mentioned catalysts, non-ferrous metals, tyres, wiring, control units, electronics, foam and textiles.

Material specific recovery targets

Quantitative data on the recycling of specific materials from ELVS is rare. Ademe (2020) have recently published a report which provides details on the reuse, recycling, energy recovery and disposal by material as displayed in **Figure 6-9** below. The figure shows that metal and metallic components (such as catalytic converters and batteries) are almost 100% reused and/or recycled. A higher share of other materials (e.g. glass, tyres and most plastics) are directed to energy recovery or disposal. The lowest reuse and recycling rates are reported for textiles and polyurethane foams.

Figure 6-9 Breakdown by type of treatment of each material constituting an ELV



Source: Ademe (2020)

The targeted survey included a specific question on whether specific waste management targets per material, such as a specific rate for aluminium, plastic, glass, would improve the implementation of the ELVD. This is arguably a forward looking, rather than backward looking (evaluation) type questions but was included at the request of the Commission. There were mixed reactions, although a majority of those that expressed an opinion stated it would improve the implementation of the Directive. Eight stakeholders (including recyclers, experts and public authorities) noted it would lead to incentives for higher recycling and would lead to better eco-design in car design.

Some stakeholders suggested specific targets for certain materials such as aluminium, glass and plastic. One stakeholder stated that a specific rate for aluminium would highly increase costs for ELV dismantling, although another business association pointed out that aluminium recycling from automotive applications is already averages 95%, which casts doubt on the claim that a target would increase costs. Three stakeholders did not see material specific targets as the ideal solution and argued that material values should remain as the driving force, to avoid cases where ATFs labour, transport and

process costs are not met by the value of the material recovered. This view was repeated during interviews with an EPR organisation and an ATF company who stated that material targets would not help because if these materials were financially interesting, they would already be collected, and such targets would require existing secondary markets for these materials. The glass-related association, however, strongly supported the idea of introducing specific targets per materials, especially for glass. As they mentioned, other Directives have specific targets for glass although it is still difficult to collect and recycle.

Regulation of recovery and sale of parts from ELVs

The OPC included a question on the sale of spare parts recovered from ELVs. Some Member States require that when these parts are sold they are accompanied with information on the vehicle that they were removed from. There has been some concern raised that some final owners of ELVs are removing parts and selling them (including via internet platforms) prior to taking their ELVs to ATFs. This question was included in the OPC hoping that this would include responses from individual consumers who may have experience of purchasing such parts.

Most stakeholders noted that when spare parts removed from ELVs are sold, they are not accompanied with any information on their origin (n=56) or that they were unaware of the issue (n=51). Of the respondents who were aware of information accompanying spare parts sold on the internet, most noted that the name of the dismantler who dismantled the spare part was provided at sale (n=27). Following this, the vehicle identification number (VIN) was noted by 17 as being provided at the point of online sale. Additionally, 16 stakeholders noted the registration number of the dismantler showing the parts were dismantled in an authorised facility was provided at the point of online sale.

On spare parts being sold without any information on their origin, over half of the stakeholders who responded to the question in the OPC were from either Germany (n=9), Spain (n=8), France (n=6), the UK (n=6), or Belgium (n=4). Other notable countries (in terms of total respondents) included Denmark and Finland. This indicates that the problem appears to exist in multiple Member States.

At the workshop, on the issue of online sales, a representative from Galloo noted that many spare parts are currently sold online, via various platforms. There is no traceability on such platforms, which needs to be reviewed. This opinion confirms the consultation findings. They stated that in the US one cannot sell spare parts (online or offline) for a vehicle without being registered as a commercial company. This was suggested as a possible solution for Europe. It seems that a recent agreement between the UK authorities and dismantlers and eBay accepts that all parts will be audited, including the seller being an ATF, before being placed on the platform for sale[25]. A representative from the French environment agency noted that there is a lack of data and that we need to know what happens to spare parts after they are sold.

[25] https://www.gov.uk/government/news/environment-agency-joins-forces-with-ebay-to-stop-illegal-vehicle-breakers

6.4.2 *Conclusions*

To what extent did the dismantling of parts before shredding affect the ELV targets and the quality of recyclates, in view of the objectives of the Waste Framework Directive (WFD) and the Circular Economy Action Plan?

The data, consultation and interviews confirm that removal of some parts/materials before shredding does occur. Some are sold as replacement parts, some are recycled. Some materials are profitable when removed pre-shredding for recycling (e.g. catalysts, tyres, batteries). This is because the materials are of high value and a market exists that supports their recycling. Some other materials could be removed pre-shredding and be recycled to a higher quality and level than is the case post-shredder. Most dismantlers do not carry out pre-shredder dismantling of these materials (glass, large plastic parts, wiring harness or electronic components) because the low value of the material vs. the cost of removal means it is not economically viable for them and there is no clear obligation in the Directive to remove before or after shredding. This is a clear example of where maximising the objectives of the Circular Economy is being constrained by economic barriers and clear language in the Directive is needed.

Coherence with the WFD is discussed in section 6.14.

Did the ELVD undermine the achievement of the objectives of the raw materials and innovation policies?

The innovation issue is addressed in a dedicated section. However, it does not appear that the ELVD has had a substantial (industry wide) positive impact on the design of cars, though there are some positive examples of design for recyclability and the use of recycled material in some new cars. However, this is also reported to be occurring in vehicle types (motorcycles) that are outside the scope of the ELVD, which suggests that consumer pressure is at least as important as the Directive. The lack of a specific target, or any indication other than 'an increasing amount' on the level of recycled content that vehicle manufacturers should include in cars, means that we are not able to measure or comment on if the efforts made to date are good or bad. However, the fact that they are variable, with some manufactures using more, indicates that it is possible to increase the level. This may be constrained by the availability of suitable recovered materials, but this would require further investigation.

Raw materials are covered in the conclusion above and in the questions under relevance concerning new materials and electric vehicles.

Would the Directive benefit from material specific recovery targets?

Making the removal of glass mandatory pre-shredding would increase material recovery but would add costs to the ELV treatment process, as the market value of the recovered glass does not appear to cover the costs of removal. Although it is arguably a question for an impact assessment of future changes, there was some support for the inclusion of material specific recovery targets, and it would contribute towards Circular Economy goals. The issue that is likely to arise is that it would be accepted and achievable at low or no cost for some materials (e.g. metals), but would impose additional costs for others (e.g. glass). It is also known that the ATFs compete with non-registered dismantlers and it would impose an extra burden on the registered dismantlers if they were obliged to meet the additional costs of this (albeit environmentally beneficial) dismantling.

An additional issue is the recycling of strategic metals and CRMs (found in electronic and electric and battery components). This is addressed under relevance but requires consideration, including guidance for dismantlers to maximise recovery and via the adaptation of Eco-design rules for these materials.

Regulation of internet sale of parts removed from ELVs.

Removal of parts for sale and reuse is in line with the principles of the Circular economy, as it avoids the resources need to recycle and remanufacture the material into a useable product. However, it appears that this market is not consistently regulated between MSs. There is also a need to distinguish between the actors who are placing used products on the market: the OEM after a remanufacturing process (like for gears or motors), ATFs who could provide the product with a guarantee or a private individual who has removed the part before bringing it to an ATF and offers the part for sale (possibly via the internet). For private sales of parts from ELVS there are some consumer protection and safety issues as well as concerns, and this is arguably a consumer protection issue, with one option being preventing the private sale (on public platforms) of spare parts. ATFs are using the sale of recovered parts help generate revenues to subsidise the costs of obligatory depollution and dismantling.

6.5 (Effectiveness) Inspections of ELV treatment facilities

The question covered in this section is:

How effective were inspections in the MSs in the ATFs to identity their legality?

6.5.1 *Analysis*

The ELVD does not require Member States to carry out inspections of ATFs or the wider sector, for example to seek out and target illegal activities. It is known that France and the UK have carried out some inspections of ELV treatment facilities with the aim of reducing illegal activities (Mehlhart et al. 2017):

- *In order to combat the illegal vehicle treatment facilities of ELVs, since 2013 France have set up a national action plan against illegal sites and activities. In the frame of this plan a joint organisation of inter-ministerial control operations at national and local level were formed. The main objective of the inspections is to verify if the operating conditions of the site are in accordance with environmental regulations. Since 2012 the number of identified illegal vehicle treatment facilities has increased from 265 in 2012, to 480 in 2013, to 461 in 2014 and to 534 in 2015. The inspections resulted in the closing of 100 illegal facilities;*
- *In the UK, authorities conducted detailed inspections in the sector and about 1 000 illegal waste sites were investigated in 2015. As a result, 989 of the sites were stopped, and 48 were classified as high risk sites. According to current information, there were 148 active illegal waste sites at the end of March 2016.*

Several Member States carry out occasional inspections of ATFS during the course of the standard approaches of the local environmental authorities, but no details of these have been collated.

According to the stakeholders that responded to the survey, inspections are not considered to be effective. Inspections of ATFs received the most positive assessment, but only 27% considered them to be fully effective. Some stakeholders (two public authorities and one NGO) are of the opinion that authorities do not have enough staff/resources to fully execute inspections across ATFs, non-ATFs and exports. Two stakeholders (a Belgian business association and a Swedish academic) indicated that the

effectiveness of the ATF inspections vary greatly, depending on the Member State and sometimes regional authorities. Three stakeholders (a German regional authority, a Swedish national authority, and a Belgian NGO) expressed their concerns that the authorities do not have enough staff and resources to execute timely inspections. Four national authorities (Swedish, Lithuanian, Danish and German) stated there is no exact statistical data related to the number of non-Authorised Treatment Facilities and the inspections of these.

According to a Greek stakeholder, authorities only inspect official ATFs and no inspections take place of repair car workshops, spare parts shops, and export companies to identify illegal trafficking of cars and spare parts. The Greek stakeholder urged the Greek authorities to undertake constant inspections to tackle illegal dismantling facilities, by observing the outbound traffic of ELVs from official ATFs for a few days or visiting repair and second-hand spare parts shops. This should also be extended to include online marketplaces as the UK Environment Agency has done for www.ebay.uk.

All three stakeholders said that **inspections in non-ATFs** are not undertaken, and this is something that has to change. In terms of **inspections of vehicle exporters**, the EPR organisation mentioned that they are effective to some extent, but the enforcement of exporting regulation requires more knowledge and expertise.

6.5.2 *Conclusions*

How effective were ATF inspections in the MSs to identity their legality?

The ELVD does not require inspections in the sector and does not require any reporting on inspection activities. Minimum standards for such inspections and reference to other EU legislation such as inspections under the WSR or environmental crime, making it obligatory to look for (suspected) illegal activities, would strengthen the competitiveness of ATFs.

Analysis of available data from the UK and France demonstrate that inspections can identify a high number of illegal activities but they also point to the fact that such inspection campaigns are costly for the administration and need continuity. The sites where inspections identify illegal treatment of ELVs are most often not ATFs, but unregistered facilities and workshops not registered as ATFs (or as repair workshops).

According to the surveyed stakeholders, ATFs are felt to have effective inspections. Some stakeholders were of the opinion that authorities do not have enough staff/resources to fully execute inspections across ATFs, non-ATFs and exports. Some also feel that the technical knowhow to conduct such inspections is missing.

6.6 (Effectiveness) Innovation

The question covered in this section is:

Did the ELVD foster or hamper innovation?

6.6.1 *Analysis*

Our targeted survey asked stakeholders if they thought that the ELVD fostered or hampered innovation (in both car design and ELV treatment). Only 6% of respondents believed that the Directive hampered innovation in relation to car design and ELV treatment. 40% of stakeholders believe it had fostered

innovation in ELV treatment. For car design, 28% said it fostered innovation, 30% said it had no impact and 36% did not know. 15 stakeholders noted that its impact on innovation on car design may not yet be perceived as car design changes are slow, with the adoption of recycled materials in car production requiring years of testing and auditing. Two examples of innovation in car design were provided:

- The car design 'packs' instead of many small parts which resulted in the need for better tooling & equipment for ELV treatment (one Belgian citizen);
- The use of different plastics created difficulty in recycling and led to post-shredder technologies and complex recycling processes for plastics (two Belgian business associations, one German national authority, one Bulgarian national authority, and one Belgian citizen).

The Better Regulation Guidelines contain a specific tool[26] on assessing innovation impacts of legislation. Although this is focussed on impact assessments, it is possible to consider most of the questions in the context of an evaluation. Looking at the main question groups, we can draw the following conclusions:

Does the measure affect the research, testing or demonstration phase?
The ELVD could arguably help in terms of increasing demand for the generation of new ideas, their adaptation and application (e.g. from the knowledge base to industry) relating to design for recyclability and recycling/recovery techniques, as it helps create some market pull for these.

Does the measure affect application of innovative solutions or to bring them to market?
The automotive industry has a relatively large research and development expenditure. This focusses on a variety of issues, with the motives for this a maximum of regulatory and consumer pressures. Use of recycled materials and ease of recycling may be important to some consumers, but it is of less interest than fuel economy or performance to most consumers. Therefore, some regulatory requirements on these is likely to have encouraged innovation.

Does the measure affect incentives around investment, growth, jobs or scaling up in Europe?
The ELVD is regarded as stricter legislation than the requirements in other parts of the world. Therefore, it could be argued that it encourages more innovation in Europe than elsewhere. However, the car industry is global, so the location of the R&D is much more driven by individual company preferences.

Flexibility and future-proofing.
The ELVD does not appear to constrain solutions to increasing use of recycled content, ease of recyclability or recovery/recycling techniques. As is argued elsewhere in this evaluation, targets for use of recycled content and recovery targets for specific materials could be considered, and these would logically increase the demand for innovation, however they do have other risks. This also crosses over with the Framework Directive on the Type-Approval of Motor Vehicles (2007/46/EC) which is addressed under coherence. The ability to update and review the exclusions of certain chemicals is also dealt with elsewhere in the evaluation.

[26] https://ec.europa.eu/info/sites/info/files/file_import/better-regulation-toolbox-21_en_0.pdf

Compliance costs.

There is no evidence of the ELVD encouraging or obliging 'defensive' as opposed to R&D into more novel solutions. There is also no evidence of additional bias as a result of the ELVD in favour of incumbents as opposed to new innovators.

6.6.2 *Conclusions*

Did the ELVD foster or hamper innovation?

It appears that the Directive does not hamper innovation. It appears to have led to innovation in relation to the removal of hazardous substances from vehicle designs and though in some cases removal of materials or components at EoL can be challenging, it generally seems that more of these are recovered and reused than in the past. Most of the stakeholders agree that the Directive has influenced the limiting of prohibited hazardous substances in vehicles and that the Directive made the recycling of ELVs, their materials and components easier and increased the quantity of recycled material used in new vehicles.

It does not appear that the ELVD has had a substantial (industry wide) positive impact on the design of cars, though there are some positive examples of design for recyclability and the use of recycled material in new cars. However, the ELVD requires the MSs to encourage manufacturers in this regard (i.e. regarding design for recycling and uptake of recyclables) and this would be better regulated at the EU level by setting concrete targets for such aspects

The risks and opportunities associated with the increasing use of new materials (which pose different recycling/recovery challenges) and the growth in the use of electric vehicles are covered in the relevance section.

The Better Regulation Guidelines contain a specific tool on assessing innovation impacts. The ELVD does not appear to raise any concerns against any of the questions suggested in this tool.

6.7 (Efficiency) Costs and benefits

The questions covered in this section are:

To what extent are the costs involved proportionate, given the benefits which have been achieved?

What are the costs and benefits (monetary and non-monetary) associated with the implementation of the ELVD for different players (e.g. public authorities, consumers?

To what extent are there distributional impacts of the costs and benefits resulting from the ELVD (e.g. on SMEs, different sectors, across MSs)?

To what extent were there (and what caused) differences in costs and benefits between MSs?

To what extent did the ELVD support the EU internal market and the creation of a level playing field for economic operators?

What is the impact of the provisions in the ELVD and its harmonisation of requirements on the competitiveness of the automotive industry within the EU?

6.7.1 *Analysis*

The analysis is subdivided into sections covering the following issues relating to costs and benefits:

- *Benefits from substance prohibition* – an important part of the ELVD's rationale is to reduce / stop the use of certain chemicals that are known to be hazardous the human health and/or the environment. It is therefore important to consider the scale and value of these benefits;
- *The economics of ELV management* – the companies involved in the collection, dismantling and shredding of ELVs, as with all companies, have a mixture of costs and incomes. Some of these costs and incomes can be clearly linked to the ELVD, but some are less clearly linked. It is therefore important to consider how the industry functions in order to try and isolate the ELVD specific costs and benefits;
- *ELVD specific administrative costs* – We have attempted to collect data on the reporting and other administrative costs that stakeholders feel can be directly attributed to the ELVD.

Benefits from substance prohibition

In the initial version of the Directive published in 2000,[27] Annex II specified 13 exemptions: 5 exemptions for the use of lead (Pb) in various alloys; six exemptions for the use of Pb in various components, an exemption for hexavalent chromium (Cr VI) in coatings and one for mercury (Hg) in bulbs and displays. The annex also required the Commission to review two of the specified exemptions as well as a number of additional ones according to the procedure specified in Art. 4(2). This initiated the first revision of Annex II to the Directive, which resulted in a limited number of revisions of the existing listings as well as the addition of 8 exemptions for various articles. For example, exemptions were also added for cadmium (Cd). In these initial stages, it is assumed that information as to the articles that still required the use of the prohibited heavy metals was still incomplete, and thus it was necessary to add applications that had not initially been identified as relevant and to remove others that were understood to have not been relevant for vehicles. The annex has been reviewed ten times[28]. The numbering of the exemptions has changed over the years and thus the further detail of the progress of the exemption review over the years refers to application types rather to exemption numbers.

The need to make spare parts available for vehicles placed on the market prior to 1 July 2003 (i.e. in cases where they contain prohibited substances) was addressed through an amendment of the annex in 2005.[29] This approach was also adopted for vehicles placed on the market before the expiry of an exemption. In general, when it becomes clear that an exemption is no longer needed, an expiration date is added in relation to vehicles type approved before a certain date. In this manner, vehicles put on the market earlier can still make use of the exemption in cases where spare parts are needed for maintenance.

In general, though in the first years after the introduction of ELV there were valid exemptions for all four prohibited substances, to date all exemptions for Cd and Hg have expired as well as all but one exemption for Cr VI and most of the Pb exemptions:

Mercury, which was used in in the past in vehicle head lights and in display components, was no longer allowed for use in vehicles after July 2012 (aside for spare parts). Though the phase-out of discharge lamps (Hg based) has progressed in other sectors, 2012 was somewhat earlier than the phase-out of

[27] See: https://eur-lex.europa.eu/resource.html?uri=cellar:02fa83cf-bf28-4afc-8f9f-eb201bd61813.0005.02/DOC_1&format=PDF, last viewed 17.12.2019
[28] https://ec.europa.eu/environment/waste/elv/legislation_en.htm
[29] See: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32005D0438, last viewed 17.12.2019

discharge lamps for general purpose light or in EEE displays and ELVD may have been a driver for this process. Nonetheless, discharge lamps as opposed to their predecessors (halogens) may also have been phased-out because of technical characteristics of competing technologies that were better suited to vehicles, such as the time needed to reach full brightness or the quality of emitted light. It is also not clear if these lamps were phased-out in favour of halogens or light emitting diodes (LEDs), though the latter is now becoming the more common option.

The use of **Cd** in thick film pastes and in NiCd batteries was prohibited in 2006 and in 2008 respectively. A further exemption for Cd in optical components that had been added to the Annex in its second revision in 2005 was removed in the next revision, probably after it had been concluded that such components were not actually used in vehicles. In the case of batteries, NiCd batteries were substituted with Li-Ion batteries which offered various advantages. Here too, though it is possible that ELVD also contributed to the shift away from Cd, it is probable that additional factors played a role in this process.

Cr VI – Ex. 11 was initially included in the Directive for Cr VI in "corrosion preventative coating" of vehicle articles up to a total amount of 2g per vehicle. This exemption was simplified in the first review (2002) of the annex to "Corrosion preventive coatings" and set to expire in 2007 and a further exemption was added for Cr VI in absorption refrigerators of caravans. In the second review of annex II (2005) an exemption was added for corrosion protection in nut and bolt assemblies of chassis applications until July 2008. This means that at the time, it was the last general vehicle Cr VI application where the phase-out required additional time. Phase-out for all such applications (2 g per vehicle) is understood to have been achieved by July 2008.The exemption for adsorption refrigerators was continued and further specified in the fifth revision, limiting its validity to the carbon steel cooling systems of these devices where Cr VI is used as an anti-corrosion agent. A last review of this exemption was conducted in 2018-2019 to align it with the RoHS Directive and with REACH, where substitute candidates had led to the specification of an expiration date for the exemption. During this review, Dometic, which manufactures such articles, estimated an amount of 1.6 to 4.8 grams of hexavalent chromium were placed on the market per vehicle containing an adsorption refrigerator (e.g., caravans) and a total of ca. 520 kg for its total EU market. The exemption is set to expire for some articles by the end of 2019 and for others by the end of 2025. This would mean that by 2025 over 520 kg of Cr VI will have been phased-out (an underestimation seeing as there are additional manufacturers placing adsorption refrigerators on the EU market) (Baron et al. 2018). Though the phase-out of this application was also driven by the RoHS Directive and by REACH, ELVD can also be considered a driver of this process. This would mean that by 2025 over 520 kg of Cr VI will have been phased-out. This is likely to be an underestimation seeing as there are additional manufacturers placing adsorption refrigerators on the EU market (Baron et al. 2018).

Pb – The largest number of exemptions have been listed in Annex II of the directive for the use of lead in various applications. The first group of exemptions is for lead in various alloys (steel, aluminium, copper and bearings and bushes). In this group, phase-out has been possible in some applications (bearings and bushes, continuously galvanised steel sheet) whereas in others reductions on the lead content have been possible. In aluminium alloys, lead content has decreased from a maximum of 3.5% to a maximum of 0.4%. For copper alloys, the maximum tolerated amount of 4% lead has not changed since the Directive came into force. Most exemptions for the use of lead in components have expired (e.g., vulcanising agents, bonding agents, valve seats, dielectric ceramic materials some of the lead

solder exemptions). An exemption for lead in batteries and a few exemptions for lead in solders remain and are evaluated from time to time to see if progress has been achieved. The exemption for lead acid batteries is probably the largest contributor to the use of lead in vehicles with a single lead acid battery containing between 9-13 kg of lead.

In the 2016 review industry estimated that a total of 58 million lead based automotive batteries were available for collection per year in the EU with a total weight of approximately 1,110 thousand tonnes (60% lead=666 thousand tonnes). A phase-out has not been possible for batteries, however in the last review of the exemption in 2016 it became clear that the development of Li-Ion batteries for this purpose was progressing (Baron et al. 2016). As for the exemptions for lead in solders, the Directive initially included a single exemption for lead in solders in "electronic circuit boards and other electric applications". This exemption was split into 10 exemptions, each addressing a specific part of the initial scope. Most of the these exemptions have now expired or are set to expire. The last review of a few of the remaining applications took place in 2018. Table 6-4 shows how this exemption has developed over the years and the relevant quantities of lead that were placed on the market for each part of the exemption. Data on the amounts is only partially available and so it is not straightforward to see whether there is a reduction or not. However, the fact that many of the exemptions have expired suggests that the amounts of lead placed on the market have decreased.

Table 6-4 Exemption development (2000 - 2016) and quantities of lead placed on the market

Phase	Exemption numbering and wording	Estimated amount of lead (Pb)		
		in 2008	in 2010	in 2016
2000 Initial Exemption	11 Solder in electronic circuit boards and other electric applications	Not known	Split after 2008	
2008 Split	8(a) Solder in electronic circuit boards and other electrical applications except on glass; Vehicles type approved before 31 December 2010 and spare parts for these vehicles (review in 2009)	500-700 tonnes, EU wide	Split after 2010	
2008 Split	8(b) Solder in electrical applications on glass; Vehicles type approved before 31 December 2010 and spare parts for these vehicles (review in 2009)	0.9 g per vehicle	Split after 2010	
Since 2010 Split	8(a) Lead in solders to attach electrical and electronic components to electronic circuit boards and lead in finishes on terminations of components other than electrolyte aluminium capacitors, on component pins and on electronic circuit boards; Vehicles type approved before 1 January 2016 and spare parts for these vehicles		Expiration date added	
Since 2010 Split	8(b) Lead in solders in electrical applications other than soldering on electronic circuit boards or on glass; Vehicles type approved before 1 January 2011 and spare parts for these vehicles		Expiration date added	
Since 2010 Split	8(c) Lead in finishes on terminals of electrolyte aluminium capacitors; Vehicles type approved before 1 January 2013 and spare parts for these vehicles		Expiration date added	
Since 2010 Split	8(d) Lead used in soldering on glass in mass airflow sensors; Vehicles type approved before 1 January 2015 and spare parts of such vehicles		Expiration date added	
Since 2010 Split	8(e) Lead in high melting temperature type solders (i.e. lead-based alloys containing 85 % by weight or more lead)		At least 5.4 tonne EU wide	2.2-22 tonnes, EU wide

Phase	Exemption numbering and wording	Estimated amount of lead (Pb)		
		in 2008	in 2010	in 2016
Since 2010 Split	8(f) Lead in compliant pin connector systems			Expired in 2017
Since 2016 Split	8(f)(a) Lead in compliant pin connector systems; Vehicles type-approved before 1 January 2017 and spare parts for these vehicles	n.a	n.a	1 tonne, EU wide
Since 2016 Split	8(f)(b) Lead in compliant pin connector systems other than the mating area of vehicle harness connectors	n.a	n.a	0.15 tonne, EU wide
Since 2010 Split	8(g) Lead in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit flip chip packages		0.2-0.6 tonne, EU wide	0.25 tonne, EU wide
Since 2010 Split	8(h) Lead in solder to attach heat spreaders to the heat sink in power semiconductor assemblies with a chip size of at least 1 cm2 of projection area and a nominal current density of at least 1 A/mm2 of silicon chip area			
Since 2010 Split	8(i) Lead in solders in electrical glazing applications on glass except for soldering in laminated glazing; Vehicles type approved before 1 January 2013 and spare parts for these vehicles		Expiration date added	
Since 2010 Split	8(j) Lead in solders for soldering in laminated glazing		0.6-1.5 tonne, EU wide (Calculated based on a variety of specific applications - No total estimation given)	2.9 tonne EU wide

Costs and benefits from prevention of lead emissions

Total costs for environment and health resulting from the use of lead are difficult to estimate even without trying to link them to the application of the ELVD. However, health and environmental effects can be derived from cases of detected pollutants' emissions, and these effects can then be assigned a monetary value. This last step can be used as an indication for determining the economic loss that pollution causes, rather than an attempt to quantify benefits from the ELVD related to use of lead as such. The following illustrates benefits from removal of lead in a broader sense than from the removal of lead required by the ELVD. The valuation of the specific benefits of lead removed by the ELVD is beyond the scope of this study.

The three studies of Bartlett and Trasande, (2014), the European Chemicals Agency, (2016) and Nedellec and Rabl, (2016) examine in detail economic costs and monetary benefits in the EU. Sources for Pb in ECHA 2016 are consumer articles and jewellery; Nedellec and Rabl examine atmospheric Pb emissions; Bartlett and Trasande don't specify the sources of Pb.

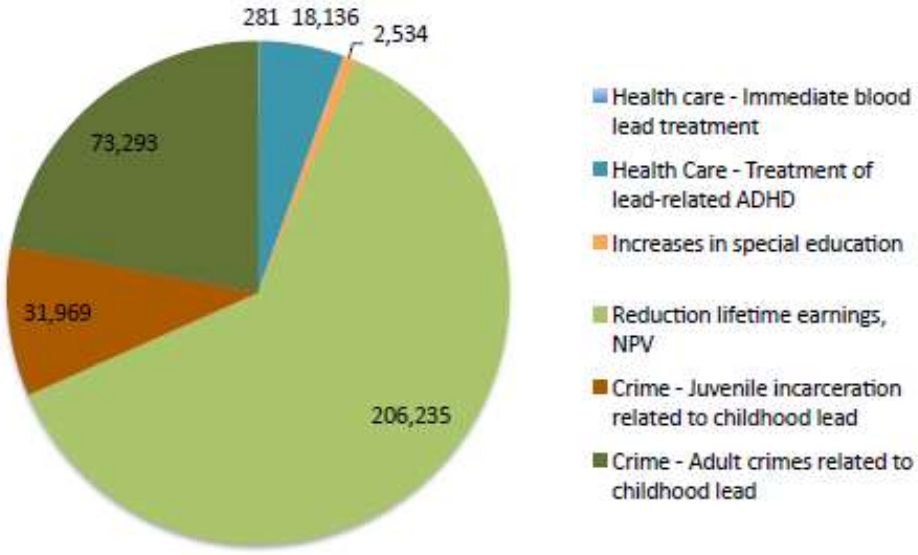
- The study of Bartlett and Trasande (2014) examines costs of childhood lead exposure based on blood lead level collected before the year 2003. More recent data was not used as lead exposures have decreased over time e.g. due to the phase-out of lead in gasoline. Exposure data was coupled to decreases in IQ and quantified as losses in lifetime economic productivity per IQ point loss. The costs obtained were adjusted for gross domestic product (GDP) and represent direct health care costs. The share of a disease burden caused by an environmental

stressor – which is lead in this case – the so-called environmentally attributable costs were calculated as 10.7 to 14.5 billion Euro per annum. In the EU27, these costs are 41.4 to 55.7 billion Euro per annum;

- Lead and its compounds are prohibited under the EU REACH regulation for several applications. The ECHA carried out a cost-benefit-analysis of REACH prohibited substances finding the following for lead and its compounds in consumer articles and jewellery: Substitution costs, additional testing costs and costs for product redesign, materials reformulation and alloy refinement of lead-free consumer articles are 26.9 million Euro per annum; cost difference between lead and lead-free jewellery and product testing costs account for 5 million Euro per annum. The quantified human health benefits for lead and its compounds in consumer articles and jewellery are > 26.9 mil-lion Euro per annum and 15.7 million Euro per annum respectively, both based on prevented IQ losses. (European Chemicals Agency 2016);
- Nedellec and Rabl (2016) calculated the costs for mortality and IQ losses per kilogram lead based on oral ingestion and inhalation of Pb compounds under typical conditions in Europe. The amount of damage costs for industrial emissions in the EU account for 29 343 € per kg Pb. With a Pb concentration of 0.567 g per ton of waste, this means damage costs for mortality and cases of IQ loss of 16.62 € per ton of waste.

The following figure shows the costs associated with lead exposure of children in the US-State of Michigan in 2012. It is presented here with the motivation to give an integrated picture of the different costs resulting from pollution with lead: health care and economic costs may be more evident than the share of costs for increased special education and crime.

Figure 6-10 Summary of costs associated with lead exposure of children in the US-State of Michigan, 2012, in thousands of US$



Source: Swinburn (2014)

The regional focus of this study is the EU but not the US. For this reason, no further data is shown here concerning numbers quantifying lead exposure in the US.

Table 6-5 Aggregation of data related to costs of lead contamination

Types of costs	Amount	Reference
Substitution costs, additional testing costs and costs for product redesign, materials reformulation and alloy refinement in consumer articles	26.9 million Euro per annum	ECHA 2016
Cost difference between lead and lead-free jewelry and product testing costs	5 million Euro per annum	ECHA 2016
Lead-attributable economic costs	41.4 to 55.7 billion Euro per annum	Bartlett and Trasande (2014)
Damage costs for industrial emissions based on oral ingestion and inhalation of Pb compounds under typical conditions in Europe	29 343 € per kg Pb 16.62 € per ton of waste (*)	Nedellec and Rabl (2016)

Table 6-6 Aggregation of data related to benefits of lead contamination

Types of benefits	Amount	Reference
Health benefits from lead-free consumer articles	> 26.9 million Euro per annum	ECHA 2016
Health benefits from lead-free jewelry	15.7 million Euro per annum	ECHA 2016

(*) Pb concentration: 0.567 g per ton of waste

The key point regarding the data that is presented and discussed above on the benefits of removing lead via environmental legislation is that it has been proven to have economic benefits in these other examples. It is therefore a reasonable assumption to state that the same is true about the lead removal that has been facilitated through the ELVD. The data is presented as there does not appear to be any studies of the specific benefits of the removal of lead from vehicles or the removal required as a result of the ELVD.

The economics of ELV management

We have reviewed a variety of sources in an attempt to analyse the costs and incomes involved in ELV management. We also included questions on this in our surveys, interviews and workshop.

Starting at the sector wide level, approximately 6 to 7 million ELVs are reportedly treated each year in approximately 14,000 ATFs (Elliott et al. 2019) and in 352 "automotive shredders" across the EU (Mc Kenna 2014).

The total turnover and number of enterprises and employees in companies that exist in whole or part for the management of ELVs is not known. The economic analysis of the ELV activity of ATFs alone is complex, as the majority of companies do not have cost accounting specific to this ELV activity, which often coexists with other activities, such as purchase/sale of damaged vehicles and second-hand vehicles, sale of new spare parts, trade in scrap metal. The nearest NACE definition is E38.3.1 – 'Dismantling of wrecks'. In 2017 (the most recent year for which data is available), Eurostat report[30] that for this code across the EU 28 there were 2,675 enterprises, 14,137 employees with a total production value of EUR 2,787 million. Comparing these numbers with the known number of ATFs

[30] Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), Code:sbs_na_ind_r2. Accessed 7/5/2020

indicated above suggests that this NACE code appears to only partly capture the number of active ATFs (e.g. 14,000 ATFs will have more than 14,137 employees).

Turning to Member State Level literature on the costs of ELV treatment:

Terra SA - Deloitte - BioIS (2015) carried out a study for Ademe on the economic evaluation of the ELV treatment chain in France (TERRA SA - DELOITTE - BIOIS 2015a; TERRA SA – DELOITTE – BIOIS 2015b). The study identified a representative sample of 25 ELV centres and 7 approved shredders in metropolitan areas. These sites were survey and interviewed regarding their costs. This work revealed a weighted average loss for ATFs of 23.90 € per ELV. However, there was a significant variation in the results, which range from -225.20 €/ELV to +109.80 €/ELV for the sample. Approximately 40% of the ATFs in the sample had a loss on their ELV activities. The result of the ATFs activity is particularly positive for ATFs whose share of ELV turnover is greater than 75% of the company's total turnover, the result being negative on average for companies whose ELV turnover represents less than 75% of the company's total turnover. For shredders the cost for the shredding of ELV is difficult to separate as all the shredders in the sample shred other scrap as well. The study reports fewer disparities in the results for the shredders compared to ATFs: the range of economic balance for ELV shredders results in 0.8 €/t ELV carcasses in weighted average (from -29.8 €/t ELV carcasses to +27.2 €/t ELV carcasses). The ELV shredder activity is loss making for 3 out of 7 shredders. The operating result for all activities is negative for 2 shredders (TERRA SA – DELOITTE – BIOIS 2015b).

It is important to remember that ATFs derive income from selling both parts for reuse and materials for recycling from ELVs.

Our survey included a question on the relationship between the cost of dismantling and the value of the parts and materials removed. The components most noted as profitable for removal included lead-acid batteries (70% of stakeholders), catalysts (66%), metal components (with Cu, Al, Mg) (55%), engines (48%), and gear boxes (48%). Other materials that some stakeholders reported as profitable to remove were electronics, especially electronic control units, wiring, foam and textiles.

At the workshop, a representative from Galloo and a EuRIC expert provided information on the cost for depollution. They noted that several French studies (for example the Ademe work referenced earlier) have shown that ATFs have an average cost of €40 per ELV for treatment, whereas car manufacturers only have a cost of €4.5 per ELV for dealing with tyres etc. A stakeholder from ACEA stated that economic viability for treatment is different across the EU, depending a lot on local markets and steel prices for component and secondary raw material sales. Two stakeholders disagreed with the reported perception that ATFs can cover their costs via the sale of spare parts. They noted that benefits and prices are decreasing every year. A stakeholder from ADEME noted that the costs and benefits are shared by dismantlers and shredders, depending on the price of steel and aluminium. When these prices decrease, shredders must buy ELVs from dismantlers at a lower price. Dismantlers also have no choice but to reduce their purchasing prices from the last owner to ensure their profitability, however this is only possible if the illegal sector is not an issue in the area.

An indication of the lack of accepted data on the costs of ELV treatment can be seen in a recent call for tender from the German EPA. The tendered study calls for services as follows: Determination of the

ecological, economic and operational effects of the dismantling of end-of-life vehicles in non ATFs and the illegal shipment of end-of-life vehicles and derivation of measures to address possible effects. Including inter alia the following work packages:

- Work package 1: Cost balance of end-of-life vehicle recycling in ATFs and shredders;
- Work package 2: Description of common types and business models of non-ATFs / illegal export of end-of-life vehicles;
- Work package 3: Determination of the ecological and economic impacts of the non-ATF dismantling of end-of-life vehicles and the illegal export of end-of-life vehicles.

Source: Umweltbundesamt Deutschland: Leistungsbeschreibung vom 18.3.2020 (FKZ 3720 33 304 0).

The study is expected to run for 12 months and should be available by the 2nd Quarter of 2021.

ELVD specific administrative costs

Our survey also asked stakeholders to provide information on their hours and costs to administer ELVD issues, including data collection, reporting, monitoring and technical compliance issues. Each issue received roughly 15-16 stakeholder responses. However, it is hard to draw conclusions from this survey about costs in general, and in particular by stakeholder types. This is largely because the reported numbers are very wide ranging and survey respondents did not provide any description of what they did or did not include in the costs.

During the workshop, Member State representatives were asked their views on this variation. A representative of Italy stated that Member States do not collect data with the same level of detail (there is no harmonisation), meaning that reporting costs, and how they should be interpreted can vary and therefore lead to misunderstandings. An example of a Member State specific cost was provided for France; their dismantlers (1700 companies) and shredders (60 companies) declare their activities to ADEME via a specialised website. This costs ADEME €170,000 a year and they use roughly 20 days a year to validate their ELV annual report.

From the data collected, it appears that companies (recyclers and ATFs) spend more resources (on average) on technical compliance than other stakeholder types. It also appears that public authorities seem to have higher costs across most categories, but particularly for Data collection, and Technical compliance. However, given the variation in responses these figures should be treated with caution. Given the diversity of approaches between Member States, collecting data to estimate the total administrative cost of compliance would require a detailed review of procedures and interviews in each Member State. Given that no Member State raised particular concerns about their administrative costs, such detailed investigation does not appear justified.

Table 6-7 Summary of cost data collected via targeted consultations:

Data collection				
Stakeholder Type	**No. responses**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (EuRIC)		100-200 depending on the country	12-60 depending on the country	100,000
Recycler/ATF	*3*	100 - 4,000	6-120	0 - 500,000
National government/administration	*4*	16-5,000	10 - 35	10 - 7,700
Regional government/administration	*3*	145 - 10,600	33 - 40	123 - 1,100

Reporting				
Stakeholder Type	**No. responses**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (EuRIC)		10-40 depending on the country	12-60 depending on the country	-
Recyclers (ATFs)	5	50 - 4,800	5 - 120	50 - 500,000
National government/administration	5	8 - 5,000	10 - 35	10 - 6,700
Regional government/administration	4 (from 3 MSs)	5 - 10,600	30 - 2,300	123 - 1100

Monitoring				
Stakeholder Type	**No. responses**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (EuRIC)		20-40 depending on the country	11-60 depending on the country	-
Recyclers (ATFs)	5 (from 3 MSs)	200 - 4,800	5 - 120	150 - 500,000
National government/administration	4	300 - 2,500	10 - 35	0
Regional government/administration	5 (4 MSs)	5 - 10,600	30 - 123	3 - 10.200

Technical compliance				
Stakeholder Type	**No. responses**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (EuRIC)		10,000 variable depending on the country	14-35 depending on the country	-
Recyclers (ATFs)	5 (from 3 MSs)	100 - 20,000	5 - 100	100 - 500,000
National government/administration	3	300 - 4,000	10 - 35	0 - 20
Regional government/administration	5 (4 MSs)	145 - 10,600	33 - 134	21 - 1,100

Input received (see table 6.8 below) from the European Automobile Manufacturers' Association (ACEA) provided data on the compliance costs of the automotive industry with the ELVD. According to their estimates, the costs associated with the Directive for the sector are around €2.7 billion between 2000 and 2020. These costs include costs for data systems (IMDS), take-back networks, information for dismantling, and awareness raising activities. A more detailed breakdown of these costs are presented in the table below. We assume that the cumulative costs are the sum over the last 20 years of the annual costs.

Table 6-8 ELVD compliance costs for the automotive industry in the EU

	Costs since implementation 2000 - 2020 cumulative (million €)	Running costs per year (million €/a)
IMDS (ELVD only)	1,632	107
Take-back networks	980	49
Dismantling Info	58	3
Consumer-Info	26	1
Overall Cost	**2,696**	**160**

**Source: Estimate by the European Automobile Manufacturers' Association (ACEA)*

It is interesting to compare the figures provided by ACEA with size of the new car market. Given that 15.2 million new passenger cars were registered in the EU 28 in 2017[31] this implies a cost of 160/15.2 = €10.53 per new passenger car.

The **costs for consumers** have been reported in the OPC as typically zero or negative. ATFs often pay to acquire an ELV from the last owner if they consider that the ELV has a high value due to spare parts or materials. In rare cases, it was mentioned that the final owners might have to pay for the transportation of the ELV from the last owner's storage place to the ATF. This contradicts an objective of the Directive regarding no cost disposal for final owners.

In practice when an ATF (or non-authorised facility, or another actor in the ELV value chain) receives an ELV, they assess its net value (considering the cost of depollution + disposal and the potential benefit of e.g. parts harvesting and material resale value). When that value is zero or negative, there is an economic incentive to not spend time and money to process the vehicle properly (this is particularly the case in high wage countries where labour costs make it uneconomic), but rather to extract the maximum value for it, e.g. sell it on for illegal disposal or maybe export to countries with lower wage costs so that value can still be extracted from it (hopefully by repairing it, but maybe to recover parts or materials and dispose of the rest). This is a link to the issue of 'missing' ELVs discussed in section 6.2.

There are several ways to address negative-value waste in general. The clearest approach is stringent enforcement or control. It is also possible to put incentives in place that somehow give the waste a positive value, like a deposit-refund scheme, or payments from the producers under an EPR scheme [which are designed to ensure free take-back], or government car scrappage schemes which have been shown to clearly create spikes in legally processed ELV numbers (cf Germany in 2009).

The distribution of costs between ATFs and OEMs (or the PROs that they might have set up) is an important issue here. There is disagreement and inconsistent data on the profitability of ATFs. OEMs consider that on average ATFs already operate at a profit, while the ATFs claim they lose money, but still process the ELVs properly (presumably to ensure compliance/avoid fines because economically they have no incentive to treat some ELVs). It seems likely that the treatment (and removal of parts for resale) of some (typically newer) vehicles subsidises the treatment of older ELVs which have a negative-value to the ATFs.

The differences between Member States regarding the average age of the ELVs arriving at ATFs is not well documented. However it is likely the some countries have an older vehicle fleet than other countries and that the average age of ELVs is higher compared to other countries (e.g. In 2018 Greece reported an average age of 22 years for ELVs, but in Italy or the UK the reported average age is 15 years[32]). Some stakeholders have raised concerns that spare parts from older ELVs contribute less (or nothing) to the revenues of ATFs and if the average age of ELVs is higher, it is more difficult for the ATFS to have a profitable business, on the assumption that the sale of parts is important to profitability.

[31] Eurostat. road_eqr_carpda
[32] Source: Quality reports of the Member States, submitted together with the Data on ELVs to Eurostat.

Summary of cost and benefit data

This section draws together the data from the literature with that collected in our consultations.

Costs associated with the ELVD are incurred by various economic operators for data collection, reporting, monitoring, and technical compliance. We have taken the costs collected in our survey and submitted by stakeholders and adjusted them as follows:

- For ATFs/dismantlers we have used the mid points of the range of costs on hours and cost per hour reported by EURIC as these are regarded as more reliable and representative than the small (and divergent) sample of individual ATF respondents;
- For national and regional governments/administrations we have taken the midpoints (excluding any individual extremes) of the figures on hours, costs and other costs reported in our survey;
- For car industry costs we have used the annual figures reported by ACEA.

In order to estimate an order of magnitude for total cost to ATFs for payments to final owners we have taken the mid-point (€200) of the pay out of between zero and 400 Euro per ELV reported in France (Ademe 2017), and reduced this to €150 based on feedback from the workshop, and the estimated total number of ELVs per year (6 million). This gives an annual cost of €900 million which ATFs/dismantlers need to cover or exceed from the revenues from reusable components and recyclables. To have a profitable business, additional revenues are needed to compensate the effort for investments and employees in the sector and to generate profits to make the business economically attractive.

The following tables collate the cost and benefit data that we have, and that we have asked / looked for but been unable to identify/accurately quantify. We also comment on which of these costs could be expected to apply even without the ELVD, i.e. in the counter factual situation of no ELVD.

Table 6-9 Costs as a result of the ELVD

Element	Total cost	ELV specific (vs, counter factual)
ATFs and shredders (source = EURIC unless otherwise stated)		
Reporting and monitoring	205 hours per year @ €35/hr for 14,000 ATFs = €100.5m/year	Hard to say how much would occur without ELVD. Some sites would be monitored by MS specific legislation
Operating	€40 / ELV (Ademe average) for 6 million ELVs = €240m/year	Depends on the MS requirements. Likely that in some MSs costs are higher to comply with ELVD requirements.
Payments to ELV last owners	Highly variable (from €0 to €300 per ELV) average of €150 = €900m/year	Will vary by car, MS and ATF, could be high if the MS in question set low standards. ELV only requires no charge (not payment), Payments vary, and ATFs can vary according to vehicle and its value to them (in parts and scrap)
Car industry (ACEA -estimated annual costs)		
IMDS	€107m/year	Set up as a result of the ELVD, but may have occurred anyway.
Take-back networks	€49m/year	May have developed as a result of other legislative and consumer pressure, but hard to know.
Dismantling Information	€3m / year	Set up as a result of the ELVD, but may have occurred anyway.
Consumer-Information	€1m/year	Set up as a result of the ELVD, but may have occurred anyway.
Member States (Average from data collected in this study)		
Reporting and Inspecting	6,400 hours per year @ €30/hour x 28 MSs= €5.4m/year	Some inspection and data collection would presumably occur without the ELVD, in virtually all MSs. Additional burden because of ELVD is hard to estimate. Low confidence in quality of reported data.

The **benefits** of the Directive can be distinguished as environmental, social and economic. Environmental benefits include the avoided damages in ecosystems due to hazardous substances and inappropriate handling of ELV fluids and other components. Indirect environmental benefit may include the lower environmental damage associated with resource extraction avoided due to recycling and reuse of materials and components from ELVs. Social benefits involve the avoided damage in human health due to exposure to hazardous substances and unregulated dismantling operations. Other social benefits include the employment and income generation for employees across the EU in the dismantling sector and other economic operators, the majority of which are SMEs. Economic benefits comprise business revenues for the dismantling and shredding sectors and for a number of other sectors that use secondary materials derived by ELV treatment. The creation of a level playing field for all market participants across the EU can also be considered an economic benefit derived from the Directive. A precise estimate of these benefits has not been possible, mainly since the exact effect of the Directive on these issues is not easily distinguishable and thus the degree to which the ELVD has led to these benefits cannot be estimated. However, it can be inferred that the Directive has been an important driver behind the development of ATFs.

For the nett value (i.e. including the costs of removal) of recovered / removed parts we have used the average of €130/ELV from a 2015 report on the situation in a sample of ATFs in France (ADEME 2015). For the value of recovered materials, we have used the average weight of an ELV in 2017 was 1088 kg[33]. The average % material composition of ELVs from Table 6-11 indicating a material flow of 70% (6m X 1.088 x0.7 = 4.56 million tonnes) of ferrous metals, and an assumed value of recovered metal of €235/tonne[34]. All of these figures are approximate estimates that will vary over time (notably depending on the market prices for metals, esp. steel) and by MS.

Table 6-10 Benefits as a result of the ELVD

Element	Total (€m/ year)	ELVD specific (vs, counter factual)
ATFs and shredders (EURIC)		
Sale of recovered / removed parts	6 million ELVs treated per year, Ademe estimate of €130/ELV = €780m.	ELVD does nothing specific to make this easier (despite it being an ELVD objective), but it could be argued that the ELVD helps attract ELVs to ATFS, where the parts can be removed.
Sale of recovered materials (e.g. recycled steel)	6-million ELVs treated, 1088kg/ ELV, 70% Ferrous metal = 4.56 million tonnes @ €235/tonne = €1,074 million	ELVs would still be scrapped and the profitable material would be recovered without the ELVD, but the ELVD arguably increases the number of ELVs that are collected. Handling of hazardous and non profitable materials would not be regulated at the EU level, creating the risk of diverse national approaches.
Car industry		
Consumer good will from role / contribution of OEMs to ELV collection costs and	Very hard to value, but some manufacturers do promote their green credentials (though nothing specific on the ELVD specific costs has been seen), so it is of interest and value to some consumers	Car manufacturers may well have done this anyway, via this or some other route.

33 Source: Eurostat: unpublished data for 2018 for 16 out of 31 EU and EEA countries

34 Using time series for (German) shredder steel scrap for 01/2015 to 06/2020 (Source: Euwid Recycling and waste management (commercial data base) average price of 235€/tonne with a confidence interval (95%) of 230 to 240

Element	Total (€m/ year)	ELVD specific (vs, counter factual)
use of reclaimed material		
Savings from use of recovered material	Maybe low (or even negative), as virgin material is often lower cost than recovered material	
Member States / citizens		
Removal of hazardous substances	Lead removal (for example) has been shown to offer clear benefits in other environmental policies. The same would be true for removal of the prohibited substances from ELVs.	Some (even most) MSs would have developed similar prohibitions, but EU wide action has standardised this and probably made the process quicker (and more thorough) in several MSs. EU wide prohibitions obliged OEMS to act on a market wide basis.
Avoidance of impact from recovered resources	GHG savings and other benefits from avoided extraction of virgin materials	Resource recovery likely to have speeded up and occurred in more MSs with the ELVD than without it.
Level playing field within and between MSs	Benefits to citizens and legitimate businesses through competing on a fair basis within MSs and between MSs	Most MSs would have aimed to achieve this within their own borders, but the likelihood of consistency between MSs would have been lower
Savings on second hand vs. new parts	Consumers arguably benefit from access to recovered part, also avoids energy use in the manufacture of new parts. Though there are also risks in purchasing used parts of unknown history.	Would have happened without ELVD. Role of ELVD in increasing this is unclear (not part of its original intention, but increased collection of ELVs arguably makes this easier)

Costs vs. benefits - qualitative

Given the difficulty in quantifying the costs and benefits of the ELVD (which we expected to occur before the project started) we included a qualitative question in the targeted survey, asking respondents if they agreed with the statement "The benefits (economic and environmental) of the ELVD outweigh the costs of its implementation".

A total of 57 stakeholders provided a response and most of these agreed or strongly agreed (32 responses or 56%). Only 4% disagreed or strongly disagreed. Those that strongly agreed or agreed were mostly from national governments (10 stakeholders or 67% of all national government responses) and business associations (7 stakeholders or 88% of all business associations). The most neutral stakeholder group was companies/business organisations (5 stakeholders or 50% of all company responses) who are the group with most exposure to the costs.

Among the interviewees, there were different views expressed concerning the cost impacts. The EPR organisation believes that the ELVD reduced the cost for operators at the end of the vehicle life cycle (e.g. dismantlers, shredders, etc.), while increased the cost for operators at the beginning of vehicle life cycle (e.g. manufacturers, vehicle dealers, etc.), whereas an ATF company gave the exact opposite answers. The EPR stakeholder also stated that the income of operators at the beginning of vehicle life cycle has been decreased as a result of the ELVD.

6.7.2 *Conclusions*

What are the costs and benefits (monetary and non-monetary) associated with the implementation of the ELVD for different players (e.g. public authorities, consumers?

The cost and benefits associated with the implementation of the Directive cannot be easily estimated.

The **benefits** of the Directive can be distinguished as environmental, social and economic:

- Environmental benefits include the avoided damages in ecosystems due to hazardous substances and inappropriate handling of ELV fluids and other components. Indirect environmental benefit may include the lower environmental damage associated with resource extraction avoided due to recycling and reuse of materials and components from ELVs;
- Social benefits involve the avoided damage in human health due to exposure to hazardous substances and unregulated dismantling operations. Other social benefits include the employment and income generation for employees across the EU in the dismantling sector and other economic operators, the majority of which are SMEs;
- Economic benefits comprise business revenues for the dismantling and shredding sectors and for a number of other sectors that use secondary materials derived by ELV treatment. The creation of a somewhat more, level playing field for most market participants (as all vehicle manufacturers have to comply, and all ATFs should operate to the same standard) across the EU can also be considered an economic benefit derived from the Directive.

A precise estimate of these benefits has not been possible, mainly since the exact effect of the ELVD on these issues is not easily distinguishable and thus the degree to which the ELVD has led to these benefits cannot be estimated. However, it can be inferred that the Directive has been an important driver behind the development of ATFs and this has increased the number of ELVs that are treated in regulate and thorough way.

The **costs** of the ELVD are somewhat easier to identify and quantify than the benefits. There are costs to the ATFs to operate to the standards required and to report. There are costs to the car industry in designing vehicles with recyclability in mind, in replacing materials previously used, and in providing information to dismantlers. Member States and local / regional authorities also face costs in collecting a reporting data. It appears that consumers are not faced with costs for the disposal of ELVs, but there remains some concern that this may not always be true for vehicles that have little or no value to car dismantlers. The complexity for this evaluation is identifying which costs of car dismantling and material recovery are specifically and only because of the ELVD.

To what extent are the costs involved proportionate, given the benefits which have been achieved? To what extent are there distributional impacts of the costs and benefits resulting from the ELVD (e.g. on SMEs, different sectors, across MSs)?

Costs associated with the ELVD are incurred by various economic operators for data collection, reporting, monitoring, and technical compliance. The data we have collected from MSs (national and regional level) for our survey is too small of a sample and too varied to draw robust conclusions. We have much more confidence in the costs to ATFs reported from their largest trade association. However, as they have reported, and as we have confirmed from interviews and survey input, there is significant variation in these across Member States. This variation appears to be caused by differences in the level of reporting detail requested by national authorities, and difference in vehicle registration (and de-registration) procedures.

Enforcement costs were not reported by national governments. The large number of ELVs with unknown whereabouts, which are partially attributed to illegal activities (i.e. illegal exports and illegal dismantling) implies that the ELVD is not being fully enforced in some Member States. Therefore, although the cost of the Directive enforcement cannot be estimated, it is perceived as lower than

required, meaning that proper enforcement would have to mobilise additional resources from Member States.

The **costs for consumers** for disposing of their ELVs has been identified as either zero or even positive. It has been reported that ATFs often pay to acquire an ELV from the last owner (including insurance companies) if they consider that the ELV has a high value due to spare parts or materials. In rare cases, it was mentioned that the final owners might have to pay for the transportation of the ELV from the last owner's storage place to the ATF. The other costs are discussed in the question regarding cost distribution.

To what extent were there (and what caused) differences in costs and benefits between MSs? What is the impact of the provisions in the ELVD and its harmonisation of requirements on the competitiveness of the automotive industry within the EU?

The study did not reveal **any data on significant differences between Member States** in relation to costs incurred by different economic operators, apart from the ATF reporting costs.

The **comparison of costs and benefits** associated with the Directive is difficult to make. However, the evidence from the consultations shows that the vast majority of the stakeholders consulted consider that the total benefits of the Directive outweigh its costs.

Regarding the **distribution of the costs associated with the Directive across the different economic operators of the ELV management sector**, it has been reported that dismantlers and shredders cannot always make a profit from their operations. An economic analysis of the ATF activity in France in 2015 showed that around 40% of ATFs were operating at a loss. According to the same study, 3 out of 7 shredding companies in France were operating at a loss. Moreover, according to the association that represented the European recycling industries in the stakeholder workshop organised as part of the evaluation, there are several studies that have shown that French ATFs have an average cost of €40 per ELV for treatment, whereas car manufacturers only have a cost of €4.5 per ELV for dealing with tyres etc. The idea that the Directive has increased costs for the economic operators at the end of the vehicle life cycle (e.g. dismantlers, shredders, etc.) was also reported by a Greek ATF.

There is no evidence or any claims that the ELVD has a negative impact on the competitiveness of the automotive industry within the EU.

The distribution of costs between ATFs and OEMs (or the PROs that they might have set up) is an important issue here. There is disagreement and inconsistent data on the profitability of ATFs. OEMs consider that on average ATFs already operate at a profit, while the ATFs claim they lose money, but still process the ELVs properly (presumably to ensure compliance / avoid fines because economically they have no incentive to treat some ELVs). It seems likely that the treatment (and removal of parts for resale) of some (typically newer) vehicles subsidise the treatment of older ELVs which have a negative-value to the ATFs.

To what extent did the ELVD support the EU internal market and the creation of a level playing field for economic operators?

There are some variations between MSs on the reporting/compliance costs of ATFs. While this could be considered an issue in terms of a non-level playing field, in that ATFs in countries with lower reporting

costs are at a comparative advantage, there is no evidence of these ATFs taking ELVs from other MSs and using these lower costs to their advantage. The lack of consistent inspections of ATFs (see section 6.5) could be described as more of a level playing field issue, as the likelihood of being stopped from operating (and fined) as an unregistered vehicle dismantler appears relatively low in most MSs.

A common observation of a number of stakeholders was that insurance companies are unduly absent from the implementation of the Directive. Since insurance companies sell ELVs in auctions (in large quantities) to the highest bidder, if left unregulated this could become a significant channel of ELVs towards illegal operations (including export).

6.8 (Efficiency) Administrative Burden and Simplification Opportunities

The questions covered in this section are:

Is there any evidence that the implementation of the ELVD has caused unnecessary regulatory burden or complexity?

Are there any good or bad practices that can be identified in terms of efficiency in the achievement of results?

6.8.1 *Analysis*

Our targeted survey included a question 'has the ELVD caused any unnecessary regulatory burdens or complexities? The majority of stakeholders did not know (52%), with a relatively even split between yes (35%) and no (33%). In the written comments on this question the most common response (n=4) among stakeholders (branch organisation, vehicle manufacturers and ATF) concerned the overlaps between the Batteries Directive and ELVD. They stated that as the collection and recycling of batteries is already covered under the Batteries Directive, it would be beneficial to identify these overlaps and inconsistencies and to correct them.

The second most common response (n=3) was that the ELVD can result in burdensome reporting. For example, an ATF claims that in Portugal due to the ELVD, the obligation to report is duplicated under national law. A business association from Belgium proposes that the reporting obligation could be simplified by using online tools (which are already used in some MSs).

Respondents were also specifically asked for suggestions to reduce the administrative burden. The most common response (n=5) concerned vehicle (de-) registration and notification systems. The proposal was that a digital system should be put in place, with vehicle registrations directly cancelled by dismantlers (which would simplify the obligation to report the ELV cancellation to national authorities and would also lighten the obligations of these national authorities to cancel the RPs) or that other MSs could use the system in place in the Netherlands as an inspiration. In that system only authorised market operators and stakeholders have access and can update the vehicle status. This would reduce the administrative burden and could also reduce the amount of untracked exports, or unregulated ELVs.

It is has not been possible to look at data from the Netherlands to test if their vehicle registration system is reducing the amount of ELVs of unknown whereabouts, because (as explained earlier in the report) there is no data and no way to accurately know how many ELVs should be treated and deregistered in a particular year, so the gap between the reported and the actual number can only ever be modelled. Multiple variables are not easy/possible to get data on (e.g. export of used vehicles within the EU without re-registration, dismantling in non-ATFs (without CoD), dismantling in another EU-MS State without CoD.)

6.8.2 *Conclusions*

Is there any evidence that the implementation of the ELVD has caused unnecessary regulatory burden or complexity?

There is no clear evidence of unnecessary regulatory burden or complexity. There are some concerns raised about overlap with the Batteries Directive, but this is picked up in coherence. The most common suggestions for reducing the administrative burden, concerned vehicle (de-) registration and notification systems, this is also picked up in coherence. Online submissions of data regarding ELV treatment numbers appears to be a relatively easy way for MSs to simplify reporting.

Are there any good or bad practices that can be identified in terms of efficiency in the achievement of results?

On the basis of the input from stakeholders, the (de-) registration systems in the Netherlands is considered to be a more effective and efficient system in comparison to other MSs. In the Netherlands, only authorised market operators and stakeholders have access to update the vehicle status. This reduces the administrative burden and the amount of untracked exports of unregulated ELVs. It is not possible to prove the relative effectiveness of the Netherlands system in comparison to other systems by using data on the number of ELVs treated.

6.9 (Relevance) Hazardous substance in ELVs and Annex II of the ELVD

The question covered in this section is:

Are the frequency and motivations for amending Annex II to the ELVD adequate?

6.9.1 *Analysis*

Article 4(1)(a) of the Directive stipulates provisions related to waste prevention and requires Member States to, inter-alia, encourage vehicle manufacturers and their supply chain "*to limit the use of hazardous substances in vehicles and to reduce them as far as possible from the conception of the vehicle onwards, so as in particular to prevent their release into the environment, make recycling easier, and avoid the need to dispose of hazardous waste*". To this end, Article 4(2)(a) prohibits the use of lead, mercury, cadmium and/or hexavalent chromium in materials and components of vehicles put on the market after 1 July 2003, other than in cases listed in Annex II. This annex specifies a number of materials and applications in which the use of these substances was tolerated after this date and in some cases still is (see further details in 6.7.1). The items listed in this annex are referred to as "exemptions" throughout this study.

Frequency of amendment to Annex II

Article 4(2)(b) empowers the Commission to adopt delegated acts amending Annex II *on a regular basis according to technical and scientific progress*. The Annex can be amended in order to specify maximum values below which the presence of an ELV prohibited substance is to be tolerated. The Annex can also be amended in order to delete certain exemptions, if the use of the specific prohibited substance it refers to is avoidable. There is no reference in the Directive as to how often exemptions should be reviewed to ensure that they are still justified. Since 2002, Annex II has been reviewed and amended ten times, usually at intervals of 2-3 years. However, the frequency at which specific exemptions have been reviewed and amended differs.

Directive 2011/65/EU on the restriction of hazardous substances in electrical and electronic equipment requires exemptions to be specified for a maximum duration (5 to 7 years depending on category type) and stakeholders may apply for a renewal of the exemption providing a justification. Though there is no requirement, in the ELVD, it has been common practice in most exemption reviews to specify when the next review should take place. Depending on the status of the development of substitutes, exemptions usually have specified review periods within 3-5 years from the end of a review. This approach aims at determining the maturity of substitutes to allow specifying an expiry date and does not reflect the design cycles of vehicles.

In relation to the frequency of amendment of Annex II and of exemption evaluations, in our stakeholder survey, most stakeholders did not have an opinion (40%) as to whether amendments were frequent enough, another large group believed they were sufficient (35%) and a number of stakeholders noted the reviews were too frequent (24%). From those who said the frequency is sufficient, 58% were national or regional administrations, and from those who said it was too frequent, 60% were either companies or business associations. The consultants note however that the question was formulated in relation to amendment of Annex II and not in relation to the frequency of evaluating individual exemptions. Though the annex is reviewed quiet frequently (usually every 2-3 years), in each review, only a number of exemptions are evaluated. In this sense, exemption evaluations are usually conducted at intervals of 5 years, with some exemptions being evaluated at shorter intervals (e.g. 3 years) where information indicates that substitutes were soon to become available or at longer intervals.
At the stakeholder workshop held as part of this study, when asked about the topic of exemption durations and how long exemptions should be renewed for in cases where substitutes for hazardous substances are still in the development stages, most stakeholders noted the exemption should be renewed for 7 years (40% of 10). Other stakeholders stated 2-3 years (20%), 5 years (20%), 10 years (10%), or that they did not know (10%). This generally indicates that most stakeholders view exemption durations below 5 years as too low for cases where substitutes are still in development and would recommend longer exemption durations of 7 years and above. The consultants assume this is related to the relatively long design cycles of vehicles that include redesign, a number of testing phases (on component, vehicle and field level), type approval and ramp-up of production scale.

The consultants recognise that in cases where substitute candidates are not yet known, that more time could be given between exemption evaluations to allow sufficient time for the design of vehicles to progress and to be adapted to scientific and technical progress. This is the case in the RoHS Directive that allows exemptions to be specified with a maximum duration of up to 7 years for categories with longer design cycles (medical devices, monitoring and control devices). However, the duration of an exemption needs to consider the availability of possible substitutes. Where candidates are identified, consideration should be given to when they are expected to become market ready. Even if additional time is needed for implementation of such substitutes throughout the automotive sector, once a substitute is proven to be suitable, it should be possible to estimate how much more time is needed to phase-out the ELVD prohibited substance throughout the sector (or in relation to sub-groups of the application range when different implementation conditions may apply). Requiring ELVD exemptions to be specified with a maximum duration and stakeholders to apply for the renewal of exemptions when the duration needs to be extended should be considered in the ELVD. A longer maximum duration, such as the 7 years allowed for categories with longer design cycles under RoHS, may also be relevant for the ELVD. However, it also needs to be clear that the maximum duration should only be specified where candidate substitutes are yet to be identified, as in such cases it can be assumed that the time for

development of substitutes, their testing and the ramp-up of full scale manufacture will need a longer period to ensure implementation. Where substitutes are identified and in development, the exemption duration should be considered in relation to the stage of development and the plan for development and implementation of substitutes. Indications that substitutes are expected to reach maturity within less than the maximum duration would justify a shorter exemption, with the aim of the evaluation allowing the specification of an end date for the exemption.

Justification for the exemptions in Annex II

Article 4(2) specifies what should be considered in the evaluation of exemptions, stipulating that "Annex II shall be amended on a regular basis, according to technical and scientific progress". In relation to the justification of exemptions, the Directive only refers to whether the substance is avoidable or not. More elaborate criteria such as those stipulated for exemptions from the RoHS substance restrictions (RoHS Art. 5(1)(a)) in relation for example to the reliability of substitutes, their availability or their impacts on health and the environment are not detailed. When asked as to the suitability of the criteria for amending exemptions listed in Annex II of the ELVD, most stakeholders (48%) did not have an opinion, though this may also have to do with the fact that it is mainly manufacturers of vehicles (OEMs and their supply chain) that participate in the evaluation of exemptions and have experience of the criteria. Most other stakeholders believed the criteria were to a large extent adequate (26%), with only 6% of stakeholders saying they were not at all relevant. Stakeholders (business associations and vehicles manufacturers; n=4) also mentioned that socio-economic aspects should be further considered together with "technical and scientific" aspects (i.e. whether a scientific alternative is economically and practically viable).

This topic was also addressed in the stakeholder workshop, where stakeholders were asked if negative impacts of substitutes on the environment and/or on health should be considered in the justification of exemptions. Only five stakeholders provided a response, all stating "yes".

Though there may be room to consider what criteria would be adequate for the evaluation of exemptions from the ELVD prohibitions, in the consultants opinion, there is room to rethink the basis for the justification of such exemptions, also in order to align such criteria with those applied in other legislation regulating the use of hazardous substances and their presence in equipment and products.

Lack of clarity as to why substance prohibitions only address the four heavy metals

Recital 11 of the Directive states that "*in particular the use of lead, mercury, cadmium and hexavalent chromium should be prohibited*", explaining that these "heavy metals should only be used in certain applications according to a list which will be regularly reviewed". Though in practice, these are the only four substances prohibited in the Directive to date (see Article 4(2)(a)), this recital can be interpreted to mean that it could become relevant to prohibit other hazardous substances should it be shown that their presence in ELVs may result in negative impacts at the EoL phase. The Directive does not specify any criteria according to which it can be determined whether additional substances are hazardous to a degree that would justify their prohibition in ELVs. Nonetheless, based on Recital 11 and Article 4 it can be assumed that additional prohibitions could be justified in cases where a decrease or the elimination of substances in ELVs would prevent "*their release into the environment […] facilitate recycling and […] avoid the disposal of hazardous waste*" (Recital 11).

To this end, Article 2(11) initially specified a hazardous substance as "*any substance which is considered to be dangerous under Directive 67/548/EEC*[35]". However, this definition was amended in 2008 through Directive 2008/112/EC [36], so from 1 December 2010 the definition for hazardous substances specified in Article 11(2) was replaced by the following: "'*hazardous substance' means any substance which fulfils the criteria for any of the following hazard classes or categories set out in Annex I of Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures;*

(a) hazard classes 2.1 to 2.4 [Explosives, Flammable gases, Flammable aerosols and Oxidising gases], *2.6* [Flammable liquids] and 2.7 [Flammable solids], *2.8* [Self-reactive substances and mixtures] *types A and B, 2.9* [Pyrophoric liquids], *2.10* [Pyrophoric solids], *2.12* [Substances and mixtures which in contact with water emit flammable gases], *2.13* [Oxidising liquids] *categories 1 and 2, 2.14* [Oxidising solids] *categories 1 and 2, 2.15* [Organic peroxides] *types A to F;*

(b) *hazard classes 3.1 to 3.6* [Acute toxicity, Skin corrosion/irritation, Serious eye damage/eye irritation, Respiratory or skin sensitisation, Germ cell mutagenicity and Carcinogenicity], *3.7* [Reproductive toxicity] *adverse effects on sexual function and fertility or on development, 3.8* [Specific target organ toxicity — single exposure] *effects other than narcotic effects, 3.9* [Specific target organ toxicity — repeated exposure] *and 3.10* [Aspiration hazard];

(c) *hazard class 4.1* [Hazardous to the aquatic environment];

(d) *hazard class 5.1* [Hazardous to the ozone layer].

In this respect it is also worthwhile mentioning Annex III of the WFD, which specifies properties of waste which render it hazardous, which refers to some of the hazardous properties referred to under CLP. Nonetheless, the properties specified in this annex are not applied in the WFD in relation to substance prohibition, but rather as a means of identifying waste which is hazardous in order to ensure its proper disposal. In this sense, this list does not clarify which properties could be relevant in relation to the prohibition of further substances.

In this sense, it can be understood that substances considered as hazardous under the above classes of the CLP Regulation would also be understood as hazardous by the ELVD. However, a classification under the CLP Regulation still does not clarify whether there is a potential risk for a substance to be released into the environment or to hinder recycling at the EoL phase. Thus, it cannot be concluded that all substances classified in the above hazardous classes under CLP should automatically be prohibited under ELV.

It is apparent that the presence of substances aside from the four heavy metals in waste may also compromise the ability to recover materials in the waste management stage. The fact that additional substances have been subject to prohibitions under other legislation (e.g. REACH, RoHS, POPs) suggests that these may have negative impacts on the environment and on waste management. In such legislation, restrictions or prohibitions may also be based on properties that are not addressed in the CLP hazard classification rules and these may also be relevant to consider in the ELVD. For example, the POPs Regulation addresses organic pollutants that are persistent. The REACH Regulation foresees

[35] This directive was in force between June 1967 and May 2015, coming into force in 1970, and was related to the classification, packaging and labelling of dangerous substances. It has been replaced by Regulation 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP).

[36] Directive 2008/112/EC of the European Parliament and of the Council of 16 December 2008 amending Council Directives 76/768/EEC, 88/378/EEC, 1999/13/EC and Directives 2000/53/EC, 2002/96/EC and 2004/42/EC of the European Parliament and of the Council in order to adapt them to Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures

authorisations of use or restrictions in cases of substances of very high concern (SVHC). The REACH criteria for SVHC refer to a number of CLP hazard classifications, but also (for example) to substances that are persistent, bio-accumulative and toxic (PBT) or substances that are very P and very B or that have endocrine disruptive properties raising an equivalent level of concern. In other words, additional substances should, therefore, at least be investigated for future prohibition from vehicles and it should also be considered whether the definition of hazardous substances in the ELVD should be amended to also address additional hazards.

For example, the hazardousness of various additives in plastics has been the focus of reviews in recent years, in relation to:

- human health hazards - including heath impacts affecting users, workers and general population in the vicinity of factories producing these plastic parts and waste operators during their waste treatment;
- emissions to the environment that may occur during use and waste management;
- possible obstacles that these may create for waste treatment and recovery.

Communication COM(2015) 614 mentions the general increase in the use of plastics and its advantages for vehicles in terms of weight reduction, however it also mentions that the presence of hazardous chemical additives can pose technical difficulties for plastic recovery. This suggests that there may be a need to regulate the presence of hazardous substances of concern in plastics used in vehicles, where it could create an obstacle to the recovery of such materials.

In this respect, the increase in the use of plastics in vehicles could indicate that there is also an increase in the use of additives that are hazardous. For example, an increase in the share of plastic from the weight of a vehicle is observed in car models (see Figure 6-11), from 10% in Golf II to 15.3% for the Golf V and to 19.5% for the Golf VII (Lieberwirth and Krampitz, 2015). This is also supported by ADEME (Monier et al. 2017), who specify a total of ca. 15% plastics in ELVs (see Table 6-11). As for the use of additives, the Global Automotive Declarable Substance List (GADSL) gives some indication, and currently specifies over 20 different substances categorised with flame retardant uses – most with a reporting obligation.

The SCIP data base[37] mandated to ECHA at the end of 2019 under the WFD may also contribute to the availability of such data in the future. In this database, suppliers of companies supplying articles placed on the EU market that contain SVHCs that are on the Candidate List in a concentration above 0.1% by weight (w/w) shall be required to submit information on such articles to ECHA, starting from 5 January 2021. The aim of this database is to promote the reduction of the content of hazardous substances in material and products and to ensure information availability on articles containing Candidate List substances is made available throughout the lifecycle of products and materials (including at EoL). It is not clear to what degree this effort would duplicate the information available through the GADSL, though it is assumed that more information would become available as to the amounts regarding SVHCs used in articles placed on the EU market.

A further example on possible hazardous substances is the presence of brominated flame retardants in plastic, that hinders the recycling and reuse of these fractions. The WEEE Directive requires that all

[37] See additional information under https://echa.europa.eu/de/scip-database, last viewed 24.3.2020

plastic parts above a certain size that contain brominated flame retardants (BFRs) be removed from waste EEE and such plastics are destroyed or irreversibly transformed due to their contamination with these substances. This is related to the fact that prohibited or restricted BFRs contained in waste plastic fractions along with other BFRs cannot be removed to avoid contamination of secondary plastics (e.g. in the case of BFRs with PBT or other SVHC properties). Separating other BFRs from the mixed fraction is also not possible and hinders the use of secondary plastics in new manufacture (with the exclusion of downcycling). BFRs are also known to be precursors for the formulation of dioxins when burned in uncontrolled fires in the presence of copper. It is also known that at least some BFRs have been used in the past in the automotive sector, for example in the form of decaBDE, the use of which is also restricted through the Stockholm Convention and its European Transposition in the form of the POPs Regulation. The depollution of plastic containing BFRs required under WEEE is not a prohibition of this group of substances, but rather a regulation of how such fractions are to be dealt with. Nonetheless, it originates from the possible content of restricted BFR in WEEE[38], which can hinder the recovery of certain fractions.

Similar to WEEE; though the ELV Directive does not address further substances directly, it includes requirements regarding the removal of "hazardous materials and components" that could "contaminate subsequent shredder waste from ELVs" (Article 3(b)). Annex I of the Directive specifically requires the removal of:

- Batteries and liquified gas tanks;
- Potential explosive components (e.g. air bags);
- Any fluid contained in the ELV that is not necessary for the reuse of the parts concerned (e.g., fuel, motor oil, transmission oil, gearbox oil, hydraulic oil, cooling liquids, antifreeze, brake fluids, air-conditioning system fluids);
- Components identified as containing mercury;
- Catalysts;
- Metal components containing copper, aluminium and magnesium if these metals are not segregated in the shredding process;
- Tyres and large plastic components (bumpers, dashboard, fluid containers, etc), if these metals are not segregated in the shredding process so that they can be effectively recycled as materials; and
- Glass.

Some of these components can be linked to the prohibited substances in terms of depollution (batteries may contain Pb and Cd and mercury is addressed through the reference to all components), and in some cases removal is to ensure that valuable metals are not lost in shredding procedures (copper, aluminium and magnesium). However, other hazardous substances may be contained in other articles or substances that could reduce the effectiveness of waste treatment operations and, in this sense, the Directive addresses some additional hazardous substances through depollution requirements.

There is no obligation to report on the removal of such articles and very little information exists as to the effectiveness of removal of these articles. A study prepared by IHS et al. (2015) investigated the availability of lead acid batteries for recycling in the EU and gives insights as to the high collection rates for such components. The recycling rate of automotive lead batteries is estimated to be close to 99%

[38] Where such substances have been restricted (e.g., RoHS restricts polybrominated biphenyls and polybrominated diphenyl ethers), the cease of use shall not be immediately apparent in the waste stream.

(understood to be 99% of collected batteries). As some of the material components are recycled and reused in the manufacture of new automotive batteries, the report considers automotive lead battery manufacture to operate in a closed loop. The collection rate however is understood to be lower; exact data is not available however from other sources it can be understood that "*some 25% of all ELVs arising in the EU do not end up in ATFs* [authorised treatment facilities]" (BIOIS et al. 2014), though this still means that where ELVs are brought to ATFs, the batteries can be expected to be removed.

Though some stakeholders may argue that the effort of substituting hazardous substances may outweigh the benefits in certain cases, the need to reduce the presence of these substances in vehicles and in ELVs continues to be relevant as a means of avoiding emissions to the environment and for enhancing the recovery of materials from vehicles. This is reflected both in the prohibition of these heavy metals addressed in other legislation (e.g. EU legislation as well as international legislation that applies in the EU) as well as in references to hazardous substances in various Union policies. Additional legislation prohibiting hazardous substances is discussed more in detail later in this chapter, in the context of coherence of the ELV with other legislation. Though the use and presence of these substances in different applications does not always bear the same risks in terms of possible emissions to the environment, the regulation of these substances reflects a consensus that the presence of these heavy metals in articles is a potential risk to the environment that needs to be prevented, managed and controlled where substitution is not yet possible. In some cases, it may be sufficient to regulate the presence of a substance in waste fractions through depollution requirements, while in others it may be relevant to consider the prohibition of additional substances.

The presence of various hazardous substances can also hinder resource efficiency. For example the Action Plan for a Circular Economy (COM(2015) 614 final) specifies that the presence of hazardous substances in waste is a possible obstacle to the recovery and use of secondary raw materials. "*The promotion of non-toxic material cycles and better tracking of chemicals of concern in products will facilitate recycling and improve the uptake of secondary raw materials*".

The Study for the strategy for a non-toxic environment of the 7th EAP (Goldenman et al. 2017) also refers to the ELV substance prohibitions that aim at preventing "*problems encountered during waste treatment and recycling that may relate to environmental and health risks or problems in waste material management and contamination*". Such prohibitions are viewed as having a positive contribution to the reduction of "*downstream impacts of the substance at the end of the product's life*". Nonetheless, the study also sees the current scope of prohibited substances as partial, explaining that other substances may also require similar action. For example, in relation to plastics with added flame-retardants it is mentioned that these "*should be kept out of the recycled material flows*". This would suggest that it may be relevant to extend the scope of substances to be prohibited in the future, for example also taking into consideration additional hazardous properties other than those of CLP that are referred to in Article 2(11) of the ELVD. Though a few additional substances are prohibited in vehicles through other legislation such as, the flame-retardant DecaBDE, it may be relevant to consider additional substances for prohibition. For example, substances with PBT properties or with endocrine disruptive properties should also be considered as well as technical aspects of waste management where the presence of certain substances may result in emissions to the environment or in reduced material recovery.

Though it seems clear that it remains relevant to prohibit the use and presence of substances in vehicles in certain cases, there is still the question of whether the ELVD is still seen as the relevant framework for this purpose. Similar to other sectors, the ELVD is specific to the automotive sector with an emphasis on the waste management of vehicles when they reach end-of-life. Substance prohibitions need to be considered in the design of vehicles but are oriented towards positive impacts related to the waste management stage (preventing emissions to the environment but also preventing obstacles to material recovery). On the topic of what framework should be used to prohibit substances in vehicles in the future, 18 stakeholders provided a response during the workshop. Most believed it was relevant to keep prohibitions in the ELVD (39%) and the Batteries Directive (33%). The latter is assumed to only refer to prohibitions of substances used in batteries, whereas it is not clear if stakeholders prefer the Batteries Directive for future prohibitions or only refer to it to ensure harmonisation between ELV and this Directive. Other stakeholders noted the REACH Regulation (11%) and Other (17%). There are various factors that are relevant for considering what framework may be relevant for the future of substance prohibitions. However, looking at the Directive and its accomplishments of objectives to date, it shows that the current framework has been and remains suitable for achieving the purpose of decreasing the amount of heavy metals in vehicles.

6.9.2 *Conclusions*

Are the frequency and motivations for amending Annex II to the ELVD adequate?

In the consultant's opinion, addressing hazardous substances and their use and contents in vehicles remains relevant. This is obvious from other legislation that has been developed in the EU for regulating hazardous substances used in similar applications to those of relevance to vehicles. It is also apparent from various policy papers of the European Commission that address not only the need to ensure that the use of such substances does not result in impacts on health and the environment but also to ensure that such use does not create obstacles to the management and recovery of waste and to strengthen the circularity of the European economy.

- Though there may be various considerations as to whether the ELVD is still the correct framework for this purpose, in the consultant's opinion it can be concluded that such regulation of substances is still needed;
- It is relevant to consider the necessity of prohibiting additional substances in the future, where this would support the reduction of risks to the environment as well as promoting resource efficiency. Though it may make sense to reconsider what substance properties should render a substance as hazardous under the ELVD (adding for example PBT and endocrine disruptive properties to the current list), it is also relevant to consider the additional criteria that should be considered for additional prohibitions. This relates to the fact that the hazardous properties of a substance alone do not yet clarify if the use of the substance is associated with impacts on the environment and on health or with hindering material recovery;
- The ELVD exemption mechanism has served its purpose, but looking at other legislation that regulates hazardous substances suggests that it may be relevant to make some adjustments in this mechanism. The criteria for exemption justification for example create a black-and white evaluation in which a substance can either be avoided or not. For example, the situation in which a substitute may also have negative impacts is not specifically addressed under the ELVD and could lead to regrettable substitutions in some cases. Adding consideration of socio-economic aspects may also be of relevance, as addressed by a few stakeholders, however it would be important to clarify that this should aim at weighing impacts on the environment and on health against economic impacts and not only make room for emphasising the latter. A

harmonisation of the justification criteria of ELV with those of the RoHS Directive should be looked into;

- The frequency of amendments of the annex is observed by stakeholders as too high, though this may be related to the burden that stakeholders have in relation to frequent evaluations of specific exemptions (differs from exemption to exemption) and not the annex in general. When asked on exemption duration, most stakeholders recommend durations of seven years and above where substitutes are not available. In the consultant's view, though for the most part the frequency of exemption evaluation seems to be functioning properly, adding some clarity as to a maximum exemption duration as well as in what cases shorter exemption validity could be considered may be relevant.

Are there existing needs that are relevant to the management of end-of-life vehicles that are not adequately covered by the Directive or by any other instrument?

Issues raised include the inclusion of some Brominated Flame Retardants (BFRs). Although DecaBDE is covered under the Stockholm convention and the EU POPS legislation, other flame retardants found in plastics are not. According to the consultants, this should therefore be scrutinized, particularly as plastics that require flame retardants are increasingly used as a light-weight material in ELVs. It should be investigated what other substances and particularly what additives used in plastics, hinder the waste management of ELVs or result in adverse impacts on the environment due to their presence in vehicles and ELV and whether there is room to prohibit additional substances.

6.10 (Relevance) Increased use of electric, electronic and other components in vehicles

The question covered in this section is:

To what extent can the ELVD cover new challenges for recycling that will contribute to better implementation of the aims of the ELVD?

6.10.1 *Analysis*

Vehicles are increasingly equipped with electronic components, which contain strategic and/or critical raw materials (CRMs). These materials include some with a high environmental relevance, such as gold, silver, palladium, tantalum and other rare earth metals.

According to a Study funded by the German EPA (Groke et al. 2017) '*Currently such raw materials are usually not reclaimed to a large extent and no routines are implemented […] to ensure reclamation approaches in the future, when higher amounts of economically strategic raw materials are expected in ELVs. Conventional treatment methods for ELV (shredding after depollution) are not designed to separate most of those strategic metals. Systematic information about the separation of relevant components from ELVs with the aim of reclamation of strategic metals is not available.*'

The study concludes that there is currently insufficient information available to dismantlers to identify electric and electronic components, which are profitable to dismantle. : '*The outcome is that the dismantling of some components is economically feasible.*[39]' However, in the targeted consultation of

[39] '*The outcome is that the dismantling of some components turned out to be economically feasible. Regarding the same components in different ELVs, the results may differ, e.g. due to varying metal content or time needed for dismantling. In case additional time is needed for dismantling, this may have negative consequences in terms of profitability. The potential to reduce the dismantling effort is limited. As a consequence, it is recommended to*

this study a vehicle production company from Germany and two business associations mentioned that an increase in the use of electronic components could increase the recycling sector's revenues, as a result of trade in more valuable used parts. Alonso (2019) also highlighted that the evolution of EU mobility towards more autonomous and connected vehicles will be associated with an increase of EEE and of interest in their reuse/recycling.

However, the German EPA study further notes: '*Regarding the same components in different ELVs, the results may differ, e.g. due to varying metal content or time needed for dismantling. In case additional time is needed for dismantling, this may have negative consequences in terms of profitability.* This finding is supported by almost half of the stakeholders consulted in our study, who believed that increased use of electronic components in vehicles will increase waste management costs. An ATF stakeholder and an EPR association reported that this partly relates to the increased use of copper wiring that needs to be separated from other materials.

The German EPA study also points out: *'The potential to reduce the dismantling effort is limited. Therefore, it is recommended to provide the dismantlers with appropriate information about which components are beneficial to separate, their identification and localisation to be able to optimise the dismantling of automobile electronics.'* Although, there is currently no legal basis established in the ELVD to make the provision of such information by the producers mandatory; this is understood to be the intention of the SCIP data base mandated to ECHA under the WFD. The WFD obliges suppliers[40] of articles placed on the EU market containing SVHCs that are on the Candidate List in a concentration above 0.1% by weight (w/w) to provide data as of 5 January 2021 (see Section 6.9 for further detail). 22% of the stakeholders we consulted noted that there will need to be further changes in the legislation as a result of increased use of electric and electronic components in vehicles.

The previously mentioned vehicle producer company from Germany and two business associations further noted that increased use of electronics did not necessarily correlate with an increased total weight of such components in ELVs. Their explanation for this was a general trend for smaller electronic components.

During the workshop, a researcher from Chalmers University noted that it's not just the increased use of electronics that have an impact. Increased use of aluminium and steel alloys is also relevant, which is an issue that they are currently researching with the JRC.

6.10.2 *Conclusions*

To what extent can the ELVD cover new challenges for recycling that will contribute to better implementation of the aims of the ELVD

There is a growing trend for increasing electric and electronic vehicle components in ELVs. However, to reclaim the strategic metals found in such electronics requires dismantling and separation of parts, and it is vital to know what these parts are and how to remove them. Currently, there is no legal basis in the ELVD requiring the provision of information by the producers on what electric or electronic components are beneficial to separate. This is therefore an issue on the information that should be made available to dismantlers. This may be addressed through the SCIP Data base mandated to ECHA

provide the dismantlers with appropriate information about which components are beneficial to separate, their identification and localisation to be able to optimise the dismantling of automobile electronics.' (Groke et al. 2017)

[40] As defined in point 33 of Article 3 of the REACH Regulation (EC) NO 1907/2006

under the WFD. However, there remains a large gap in car manufacturers providing detailed information on what materials their components include, particularly for electric and electronic components. Having measures in place in the legislation to ensure information is shared could increase the amount of reclaimed strategic metals.

6.11 (Relevance) Increased use of lightweight materials in vehicles like plastics, carbon-fibres, fibre-reinforced (plastics) materials and others

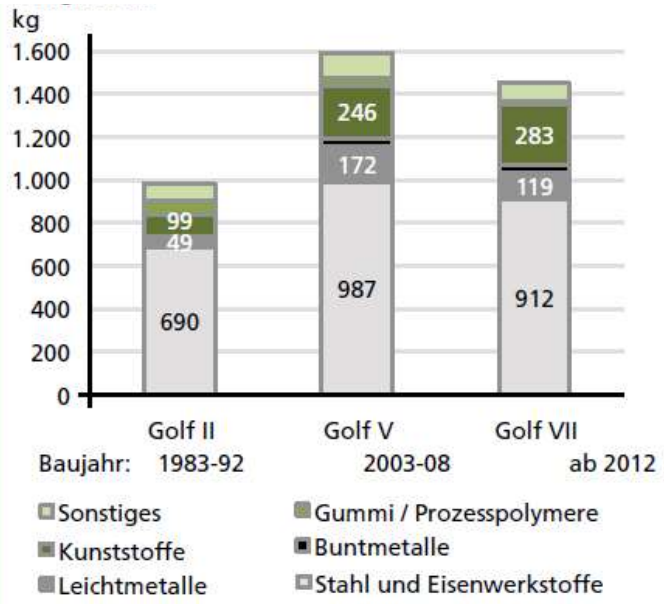
The question covered in this section is:

To what extent is the ELVD addressing factors influencing EoL (strategies to reuse/recycling of materials, improved replaceability and repairability, remanufacturing and second use possibilities)?

6.11.1 *Analysis*

Lieberwirth and Krampitz (2015) assessed recent trends in the use of lightweight materials in vehicle construction and the effects of this on recycling. The development of the share of plastics for different VW Golf models is displayed in the figure below. This indicates that the plastics content has increased over time, from 10% in the Golf II, to 15.3% for the Golf V and 19.5% for the Golf VII.

Figure 6-11 Unladen weight including operating fluids and material composition of the VW Golf series



Source: (Lieberwirth und Krampitz 2015):

The findings are a good match with analysis conducted by ADEME (Monier et al. 2017), which indicated an average share of 14.8% of plastics in ELVs in France in 2015. A certain share of plastics from tyres, battery casings, cable sheathing and paints should also be considered in addition to these.

Table 6-11 Average composition of an ELV in 2015 in France according to ADEME (Monier et al. 2017)

Polypropylene (PP) - other parts	4.4%
ABS, PVC, PC, PMMA, PS, etc.	2.2%
Polyurethane foam	2.0%
Textiles, other	1.7%
Other rubber compounds	1.1%

Polypropylene (PP) - bumpers	1.1%
Polyamides (PA)	1.0%
Polyethylene (PE) - fuel tanks	0.8%
Polyethylene (PE) - other parts	0.5%
Total	**14.8%**
Tyres	3.4%
Lead starter battery	1.4%
Wiring harnesses	1.0%
Paint	0.8%
Total	**6.6%**

Ferrous metals	70.0%
Non-ferrous metals (excluding wiring harnesses)	4.0%
Glass	3.0%
Spent oil and filters	0.7%
Catalytic converters	0.5%
Cooling or brake fluids	0.4%
Air-conditioning fluids	0.1%
Total	**78.7%**

For this evaluation study, we were not able to identify the total share of carbon-fibre and fibre-reinforced plastic materials in ELVs. In both cases, there are challenges in identifying these materials during dismantling while both can hamper the recycling of the separated plastics fractions.

Many (42%) of the stakeholders consulted for this study believed that an increased use of lightweight materials will increase waste management costs. An ATF stated that some new materials require more complex technologies and higher energy demand to recycle (if possible to recycle), which would result in higher waste management costs. A business association noted that the increased use of electric and electronic components will make the 95% recovery target impossible to achieve, as these materials cannot be technically or economically recycled under current conditions. They perceived that the Directive could be the instrument to balance the trade-off between lightweight material use and recyclability.

The conclusion that the use of lightweight materials increases costs for dismantlers was disagreed with by some at the workshop. A representative of the European Aluminium Association also noted that increased costs stemming from increased uses of lightweight materials is not true for all such materials. This was noted as not being the case for aluminium and other non-ferrous metals – where the opposite is said to be true.

The ELVD does not require specific information from producers, dismantlers or shredders regarding the presence of such materials. However, newly designed vehicles must achieve a type approval according to Directive 2005/64/EC. One section of type approval addresses the recyclability of the vehicle and the components used/materials and stipulates that recyclability should be feasible 'in principle' for 85% of the vehicle weight. When new materials are used in vehicles, such as carbon fibre, it is necessary for

the type approval to demonstrate the feasibility of 85% recycling. More information on the coherence of the ELVD with Directive 2005/64/EC is provided later in this chapter.

Some 25% of consulted stakeholders noted that the increased use of lightweight materials will require changes in the ELVD. An EPR organisation mentioned that treating such materials is highly energy intensive, and as such a change in the ELVD to allow for GHG emissions to be taken into account (i.e. the carbon footprint), when setting material targets, might be necessary.

6.11.2 *Conclusions*

To what extent is the ELVD addressing factors influencing EoL (strategies to reuse/recycling of materials, improved replaceability and repairability, remanufacturing and second use possibilities)?

Plastic content in vehicles is increasing. This may also be the case for carbon fibre. It is expected that this will increase further overtime. An important issue is when such components are mixed during recycling, as it hampers the recycling of carbon fibre and plastics. Some materials are also difficult to recycle per se.

According to Directive 2005/64/EC (Type Approval), 85% of the vehicle weight should be 'feasibly' recyclable. However, there are no specific requirements that facilitate the separation of plastics and other lightweight materials such as carbon fibre and fibre reinforced plastics, whether in the form of data provision on lightweight material contents or obligations for ATFs to separate such materials. The issues of coherence with the Type Approval Directive is discussed further in section 6.14 on coherence.

The analysis presented does not point to a specific course of action that would be preferable.

6.12 (Relevance) Increase in sales of electric or hybrid vehicles

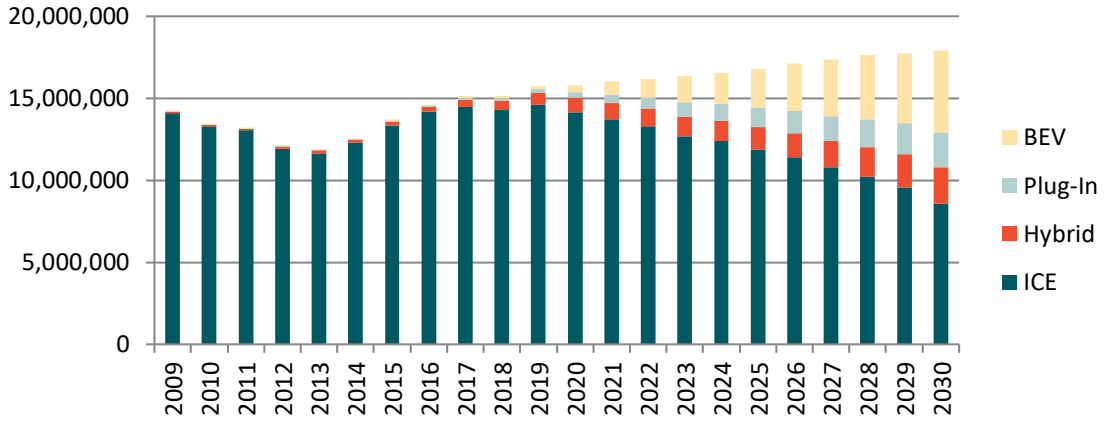
The question covered in this section is:

To what extent can the ELVD cover technological developments? (e.g. the growing share of electric vehicles)?

6.12.1 *Analysis*

Almost all stakeholders expect the number of registered battery electric vehicles (BEV), plug-in hybrid EV (PHEV) and hybrid EV (HEV) to continue to increase, bringing both new challenges and new opportunities for the ELV sector. The expected increase in uptake of all Electric Vehicle (EV) types is illustrated in the figure below. This illustrates the projected development of passenger car sales in the EU until 2030.

Figure 6-12 Development of passenger car sales in the EU (BEV=Battery Electric Vehicles, ICE=Internal Combustion Engine)



BEV: Battery Electric Vehicle (pure EV);
Plug-In: Plug-In electric vehicle (combination of ICE and electric motor, which is the main source of power);
Hybrid: hybrid electric vehicle (combination of electric motor ICE, which is the main source of power)
ICE: internal combustion engines powered by gasoline, diesel, biofuels or natural gas
Source: Model for passenger cars sales, Oeko-Institut e.V

The data in the figure up to 2017 are statistics (Eurostat, ACEA) and the projections of the future sales are based on the International Energy Agency's (IEA) 2DS scenario (IEA 2017) and statistical trends in the EU's share of total global sales (Boston Consulting Group 2017). Projections of the EV share in the EU show a wide spread of results. This relates to institutions often publishing different scenarios representing optimistic, likely or pessimistic projections related to EV deployment. The numbers presented are in line with an overall increase in sales with e.g. (Boston Consulting Group 2017) or (PWC 2018). The share of electric vehicles sales corresponds with other models and calculations such as the medium ZEV forecast in (EAFO 2017), or the below 40 scenario (McKinsey 2014) or (Boston Consulting Group 2017).

The share of EVs in the EU in the passenger car segment is calculated individually for each Member State based on the registration statistics starting from 2009. The preferences for alternative drivetrains are different in each country. For instance, the statistics between 2009 and 2017 show that in Finland Hybrids have been a lot more popular than BEVs. Therefore, it is assumed that sales of Hybrids will stay on a rather high level while the BEV's share increases steadily. Other examples, such as the Netherlands show that BEVs have developed to become the dominant alternative drive train already. In summary each member state has individual growth rates for the propulsion types ICE; Hybrid, Plug-in Hybrid and BEV resulting in a reliable projection of the development of the sector in the EU based on current trends.

The result shows a rapid uptake of alternative drivetrains with BEVs being the dominant type. In 2030, approximately a quarter of all passenger cars sold in the EU are predicted to be battery-powered. Plug-In Hybrids and Hybrids together are expected to account for another quarter of sales while the rest of the vehicles are expected to be ICEs.

The new challenges that are expected to arise include the following.

Profitability of dismantling traction batteries - More than 50% of the consulted stakeholders of this study noted the increased use of EV will increase waste management costs for ELVs. This was particularly noted by an ATF during the workshop under this study. They explained that this is because

such vehicles require different and more difficult dismantling processes. Several of the consulted stakeholders, including companies, business associations and academics even suggested it would require new technology and processes for ATFs.

Generally, dismantlers do not know whether the dismantling of traction batteries will be profitable or not. Dismantling of high voltage traction batteries requires specific staff training. Dismantling will take between ½ to 1-hour effective working time for each traction battery, with safe storage causing additional costs. This effort might be compensated if the traction battery is sold for 'second use' but it might also be possible that additional costs occur for long distance transport of dangerous goods[41] to a limited number of qualified repurposing or recycling facilities. Compensation by recyclers depends on prices for the incorporated metals like nickel and cobalt, which are currently volatile. For several months in 2018 no compensation was paid[42].

There is currently an ongoing discussion of the relative environmental and economic benefits of a second life (i.e. reuse, including for another application) of traction batteries for electric vehicles vs. recycling the batteries. The conclusion of this discussion is not yet clear and it appears to be beyond the scope of this evaluation.

Safe management of Li-ion batteries - The situation for EVs that have an accident is difficult as the dismantler (or workshop) needs to check if the traction (Li-ion) battery is affected by the accident and if specific fire protection equipment (for transport/storage of the ELV) is required to ensure safe management of thermal runaway of Li-ion batteries.

Critical Raw Materials - Currently the number of ELVs from BEV is very small and considering an average lifetime of approximately 15 years this is expected to persist for the near future. At the same time, the ELVD is not only relevant for ELVs but also for the design of new passenger vehicles. Components for EVs are getting more complex, such as batteries (the recycling of which are covered by the Batteries Directive), power electronics, electric motors and others. Such components include different chemical elements, some of them Critical Raw Materials (CRM). CRMs are typically difficult to recycle (or the proper technology is still under development), (European Commission, 2020) and risk being lost via current dismantling and shredding procedures. In some cases, recycling of specific materials is technically feasible, even though the technology is not yet developed at an industrial level or is not currently economically viable. This will make the recycling of such components feasible in the near future. Additionally, for example, permanent magnets required for synchronous motors contain rare earth metals such as neodymium, praseodymium, terbium and dysprosium, which are among the CRMs (JRC, 2017). The ELVD only contains a total recycling target. It is therefore not necessary to ensure high-quality recycling of components containing rare earth materials to meet the general recycling target, which may be a problem for the future. It is not clear if the Directive 2005/64/EC on the type-approval of motor vehicles regarding their reusability, recyclability and recoverability[43] is being considered for amendment in order to better promote the recyclability of EV with such complex components (see the coherence section).

The new opportunities foreseen from the increased sale of electric or hybrid vehicles include the following.

[41] Li-Ion batteries are classified by the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) as dangerous goods.
[42] Recycling free of charge if Li-ion Batteries are delivered free fence.
[43] OJ L 310 25.11.2005, p. 10

Costly components generate dismantling income - ELVs from EVs have, in addition to the batteries, several very costly components like the high voltage management systems and other components, which may generate income for the dismantlers. However, dismantlers are not currently experienced with such components and the markets for them is not yet developed. At the same time, valuable components for recycling like automotive exhaust catalysts (embedding platinum) are not available from EV. However, recent (JRC, 2019) and soon to be published reports (JRC, 2020) show that future vehicles will improve, e.g. increased automation level of vehicles, and a potentially small share of fuel cell (FC) EVs in the EU fleet after 2030. Platinum is a key component of FCs and its recovery could be relevant in the future, as well as palladium, ruthenium, lanthanum etc. in different vehicles components (e.g. electronics, electric motors, catalytic converters and particle filters).

Stakeholders consulted in this study, including a German vehicle production company and two business associations, claimed that electric/hybrid vehicles will increase the revenues of the recycling sector due to the higher recovery of valuable metals, although the initial cost of battery recycling will be high. On Li-ion EV batteries, an EPR organisation stated that although it is currently profitable to remove these batteries, via current relatively informal markets (with the informality reflecting the very small numbers), there will be risks when this market grows (as the number of batteries involved will mean that a more formal approach is required, and there will not be enough demand from individual DIY second users).

As there are many developments, with the increased use of EVs, stakeholders were asked how this should be regulated. 30% of the stakeholders consulted noted that the increased uptake of EV vehicles will require regulation. At the workshop, one stakeholder noted that EV batteries need to be addressed in the Directive. A batteries association noted, however, that the ELVD creates regulatory burdens and complexities for manufacturers and dismantlers of EVs. Their main concern is that regulation is already provided by three pieces of legislation: The ELVD, Batteries Directive, and the Chemicals Legislation. They noted that the legislation is not perfectly aligned, which creates costs. Furthermore, an EPR organisation felt that the Batteries Directive would be the better route to regulate the Li-ion (and other future technologies for the traction battery) EV market, particularly with regard to second use and the transfer of responsibility.

6.12.2 *Conclusions*

To what extent can the ELVD cover technological developments? (e.g. the growing share of electric vehicles)?

In 2030, approximately a quarter of all passenger cars sold in the EU are predicted to be battery powered. Plug-In Hybrids and Hybrids together are expected to account for another quarter of sales while the rest of the vehicles are expected to be ICEs. This has a number of implications for the ELVD. Dismantling may become less profitable as costs for storage, training, equipment, safety (e.g. against fires from Li-ion batteries) and transportation may increase. The increased use of lightweight materials and electronic components are also factors that may increase the cost of dismantling. EVs' complex components and new materials are expected to pose difficulties in future recycling especially in the context of the critical raw materials (CRMs).

From the point of view of the Directive, the question is whether the existing provisions of the ELVD for enhancing producer responsibility (EPR) are sufficient to ensure a fair share of any future (economic) burdens that may emerge from the expected changes to the ELVs composition. It is also necessary to assess whether, as it stands, the Directive can facilitate an increase in the level of reuse (lifetime

extension and resource efficiency of components and materials) and recycling of CRM and avoidance of their loss during dismantling and shredding.

The analysis from the previous evaluation questions suggest, as it stands, that the Directive does not include the necessary provisions to ensure recyclability of material. The current EPR provisions are also not sufficient to cover the expected burdens that will arise as a result of the complexity of treatment for EVs and their Li-ion batteries. Nevertheless, the costly components may be able to generate second-life income once dismantled and repaired. This possibility highlights the fact that technological developments can also bring new and potentially profitable opportunities.

For CRMs and more generally for electronic and electric parts in cars, the ELVD does not currently sufficiently cover a number of aspects related to recyclability. There is not enough relevant information and no processes for informing ATFs what components are necessary to separate to ensure the recovery of strategic metals (gold, silver, palladium, tantalum and rare earths). For CRMs, the use of such new materials in EVs poses difficulties in future recycling. The ELVD currently only addresses a total recycling target with no additional targets for components containing rare earth metals.

6.13 (Relevance) Scope

The questions covered in this section are:

Is there still a need for the ELVD?

To what extent are the definitions in the ELVD still up to date?

To what extent is the scope of the ELVD still appropriate?

6.13.1 *Analysis*

This analysis provides an overview of the questions on the scope of the ELVD, whether the Directive is still useful, and whether the definitions in the Directive are up to date and appropriate. This section principally focusses on the coverage in scope of the ELVD on different "Vehicle classifications". Other gaps in the scope also emerged, such as the role of insurance companies and inclusion of e-bikes. These are covered in a second sub-section on "Other issues of scope".

Vehicle Classification

The ELVD covers passenger cars classified as M1[44], light commercial vehicles classified as N1[45] and three-wheel motor vehicles[46] as defined in Directive 92/61/EEC but excludes motor tricycles[47]. In its frequently asked questions chapter, the ELV Guidance Document (EU, 2005) clarifies that motor

[44]Category M1: Motor vehicles designed and constructed primarily for the carriage of persons and their luggage and comprising not more than eight seating positions in addition to the driver's seating position. Vehicles belonging to category M 1 shall have no space for standing passengers. The number of seating positions may be restricted to one (i.e. the driver's seating position). More details on the terms used in this definition e.g. 'seating position' are provided in Annex II of Directive 2007/46/EC of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, last amended by 4.4.2019.

[45] Category N1: Motor vehicles designed and constructed primarily for the carriage of goods and having a maximum mass not exceeding 3,5 tonnes. More details on the terms used in this definition e.g. 'mass' are provided in Annex II of Directive 2007/46/EC of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, last amended by 4.4.2019.

[46] The terms used in the ELVD are not as specific as the Regulation (EU) No 168/2013 of 15 January 2013, last amended by 4.4.2019 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles repealing the mentioned Directive 92/61/EEC. For details on the vehicle classification, please refer to Annex II, GENERAL DEFINITIONS, CRITERIA FOR VEHICLE CATEGORISATION, VEHICLE TYPES AND TYPES OF BODYWORK of Regulation (EU) No 168/2013.

[47] See footnote before

caravans are in scope. This is explained based on Directive 70/156/EEC, which defines motor caravans as a special purpose M category vehicle.

Other vehicles, such as buses with more than 9 seats, motorcycles, commercial vehicles for the transport of goods with a maximum mass of more than 3.5 tons, trailers and other vehicles (e.g. trains, boats and airplanes) are not covered by the ELVD.

The table below displays the share (in numbers) per road vehicle category as reported by Eurostat. While Eurostat's definition for passenger cars is effectively the same as applied for the ELVD, Eurostat's definition for lorries does not distinguish between lorries below the maximum weight of 3.5 tonnes and above. Passenger cars (with a similar definition as the M1 in the ELVD) dominate the number of vehicles reported. Lorries (including to a large extent N1 vehicles), represent the second largest group.

There have been different interpretations as to components designed and used in vehicles and as to whether they are part of the ELV. This relates to, for example, components that are not necessarily fixed in the vehicle, but that are used solely with or in it, such as car keys, vehicle radios and vehicle navigation systems. As this issue is also related to the scope and definitions of the WEEE Directive, it is detailed under the Coherence section later in this chapter.

Table 6-12 Share of vehicle type (by numbers) in EU 28 for 2016

Vehicle type	Frequency	Percentage
Passenger cars	258 003 552	76.3%
Lorries	34 413 937	10.2%
Motorcycles	22 018 223	6.5%
Trailers and semi-trailers	15 898 235	4.7%
Road tractors	3 809 333	1.1%
Special vehicles	3 256 933	1.0%
Motor coaches, buses and trolley buses	902 522	0.3%

Source: Eurostat, stock of vehicles by category, [tran_r_vehst]; download 2020/01/05

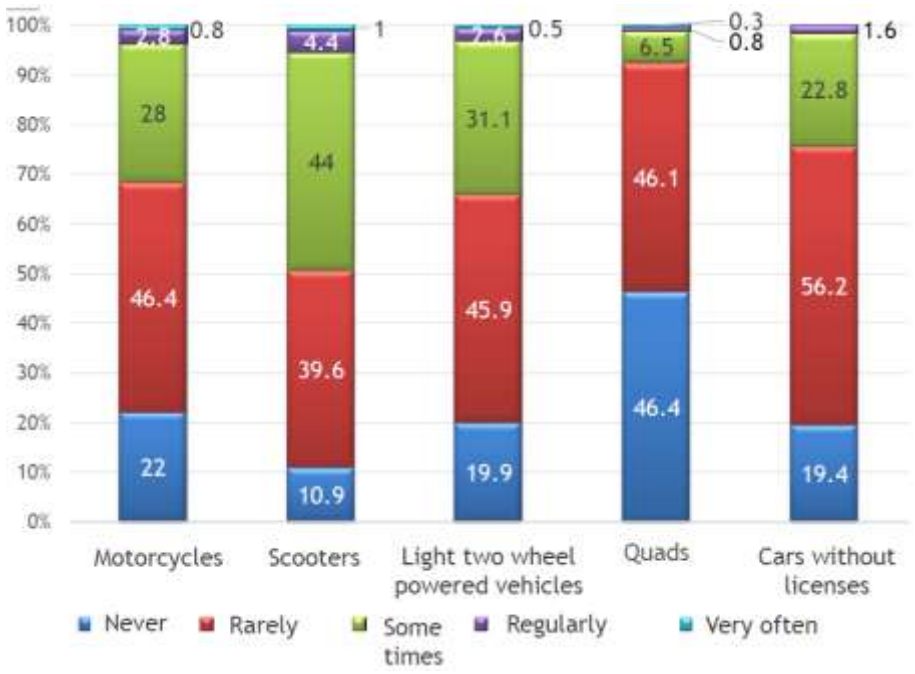
When stakeholders were asked whether the ELVD's scope should be extended to other vehicle types (motorcycles, buses and trucks), most stakeholders supported its extension across all vehicle types (all had more than 60% of stakeholder strongly supportive or supportive). Those in favour, such as recyclers and national or regional governments, mentioned that motorcycles, trucks and buses have comparable vehicle documents and comparable waste streams to M1 and N1 vehicles. From the interviews, an ATF and an EPR organisation further supported the inclusion of motorcycles, buses, and trucks. One stakeholder from the workshop noted that the ELVD was regarded as good practice for waste treatment and as such, these good practices should be extended to other vehicle types. A representative of EuRIC noted during the workshop that - in the context of ELV treatment - trucks, buses and cars have similarities. Therefore, they were not opposed to their inclusion in the ELVD.

In contrast to this, however, a vehicle manufacturer and two business associations, from the targeted surveys highlighted that trucks and buses are used for commercial purposes and have longer lifetimes than passenger cars. Most of them are first used in Europe and, subsequently, they are sold and used again in other regions of the world. Therefore, they don't see an extension of the scope as feasible. An

interviewed stakeholder also noted that different EoL treatment requirements are needed for the different vehicle categories, and it was unclear how the Directive would take this into account.

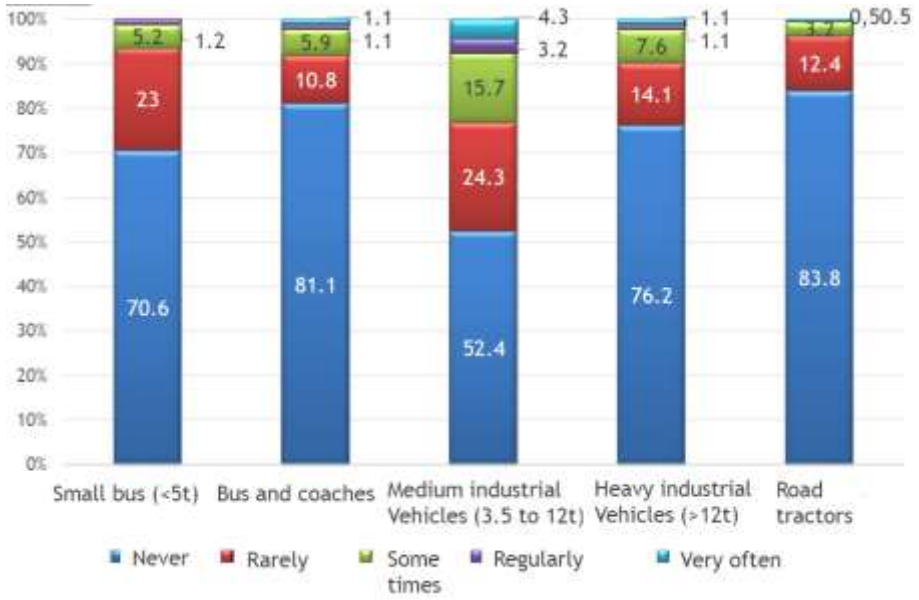
Evidence from a survey on the types of non-car vehicles received by ATFs in France show that most ATFs do not frequently receive end-of-life vehicles other than cars. More specifically, ADEME asked French ATF companies about the frequency they receive vehicles that are not cars or light industrial vehicles. As can be seen in Figure 6-13, 70 - 90% of French ATFs "never" or "rarely" receive motorcycles, light two-wheel powered vehicles, quads and cars without licence.(Ademe, 2018) For scooters, responses were equally shared between "never" or "rarely" (50.5%) and "sometimes" or "regularly" (48.5%).

Figure 6-13 Responses by French ATF companies on the types of vehicles they receive for treatment I (ADEME, 2018)



According to ADEME's survey, the French ATF companies receive heavier vehicles even more rarely. In particular, for small buses (<5t), buses and coaches, heavy industrial vehicles (>12t), and road tractors, >90% of the respondents answered that they "never" or "rarely" receive such vehicles. Only medium industrial vehicles seem to be treated by ATFs a little more frequently, with 23% of the respondents reporting that they receive such vehicles "sometimes", "regularly", or "very often" (see Figure 6-14).

Figure 6-14 Responses by French ATF companies on the types of vehicles they receive for treatment II (ADEME, 2018)



ACEA (the European Automotive Manufacturers Association) has published a position paper in which they elaborate on the reasons why the Directive should not extend the scope to trucks and buses, especially with the circular economy and the competitiveness of the automotive industry in mind. This paper was additionally cited by both Volvo and ACEA in the workshop of this study. Their main arguments are as follows (ACEA, 2020[48]):

- **The complexity of heavy-duty vehicles** – Each of them is tailored to perform a specific commercial need and thus there are thousands of different HDVs. In addition, they are not finished vehicles when they leave the manufacturers' gate as they are led to the body builders to complete these vehicles with a variety of different specialised equipment;
- **Their market volume, mileage and lifetime** – Trucks and buses are sold in low volumes compared to passenger cars (1 HDV for 35 cars). HDVs have a longer lifetime and are usually sold multiple times after their initial purchase. Moreover, since they are often re-sold and used in other world regions, a small number of HDVs are scrapped in Europe;
- **Their durability and reparability** – From a design perspective, HDVs should be more reliable and easily reparable than passenger cars;
- **Their re-manufacturing and recycling** – The HDVs are re-manufactured many times and are sold as new, which creates complexities with their EPR. In addition, these vehicles exhibit high recycling rates as they are made of mostly valuable materials;
- **HDV manufacturers already phase-out hazardous substances and provide dismantling information** – Manufacturers of HDVs follow the requirements of the REACH Regulation and customer demand and are thus already phasing out heavy metals on a voluntary basis whenever that is technically and economically possible. In addition, HDV producers provide manuals on a voluntary basis for the depollution and dismantling of trucks and buses.

The Spanish national association for recycling of industrial vehicles has published a report that explain the characteristics of industrial vehicle scrapping facilities (Anervi, 2011). According to this report, the process followed for the decontamination and dismantling of industrial vehicles is generally different

[48] https://www.acea.be/publications/article/position-paper-evaluation-of-the-end-of-life-vehicles-directive

from the treatment required for a passenger car. In addition, the waste generated, the space required for the treatment and storage of such vehicles, and the physical resources required for the operation of such facilities are additional differences between the treatment of industrial vehicles and passenger cars. Therefore, it can be inferred that it would be difficult to develop common requirements for the dismantling and decontamination of industrial vehicle and passenger cars and their respective treatment in the existing facilities.

Specifically on the inclusion of motorcycles in the ELVD, a motorcycle association was unsure about the full implications of being part of this Directive. The original justifications for excluding motorcycles (and presumably trucks) was reported as being a combination of the relatively low number of vehicles, the high (relative to cars) presence of SMEs in the manufacturing of motorcycles and the relatively long life of the vehicles. According to the stakeholder, all these reasons remain true. During the workshop, the motorcycle association noted that it is difficult to quantify the number of untreated motorcycles. Therefore, it is difficult to identify whether they pose an environmental threat. From the workshop, an Italian representative noted that motorcycles in Italy are treated to the same standards as cars. They, therefore, did not object to including motorcycles in the Directive. However, they noted that there would have to be consideration that the recycling and reuse amounts will be lower (i.e. the amounts in weight will be different[49]).

Other issues of scope

The workshop further raised issues of a gap in scope regarding small e-vehicles: i.e. e-bikes, unicycles, e-push scooters, and wheelchairs. This was noted by the German Environment Agency. It was unclear whether they should be included under the ELV or WEEE Directive. It was highlighted by EuRIC that the incorrect disposal of Li-ion batteries from such vehicles causes risks of fires in WEEE recycling facilities and ATFs. Nevertheless, the Commission noted that this is an issue to be covered under the future batteries regulatory framework. If these batteries are not covered under other legislation then there would be a gap of treatment of such vehicles.

Issues regarding circularity, waste, and recycling were raised. Seven stakeholders, from the targeted survey, mostly national governments, raised issues with certain definitions in the ELVD. All noted that there was a need for a clear definition of what an ELV was, including a distinction of an ELV from a used vehicle. It was also suggested that a definition of waste was required (aligning the ELVD to the Waste Framework Directive (WFD) as far as possible). A representative from the Spanish environment ministry stated in the workshop that we should be aware of the WFD, in which all things which reach the end of life are defined as waste (so this includes trucks and motorcycles). However, the WFD does not cover the design of products, though this is considered in the ELVD.

The final gap in scope of the Directive, as noted by stakeholders was for the stakeholder type of insurance company. Two business associations from the targeted survey noted a need to improve the involvement of insurance companies. During the workshop this was further discussed by a representative of EuRIC. They noted that insurance companies are an active and important part of ELV management (as they are the last owners of any cars damaged beyond repair in accidents). They stated that their responsibility has been ignored by the first ELVD although they are defined as economic operators and that this lack of inclusion *indirectly* feeds illegal ELV activities – i.e. through their

[49] References of the exact figures was provided by the ADEME on a campaign of material compositions of motorcycles, quads and cars without licenses.

involvement in unregistered online sales of ELVs. A representative from the French ministry of environment noted that a possible solution is to link insurance payments to CoD so that only the presentation of a CoD will allow the insurance payment to cease. It was highlighted that this is already done in Czechia and was deemed as a positive solution. This was further supported by a representative of EuRIC explaining that, in order to stop paying the insurance premium, a validly issued CoD, sale or export must be presented otherwise the car insurance cannot be terminated. The representative from the German Environment Agency additionally noted that it should be obligatory to note the status of a vehicle (waste or non-waste) and that online platforms should be made legally responsible for the illegal trade on their platforms.

6.13.2 *Conclusions*

Passenger vehicles make up the major share of vehicles currently operating in the market. It also appears that ATFs do not receive a large number of non-car vehicles for treatment. Therefore, the current situation shows that many of the >20% vehicles on the market are not being treated by ATFs working under the ELVD, although some (particularly motorcycles and scooters) are, and with no apparent problems. Stakeholders broadly support the inclusion of different vehicle types (lorries, buses, motorcycles), if they can be treated effectively under the Directive. However, it was noted by the industry that they should be treated by separate legislation, as these vehicles are sufficiently different to require their own dismantling and treatment processes. Another gap in the scope noted by some stakeholders was the use of small e-vehicles (e-scooters, e-bikes, etc.). However little information was provided on their current and forecasted impact.

Is there still a need for the ELVD?

There is still a need for the ELVD, to ensure that ELVs are disposed of and treated correctly. This is principally to ensure that hazardous chemicals that were used in vehicles do not escape into the environment and that materials are recovered for reuse or recycling. The known use of hazardous substances in older vehicles, which are now coming to EoL necessitates that ELVs are managed correctly. In addition, it ensures that other hazardous chemicals such as Lead, Mercury, Cadmium and Hexavalent Chromium are no longer used in vehicles. Furthermore, such hazardous substances can also hinder the resource efficiency, recovery and reuse of secondary raw materials from ELVs. As such, the ELVD has an important place to ensure that environmental protection and circularity is increased.

To what extent is the scope of the Directive still relevant/fit for purpose?

The vast majority of the vehicle market (cars) is covered by the ELVD. However, some gaps remain. Stakeholders discussed the need to possibly include lorries, buses, motorcycles and small e-vehicles into the scope. Many feel that they should be covered by the Directive, if treatment within the same scope is possible and effective. Their inclusion would also be justified by the overarching assumption of waste and environment policy that the disposal / treatment of all waste that poses a potential risk to the environment should be regulated and controlled. Although vehicle types not covered by the ELVD are covered by general waste provisions, these are not as specific as the ELVD, and hence miss the opportunities to improve vehicle design and maximise the recovery of valuable resources, The industry, however, notes that many of these types have too many differences to be dealt with effectively by the same legislation. These differences include, the relatively low numbers of vehicles (implying a smaller scale of risk than for cars), a high share (compared to cars) of SMEs involved in the manufacture (implying a large impact on SMEs, who have less resources to comply with the directive), longer life vehicles compared to cars and more legitimate export of used vehicles out of Europe. These issues all

appear to remain true, so adding motorcycles and trucks to the ELV would require an analysis of the environmental risks against these factors.

The issues surrounding the expected growth in Electric vehicles are discussed in the previous section.

6.14 Coherence

The questions covered by this group of questions are:

To *what extent is the ELVD internally coherent?*

Does the ELVD contain any internal incoherencies?

To what extent is the ELVD coherent with other EU policy instruments and the overall EU and international policy goals?

To what extent are there synergies and overlaps between the ELVD and other EU policy instruments?

To what extent does the ELVD support the overall EU policy goals?

To what extent are the Definitions in the ELVD coherent with other EU policies?

To what extent is the ELVD coherent with international obligations (i.e. from the Basel Convention and Stockholm Convention)?

6.14.1 *Analysis*

The ELVD is related to many other EU interventions due to the multifaceted nature of vehicles, which involve environmental, resource, waste-management, and socio-economic considerations. Therefore, apart from the internal coherence of the Directive, the ELVD should be analysed in terms of its coherence with overarching EU policies (especially on circular economy) and other EU legislation as well as with international agreements. More specifically, the analysis of the Directive's coherence with EU interventions includes the:

- Directive 2008/98/EC on Waste (Waste Framework Directive or WFD);
- Regulation 1013/2006/EC on Shipments of Waste (Waste Shipments Regulation);
- Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE Directive);
- Directive 2011/65/EU on the Restriction of Hazardous Substances (RoHS Directive);
- Directive 2006/66/EC of 6 September 2006 on Batteries and Accumulators and Waste Batteries and Accumulators (Batteries Directive);
- Regulation 850/2004/EC of 29 April 2004 on Persistent Organic Pollutants (POP Regulation);
- Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation & Restriction of Chemicals (REACH Regulation);
- Directive 1999/37/EC on Vehicle Registration Documents;
- Directive 2005/64/EC on the Type-approval of Motor Vehicles regarding their Reusability, Recyclability and Recoverability and ISO 22628 Road vehicles — Recyclability and Recoverability - Calculation method; and the
- European List of Waste.

International interventions for environmental protection are also relevant, in particular the:

- Stockholm Convention; and the
- Basel Convention.

Participants of the targeted stakeholder survey were asked about the coherence of the ELVD with the following legislation/policy: (WEEE Directive, Batteries Directive, RoHS Directive, POP Regulation,

REACH Regulation, Circular Economy policy, Waste Shipment Regulation, Directive 1999/37/EC, and ISO 22628. A large number of stakeholders did not have an opinion. However, the policies perceived as most coherent were the Batteries Directive and the WEEE Directive. The majority of stakeholders agreed that the coherence between the Circular Economy (CE) Policy and the ELVD should be improved. The coherence of the various legislation is discussed further in the next sections.

Coherence with the Waste Framework Directive

Regarding the coherence with the Waste Framework Directive (WFD) the following observations can be made:

Targets

While the WFD sets out recycling targets for municipal waste, the ELVD Directive sets out one target for re-use and recovery and another one for re-use recycling. Each of the ELVD targets is therefore a "double" target, which corresponds to 2 different activities (re-use and recycling; re-use and recovery). In addition, there is no target for "recovery" in the WFD or in another piece of EU waste legislation, but there is a target to reduce the amount of waste destined for landfilling (to 10% by 2035).

Reuse

While the WFD distinguishes between 'reuse' and 'preparing for reuse', the ELVD establishes its own definition of 'reuse'. Which is different/more specific than the definition of the WFD. In the stakeholder workshop, this aspect was also raised by a representative from the German Environment Agency who requested definitions for reuse and preparation for reuse as they were both relevant for the waste hierarchy. The representative also mentioned that it was not clear whether only the components or the whole vehicle could be reused.

THE WFD defines reuse under its Art. 13(3) as "*any operation by which products or components that are not waste are used again for the same purpose for which they were conceived*". In Annex IV, reuse is addressed under "*Measures that can affect the consumption and use phase*" referring to the "*promotion of the reuse and/or repair of appropriate discarded products or of their components, notably through the use of educational, economic, logistic or other measures such as support to or establishment of accredited repair and reuse-centres and networks especially in densely populated regions.*" This is understood to refer to reuse of products that are still operable or their components where these are extracted during the use phase of the product, for example in repair shops.

In contrast, the ELVD defines reuse in Article 2(6) as "*any operation by which components of end-of life vehicles are used for the same purpose for which they were conceived*". In this sense, reuse of ELV components is something that takes place in the waste phase, at which time the vehicle (and its parts) are considered as waste. This would be understood to require the fulfilment of end-of-waste criteria of a component for it to be able to be extracted and reused in other vehicles. However, though the ELVD refers in Article 7(5) to "*the need to ensure that the reuse of components does not give rise to safety or environmental hazards*", it does not refer to further criteria that need to be fulfilled before a component or material can be extracted from an ELV and reused. Article 7(5) may leave room for fulfilment of the WFD Article 6(5) requirement that in the case of reuse "*the material meets relevant requirements under the applicable chemical and product related legislation*" However, it is not clear that this ensures that the conditions for end of waste laid down in paragraph 1 of WFD Article 6(5) have

been met "*before the legislation on chemicals and products applies to the material that has ceased to be waste*."

Dismantled components from ELVs for reuse are not seen as waste. The Commission Decision 2005/293/EC (European Union 2005a) tasks the Member States to report on the amount of reuse and this amount contributes to the 'reuse and recycling rate'.

Figure 6-1**Error! Reference source not found.** displays the share of reuse, compared to the total v olume of reported reuse, recovery and disposal operations as reported by the Member States for the year 2017/the year indicated. The level of reuse varies across the EU. One reason might be that the volume for reuse refers to different sources: Some MSs apply the metal content assumption (MCA) where the reuse is reported based on declarations from the ATFs. Other MSs apply the subtraction method described in note 4 to table 4 of the Commission Decision 2005/293/EC[50]. Today, nearly all Member States report a certain amount of reuse, but the ELVD does not establish a separate target for reuse, the highest level of the waste hierarchy according to the WFD.

Recycling

The definition for recycling differs between the ELVD and the WFD. Therefore, it is possible to consider backfilling as recycling under the ELVD, while backfilling is not considered as recycling under the WFD.

Producer Responsibility

While the term producer is established in the ELVD and the producers have to bear several obligations under the ELVD does not refer to an elaborated system of Extended Producer Responsibility and minimum requirements for such system as established by the WFD (see section 6.3. above for more elements on EPR and the ELVD).

Coherence with the Basel Convention and Regulation 1013/2006/EC on Shipments of Waste (Waste Shipments Regulation)

The Basel Conventions is implemented in the EU via the Regulation 1013/2006/EC on Waste Shipments.

In the targeted stakeholder survey, the majority of the respondents perceived the ELVD to be coherent with the Basel Convention (57%) and only 3% of the respondents (n=2) think that it is not coherent. The two stakeholders that considered that the Directive is not coherent with the Basel Convention are a regional administration and an NGO. However, it could be that stakeholders only considered coherence in relation to the substances addressed by each framework as hazardous: Three stakeholders, two business associations and one regional government, were of the opinion that since the ELVD was implemented 19 years ago and does not consider SVHCs next to heavy metals, it is therefore not coherent with the Basel Convention. But the difficulties related to the coherence of the ELVD and the Basel Convention are related more to the ability to distinguish between used cars and ELVS. In this respect, two stakeholders also provided written comments regarding the coherence between the Waste Shipment Regulation and the ELVD. A German government body pointed out that the transboundary shipment of ELVs is not under the scope of the ELVD. Another stakeholder pointed out that the lack of a

[50] 'Member States not using the metal content assumption shall calculate reuse (A) on the basis of the following subtraction method: the individual vehicle weight (Wi) minus weight of the de-polluted and dismantled end-of-life vehicle (body shell) (Wb) minus the weight of the de-polluted and dismantled materials sent for recovery, recycling or final disposal. Member States using the metal content assumption shall determine A (excluding the metal components) on the basis of declarations from the authorised treatment facilities.' (European Commission 2005a)

definition of what constitutes an ELV prohibits the effective implementation of the Waste Shipment Regulation.

ELVs are classified as hazardous waste and cannot be exported to non-OECD countries. However, it is often difficult to distinguish used vehicles from ELVs.

The Member States' waste shipment correspondents' guidelines No 9 has been developed to enable customs services to distinguish used vehicles from ELVs.

'1. These Correspondents' guidelines represent the common understanding of all Member States on how Regulation (EC) No 1013/2006 on shipments of waste (Waste Shipment Regulation – WShipR) should be interpreted. The guidelines were agreed by the correspondents at a meeting on 8 July 2011 organised pursuant to Article 57 of Regulation (EC) No 1013/2006. They are not legally binding. The binding interpretation of Community law is the exclusive competence of the European Court of Justice. The guidelines apply from 1 September 2011 and should be reviewed at the latest five years from the above date and, if necessary, revised.'

In practice, Correspondent Guidelines No 9 are not always easy to apply for the authorities, as they are not legally binding and contain advice rather than straightforward criteria to distinguish between waste and non-waste. Furthermore, it refers to a case-by-case approach according to a number of characteristics. Customs authorities at large shipment hubs like Rotterdam claim that it is not possible for them to assess each single used vehicle for export to decide if it is waste or not. In the event of targeted controls, the guidelines can still be used, but apparently, they are not applied largely in practice. The effect is that many used vehicles, considered within the EU as ELVs, are exported to foreign countries and it is not known to European authorities if they are reregistered again or if they are used as a source for spare parts only and discarded if they have no value any more. This issue is discussed in depth under the effectiveness section.

Coherence with Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE Directive)/ Coherence with Directive 2011/65/EU on the Restriction of Hazardous Substances (RoHS Directive)

Directive 2012/19/EU (WEEE) and Directive 2011/65/EU (RoHS) concern the end of life of electrical and electronic equipment (EEE) and the restriction of hazardous substances therein respectively. These Directives are similar to the ELVD in that they prescribe how EEE should be handled at its end-of-life and what substances are prohibited for use in the design of EEE. Generally speaking, the Directives regulate a different sector from the automotive one. However, given the definition of EEE some overlaps may exist. In this respect, in the targeted stakeholder survey, a manufacturer and two business associations claimed that there is clear evidence of overlap between the ELVD and the WEEE Directive due to varying interpretation of scope between MSs. Further detail was not given, but it is possible that the cases of electric/electronic equipment used in but not installed in vehicles was meant here, i.e. vehicle keys, navigation systems and other equipment not fixed in the vehicle. For the same Directive, a national government mentioned that the scope of application for electrical/electronic components is different and should be aligned to have a clear distinction which components are under the scope of the ELVD and which are under the scope of the WEEE Directive.

EEE is defined as "*equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1 000 volts for alternating current and 1 500 volts for direct current*;" (RoHS Art. 3(1), WEEE Art 3(1)(a))[51].It could be considered that electronic components used in vehicles in scope of the ELVD may also fall under these Directives. However, the WEEE Directive and the RoHS Directive exclude vehicles from their scope (RoHS Art. 2(4)(f); WEEE Art. 2(4)(d)). Components installed in vehicles are also excluded from the scope of RoHS and WEEE (RoHS Art. 2(4)(c); WEEE Art. 2(3)(b)) as it falls under: "E*quipment which is specifically designed, and is to be installed, as part of another type of equipment that is excluded or does not fall within the scope of this Directive, which can fulfil its function only if it is part of that equipment, and which can be replaced only by the same specifically designed equipment*". This clarifies, for example, that electric components that are installed in the vehicle to begin with by the OEM, or replaced during maintenance, are considered part of the vehicle and are to be handled as part of the ELV when still installed in it at EoL.

From the latter exclusion, it is understood that EEE that is designed specifically for use within a vehicle, is considered part of the vehicle and assuming it is installed in the vehicle at end of life it is assumed that it would be considered part of the ELV. For example, this is understood to be the case for vehicle radios that may be installed in the vehicle throughout its lifetime, though not initially installed by the OEM. This interpretation is supported by the ELV Guidance document (European Commission 2005b), which states that the Commission considers "*that if a device is designed specifically for use in a vehicle (e.g. a car radio), the ELV applies. If a device is not specifically designed for use in a vehicle, that device is covered by the RoHS Directive*". Seeing as car radios cannot fulfil their purpose in equipment other than the vehicle, the Commission does not consider them to be in scope of the WEEE Directive.

However, though this statement clarifies the status for vehicle radios, it is not clear that it also applies to products that are not permanently installed in the vehicle, such as car keys. The keys of a vehicle, most of which now include electrical components, are not installed in the vehicle and thus it would stand to reason that RoHS Art. 2(4)(c) and WEEE Art. 2(3)(b) do not apply as these require not just that the device is designed for use in a vehicle but also that it "*is to be installed*" in the vehicle for the exclusion to apply. Though car keys cannot fulfil their function (of operating the car) without being inserted in the key slot, they are not understood to be a fixed installation.

Uncertainty also exists as to articles installed by the vehicle owner in the vehicle, but removable from the car for installation in another vehicle as these are not considered to be installed in the vehicle. As some consumers dispose of such equipment in EEE disposal bins, these would be handled together with WEEE. If the intention is indeed that such articles are considered under the scope of ELVD and not under the scope of the WEEE Directive, the various articles would need to be adjusted to clarify in which cases equipment not installed in the vehicle is also covered by the exclusion. This would also apply in relation to such articles being under the scope of RoHS, though here some additional aspects need to be considered, namely the status of substance prohibitions (ELV) and restrictions RoHS and the resulting substances that may enter the waste flow through ELVs and EoL articles contained therein.

[51] RoHS further defines in Article 3(2) that "for the purposes of point 1, 'dependent' means, with regard to EEE, needing electric currents or electromagnetic fields to fulfil at least one intended function;".

In terms of hazardous substances, the fact that all substances prohibited under ELV are also restricted under the RoHS Directive simplifies the situation in case of EEE devices installed in vehicles at EoL that should be treated as part of the ELV. The RoHS Directive also restricts Cd, CrVI, Hg and Pb and therefore even if a device was not designed with the intention of being used within a vehicle, it should be disposed with the vehicle, it can currently be assumed to comply with the ELV prohibitions and thus not to create a risk of contaminating the ELV waste streams. This is particularly the case as in the updating of exemptions to scientific and technical progress in both Directives, the Commission often seeks alignment, i.e. once an exemption is no longer justified in one Directive, an evaluation in the other Directive is usually initiated to update the other Directive to ensure equal progress. This has been the case since as early as 2008, when the Commission launched a study that looked at exemptions for lead solders in both directives simultaneously (Zangl et al. 2010). Additional alignment has also been sought since then, not just for lead solder exemptions but also for exemptions for lead in alloys (steel, aluminium and copper) and for Cr VI in adsorption refrigerators. As RoHS restricts additional substances[52], concerns exist as to cases where equipment, developed in compliance with the ELVD but not with the RoHS Directive, is removed from the ELV and sent to waste handling together with EEE waste streams or fractions. This appears to be the case for adsorption refrigerators removed from motor caravans. Though it is understood that printed circuit boards dismantled from ELVs are handled separately from those applied in EEE, these fractions could be mixed in some cases. ELV components could contain substances restricted under RoHS and in this sense potentially contaminate such fractions, infringing the intention of these Directives to prevent environmental impacts at EoL and increasing the amounts of secondary materials that can be recovered from them. In this sense, clarification of the status if EEE installed or specifically designed for use only within vehicles would benefit the situation as it would be clear in which waste stream such equipment is to be included and treated.

Coherence with Directive 2006/66/EC of 6 September 2006 on batteries and accumulators and waste batteries and accumulators (Batteries Directive)

The Batteries Directive (BD) stipulates how batteries are to be handled at their end of life, also affecting how these articles are to be designed and manufactured (substance prohibitions, battery removability from appliances, etc.). As batteries used in vehicles are within the scope of the BD but also regulated through ELV, there are certain overlaps between the two directives.

In the targeted stakeholder survey, a manufacturer company and two business associations pointed out that there is a difference in the definitions of remanufacturing, reuse and recycling in the ELV and Batteries Directives, but did not detail this further. It is not clear what was meant, as recycling is defined similarly in both (the ELVD definition incudes clarification as to energy recovery) and the Batteries Directive does not define reuse. Neither of the directives defines remanufacturing.

In relation to prohibition of hazardous substances, the BD specifically refers to cadmium, lead and mercury as hazardous substances, however prohibitions have only been introduced to date for Hg (in all battery applications) and for Cd (in most portable batteries) in this directive. Automotive batteries are only considered to be batteries with automotive starter, lighting or ignition power functions. Other batteries used in vehicles fall under the BD definition for "industrial batteries". In both cases, Recital 30 of the BD specifies that "*Automotive and industrial batteries and accumulators used in vehicles should meet the requirements of Directive 2000/53/EC, in particular Article 4 thereof*". In this sense,

[52] Two groups of flame retardants and four phthalates are currently restricted and additional substances are being looked into in a study that should be finalised at the beginning of 2020.

the substance prohibitions of ELV apply to these components. Exemption 5b of Annex II of ELV refers to lead in batteries and is still valid for lead acid batteries in most vehicles[53]. Exemption 16 of Annex II of ELV is for cadmium in batteries of electric vehicles but is only valid for spare parts in vehicles put on the market before 31.12.2008.

It is not completely clear if car keys are in the scope of ELV (see above). Such devices may use button cell or small round cell batteries, which fall under the category "portable batteries under the BD. It is possible that button cell batteries using mercury could be used in car keys. In such cases, the batteries would be covered through the BD itself in the case that car keys are considered EEE. However, if these articles are considered in scope of ELV, Recital 30 would not apply as it does not mention portable batteries. If the latter is the case, this inconsistency could be fixed through adding a stipulation that portable batteries used in vehicles must also meet the requirements of ELV. As there is no exemption for mercury in button cell batteries under Annex II of the ELVD, this inconsistency would be resolved.

Regarding waste management the ELVD stipulates that Batteries must be dismantled. The recycling of the batteries and the recycling rates are governed by the Batteries Directive. The recycled amount of the dismantled batteries contributes to the recycling rate of the ELVs.

Considering the large and heavy traction batteries of EVs, this issue is set to become more relevant in the future. As the traction batteries are considered industrial batteries and the 'producer shall not refuse to take back', it is not clear if the dismantler must bear the cost for storage and transport of such batteries (today mostly Li-ion and for some hybrid EV also NiMH batteries). The targeted 'recycling efficiency rate' for 'other batteries' is according to the Batteries Directive 50%. Traction batteries for EV (both Li-ion and NiMH) fall under this category. Depending on the share of the battery in the total weight of the vehicle, achieving the target of the Batteries Directive might not be sufficient to achieve the recycling target of the ELVD.

Coherence with the Stockholm Convention / Coherence with Regulation (EU) 2019/1021 of 20 June 2019 on persistent organic pollutants (POP Regulation)

The Stockholm Convention, whose implementation in the EU is ensured through the POPs Regulation, requires countries that have ratified it to prohibit and/or take legal and administrative measures to eliminate the production, use, import and export of chemicals specified in its annexes. The convention initially listed 12 persistent organic pollutants (POPs) for elimination or restriction. The list has been expanded with 16 additional substances, though the timelines for the substances differ and some of the substance bans are still to come into force. The Stockholm Convention is also connected to the Basel Convention as Article 6 paragraph 2(c) of the Stockholm Convention establishes that the Conference of the Parties shall cooperate closely with the appropriate bodies of the Basel Convention to, inter alia: work to establish the concentration levels of the POPs listed in Annexes A, B and C in order to define the low POP contents.

None of the POPs listed in the convention are addressed under article 4 of the ELV. As the Convention applies to vehicles it can be considered to overlap in also prohibiting certain substances in vehicles, however there have been no contradictions between these legislations so far. Stakeholders seem to support this.

[53] The exemption for batteries in high-voltage systems that are used only for propulsion in M1 and N1 vehicles (5a) expired on 1.1.2019. Ex. 5b is to be reviewed in 2020.

In the targeted stakeholder survey a large group of the respondents found the Directive coherent with the Stockholm Convention (40%), while 9% of the respondents (n=5) thought it is not. Those that did not perceive the ELVD to be coherent with the Stockholm Convention were a regional administration and two business associations, a dismantling company, and environmental organisation. Three stakeholders, two business associations and one regional government, were of the opinion that since the ELVD was implemented 19 years ago, it does not consider POPs Stockholm Convention. One recycling business association highlighted some inconsistencies in Annex II regarding for example POPs in plastics.

Nonetheless, substances restricted under the Stockholm Convention (respectively under the POPs Regulation) do not only require OEMs to discontinue use (as is the case with ELV substance prohibitions) but also dictates how the waste management sector is to go about the treatment of fractions contaminated with such substances.

The ban on the flame retardant decabromodiphenyl ether (decaBDE) has probably been the most significant to the automotive sector, though this substance was first banned through REACH (restriction) and thus automotive associations already addressed this issue in 2016, so as to ensure that this substance would no longer be used in vehicles placed on the EU market after mid-2018 (ACEA et al. 2016). The restriction under REACH applied after 2 March 2019 and the derogation at that time was given for all articles placed on the market before that date, including cars. However, the prohibition also applies to waste management (Article 7) and thus affects the treatment of ELV. For the ELVD, the introduction of the flame retardant decabromodiphenyl ether (decaBDE) to the Stockholm Convention and in consequence to the POPs-Regulation has caused concerns that the treatment of a relevant fraction of the shredder light fraction cannot continue without change.

Article 7(1) of the POP Regulation requires that "*Producers and holders of waste shall undertake all reasonable efforts to avoid, where feasible, contamination of this waste with substances listed in Annex IV*". This requires that the mixing of clean waste with contaminated waste is avoided, however when a vehicle is shredded, components with POPs and components without are mixed. In parallel, Article 7(2) requires that waste containing or contaminated with any of the listed POPs "be disposed of or recovered" according to the first part of Annex V of the Regulation "*to ensure that the POP content is destroyed or irreversibly transformed so that the remaining waste and releases do not exhibit the characteristics of POPs*".

Art. 7(4) provides a number of derogations to this provision, among others when the "*the content of the listed substances in the waste is below the concentration limits specified in Annex IV*". As a result of discussion with stakeholders, Annex IV of the POPs Regulation currently refers to a combined threshold of 1000 mg/kg for the sum of all identified POP-PBDEs (including decaBDE) and requires that '*the EC shall review that concentration limit and shall, where appropriate and in accordance with the Treaties, adopt a legislative proposal to lower that value to 500 mg/kg. The Commission shall carry out such review as soon as possible and, in any event, not later than 16 July 2021*'. However, this is understood to apply to fractions where all components contain or are contaminated with the POP, since according to the last paragraph of Annex V part 1, when the POP is only contained in certain components or equipment within the waste fraction, these must first be separated for this exclusion to apply.

Annex V part 1 details treatment methods that ensure destruction or irreversible transformation and refers to: physico-chemical treatment, incineration on land, use as a fuel to generate energy and recycling/reclamation of metals and metal compounds under certain conditions (the latter two do not apply to waste with PCBs).

Annex V part 1 specifies that pre-treatment operations can only be undertaken prior to the methods specified therein, provided that Annex IV substances listed are isolated in the process and "*subsequently disposed of" through one of the methods. "Where only part of a product or waste, such as waste equipment, contains or is contaminated with persistent organic pollutants, it shall be separated and then disposed of in accordance with the requirements of this Regulation*". Considering shredder operations as separation, decaBDE containing parts (respectively plastics, often with concentrations beyond 10.000 ppm) are directed to the SLF and this must subsequently be disposed of through one of the Annex V treatments. This view was supported by the German Environment Agency representative in the stakeholder workshop, who noted that a significant amount of Shredder Light Fraction (SLF) needs to be disposed of securely (i.e. incinerated not landfilled) as it contains Persistent Organic Pollutants (POPs). In result, that means that the entirety of the SLF is required to undergo one of the treatments specified in part 1 of Annex V regardless to the decaBDE content in the entire SLF. Typically, the concentrations in the SLF are below the threshold of 1000 ppm decaBDE as it contains also many other plastics without decBDE. Today several countries dispose SLF (or parts of the SLF on) landfills which is, considering the logic of the POP regulation, not allowed.
To reduce the amount, which cannot be recycled, PST can be applied as advanced separation technology. PST must anyhow be applied to achieve the challenging recycling targets of the ELVD. In this PST the DecaBDE can be directed by density separation to the PVC-rich fraction with a typical density of more than 1.23 g/cm3. Other SLF may be directed to recycling.

This view is supported by a study carried out in 2018 (Mehlhart et al. 2018) that mentioned that a further effect of listing decaBDE in the POPs Regulation is that waste treatment operation D1 (deposit into or on to land (e.g. landfill, etc.) which is understood to have been a common practice in the past), is prohibited for waste fractions of ELVs containing decaBDE.

This issue was also discussed during the stakeholder workshop. A representative of Volkswagen noted that on the content of the flame retardant decabromodiphenyl ether (decaBDE), there was a Ramboll report on POPs and they found an average of 109 ppm decaBDE in the SLF (Ramboll, 2019). Some of this was noted as also ending up in Shredder Heavy Fraction (SHF), for which there is no upcycling treatment option. EuRIC provided information from a study commissioned in the UK analysing parts that contain decaBDE in ELVs. It noted that for a few vehicle models, from 2007 or earlier, there were a limited number of BFRs in small and light components exceeding the given thresholds. Oeko-Institut commented that regardless of the concentration in the SLF, the fact that DecaBDE containing parts are directed to this fraction means that it cannot be landfilled. However, the EuRIC further noted from the study that operators are aware that fractions containing decaBDE cannot go to landfill, however for plastic waste it was found that the contents of decaBDE in ELV plastics was well below the 1000 ppm.

In additional input received from EuRIC after the workshop, the association specified that "*To our knowledge, Authorised Treatment Facilities (ATF) do not remove those decaBDE containing parts prior to shredding. Indeed, given the limited use of decaBDE in cars, the concentrations of decaBDE in residual waste will be very low. Shredders generally operate with a mixture of ELV and WEEE.*

Therefore, in some cases, the bromine containing plastics fraction can be sorted out during post-shredder treatment, following standard EN 50625-3-1, separating plastics fractions containing >2000 ppm Br (high-brominated fractions) from those containing <2000 ppm Br (low brominated fractions). DecaBDE- containing plastics factions are sent to incineration if bromine content above 2000 ppm (high-brominated fraction)." In the consultant's opinion, the bromine content threshold is not equivalent to the threshold specified in Annex IV of the POPs Regulation. It refers to the share of Br atoms and not the share of brominated flame retardants (BFR), whereas the POPs threshold applies only to certain PBDE and not to all BFR). Nonetheless, reference only to the Br content suggests that a larger portion of BFR are contained, whereas the POPs threshold is lower (1000 ppm) and refers only to a sub-group of BFR. This raises concern that certain post shredder fractions containing decaBDE may not be disposed of properly.

Regarding the awareness of recyclers to the threshold and its implications, EuRIC further mentioned that "*Operators are aware that decaBDE containing fractions cannot go to landfilling. However, low concentrations of decaBDE in plastic waste from ELV, makes that decaBDE concentration from ELVs do not reach the limit thresholds for POP waste – 1000 ppm - requiring specific treatments. Even using very conservative assumptions, theoretical calculations from the UK study mentioned above found that the decaBDE concentration in ASR*[54] *obtained using an average bromine concentration from analysed components would range between 365-445 ppm. Both values are significantly below the limit threshold for POP waste.*"

On the topic of techniques for density separation, representatives from Galloo and EuRIC provided some comments. They noted that separation is an option to separate (post shredder) plastic fractions with flame retardant. The heavier fraction that contains traces of the flame retardant are then treated according to the POPs Regulation (i.e. incinerated not landfilled). It was further noted that this denser fraction includes a share of Polyvinyl chloride (PVC) plastics with a chlorinated fraction, which could be recycled. It was estimated that some 10-15% of this recyclable plastic was lost to this fraction. A representative of EuRIC noted that they gather through their membership most operators recycling plastics from cars. They noted that they have two experts participating in the Basel convention and that the discussion on this issue had moved to the international level.

In conclusion, though there may be no incoherencies per se (it is not that one framework contradicts prohibitions of the other), it can be said, that the Stockholm Convention and its implementation via the POPs Regulation affects firstly, the materials/chemicals used for the production of new vehicles and, secondly, the disposal and recycling options for materials separated from ELVs which subsequently may impact the ability of ELV operators to fulfil the targets specified in the ELVD for recovery and reuse.

Coherence with Regulation 1907/2006 concerning the Registration, Evaluation, Authorisation & restriction of Chemicals (REACH Regulation)

The REACH Regulation regulates the manufacture, placing on the market and use of chemicals in the EU with the aim of providing a high level of human health and environmental protection. REACH applies not only to chemicals on their own, but also to chemicals in mixtures and articles placed on the EU market, therefore, it may also affect the manufacture of vehicles in terms of the substances that can be used in the manufacturing process of the vehicles or that can be contained in a vehicle used and placed on the

[54] ASR – automotive shredder residue.

EU market. In this respect, stakeholders participating in the targeted survey stated that the focus of the ELVD and the REACH Regulation regarding the use of chemical compounds is different (upstream vs. downstream) and that the scope of REACH is much wider. In this sense, overlaps in relation to substance restrictions between REACH and ELVD can exist, however to date discrepancies have not arisen;

The list of substances subject to an authorisation requirement (Annex XIV of REACH) lists various substances that have been identified as substances of very high concern and the use of which may not take place in the EU without an authorisation being granted. This obligation does not apply to uses of articles that may still contain these substances, however, suppliers of such articles need to report the content of SVHCs in the article above a certain threshold (Art. 33 of REACH). Annex XIV to REACH specifies a number of lead compounds and Cr VI substances. Although several authorisations have been granted for certain specific Cr VI substances for use in the manufacture of vehicles or their parts, these are understood not to remain in the final product (e.g. Authorisation for use of chromium trioxide in functional chrome plating of valves used in engines of light gasoline and diesel vehicles and in heavy duty diesel combustion engines) or to have a parallel exemption under the ELVD (e.g. Exemption no 14 of ELV Annex II for Cr VI in adsorption refrigerators). For lead compounds, there are authorisations for lead sulfochromate yellow and lead chromate molybdate sulphate red in "industrial application of paints on metal surfaces" in various equipment including vehicles. As exemptions have not been sought under ELV for these uses, it needs to be assumed that these pigments must not be used in vehicles that fall under the scope of ELV. It is noted that the list of Restrictions (Annex XVII of REACH) lists limitations to the use of specific hazardous substances or determines conditions as to how they may be used, placed on the market (as such) or as to their tolerated presence in specific articles. Restrictions exist in REACH for compounds including Cd, Cr VI, Hg and Pb. Although they do not specifically refer to applications in vehicles, these applications are covered by the ban. Therefore, as long as an exemption for the same application in vehicles was not valid under ELV, there would be no discrepancy.

Coherence with Directive 1999/37/EC on vehicle registration documents

The coherence (or lack of) between the Directive 1999/37/EC on vehicle registration documents (European Union , 1999) and the ELVD is addressed in detail in (Mehlhart et al. 2017) in chapter 9.1 and in Annex 9-01 to that report. A main finding is that the ELVD and Directive on the registration documents for vehicles (1999/37/EC) do not use harmonised terms for issues such as `suspension´, `de-registration´, `temporary de-registration´ of vehicles and the `cancellation of a registration´ and `permanently cancelled' registration. This was also pointed out by a government entity from Sweden in the targeted stakeholder survey that recommended that the definitions be harmonised. A local authority from the Netherlands further pointed out that Directive 1999/37/EC does not allow for the exchange of information to determine whether a vehicle has received a CoD in another Member State. These terms have effects on the relation of deregistration and CoDs to be issued: Today a vehicle can be (temporarily) deregistered and disappear without any need to issue or provide a CoD or other information on the whereabouts of the vehicle. The study (Mehlhart et al. 2017) concluded that there is a need for harmonisation of the terms and a need to establish a 'conclusive list of conditions when a permanent cancellation shall apply'.

Coherence with Directive 2005/64/EC on the type-approval of motor vehicles regarding their reusability, recyclability and recoverability and ISO 22628 Road vehicles — Recyclability and recoverability

The issue 'design for reuse and recycling' is regulated in more detail in Directive 2005/64/EC on the type-approval of motor vehicles regarding their reusability, recyclability and recoverability[55]. The Directive 2005/64/EC provides the detailed information how to demonstrate reusability, recyclability and recoverability.

According to Article 6(1) '*Member States shall not grant any type approval without first ensuring that the manufacturer has put in place satisfactory arrangements and procedures, in accordance with point 3 of Annex IV, to manage properly the reusability, recyclability and recoverability aspects covered by this Directive. When this preliminary assessment has been carried out, a certificate named 'Certificate of Compliance with Annex IV' (hereinafter the certificate of compliance) shall be granted to the manufacturer.*'

And Article 6(3) continues:
'*For the purpose of paragraph 1, the manufacturer shall recommend a strategy to ensure dismantling, reuse of component parts, recycling and recovery of materials. The strategy shall take into account the* ***proven technologies available*** *or* ***in development*** *at the time of the application for a vehicle type-approval.*'
At the same time Article 4(16) introduces the following definition:
'*recyclability rate of a vehicle (Rcyc)' means the percentage by mass of a new vehicle,* ***potentially*** *able to be reused and recycled*;

Some contradiction might be derived between 'proven technologies' (even in development) as expressed in the Directive 2005/64/EC Article 6(3) and 'potentially recycled' as applied for the definition of the 'recycling rate' in Article 4(16). As far as technologies in development enabling potential recycling are not available if the vehicle becomes and ELV this would clearly jeopardise the achievement of the targets established by the ELVD.

In fact, a car can receive the approval of recyclability, if it can be recycled in theory for instance in a highly advanced PST plant. However, if such PST plants are not established across the EU (which is not reported to the EC in the current – non obligatory – quality report accompanying the data), then the recyclability is not achieved in practice. Therefore, there is possibly a need to adjust the Directive 2005/64/EC making it more coherent with the intention of the ELVD and the effective conditions in place.

Coherence with the European List of Waste

While not explicitly connected to the ELVD, the European List of Waste (ELoW) is of relevance for the waste management of ELVs. Until 2001, 'discarded vehicles' (ELoW entry 16 01 04) were considered as non-hazardous. In 2001, through Commission Decision 2001/119/EC changed 'end-of life vehicles' (ELoW entry 16 01 04*) to be considered as hazardous. As displayed in the table below the ELoW (European Union, 2000b) today includes several outputs of ELV treatment and some are considered as hazardous.

[55] OJ L 310 25.11.2005, p. 10

Currently the ELVD does not refer to the ELoW. It might be of added value to consider referring to the ELoW when reviewing / amending the ELVD.

Table 6-13 Waste from ELVs as indicated in the European List of Waste

European List of Waste Number	Label
16 01	**end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)**
16 01 03	end-of-life tyres
16 01 04*	end-of-life vehicles
16 01 06	end-of-life vehicles, containing neither liquids nor other hazardous components
16 01 07*	oil filters
16 01 08*	components containing mercury
16 01 09*	components containing PCBs
16 01 10*	explosive components (for example air bags)
16 01 11*	brake pads containing asbestos
16 01 12	brake pads other than those mentioned in 16 01 11
16 01 13*	brake fluids
16 01 14*	antifreeze fluids containing hazardous substances
16 01 15	antifreeze fluids other than those mentioned in 16 01 14
16 01 16	tanks for liquefied gas
16 01 17	ferrous metal
16 01 18	non-ferrous metal
16 01 19	Plastic
16 01 20	Glass
16 01 21*	hazardous components other than those mentioned in 16 01 07 to 16 01 11 and 16 01 13 and 16 01 14
16 01 22	components not otherwise specified
16 01 99	wastes not otherwise specified
16 06	**batteries and accumulators**
16 06 01*	lead batteries
16 06 02*	Ni-Cd batteries
16 06 03*	mercury-containing batteries
16 06 04	alkaline batteries (except 16 06 03)
16 06 05	other batteries and accumulators
16 06 06*	separately collected electrolyte from batteries and accumulators
16 08	**spent catalysts**
16 08 01	spent catalysts containing gold, silver, rhenium, rhodium, palladium, iridium or platinum (except 16 08 07)
16 08 02*	spent catalysts containing hazardous transition metals or hazardous transition metal compounds
16 08 03	spent catalysts containing transition metals or transition metal compounds not otherwise specified
16 08 07*	spent catalysts contaminated with hazardous substances
13	**OIL WASTES AND WASTES OF LIQUID FUELS (except edible oils, and those in chapters 05, 12 and 19)**
14	**WASTE ORGANIC SOLVENTS, REFRIGERANTS AND PROPELLANTS (except 07 and 08)**

6.14.2 *Conclusions*

Does the ELVD contain any internal incoherencies?

Generally, the Directive is noted as being internally coherent (i.e. it does not contradict itself). However, the literature review detected that Article 4(1) on prevention encourages MS to limit hazardous substances in a way that could contradict single market rules. According to Article 4(1), Member States shall ensure prevention by diverse measures expressed. Considering the European single market, it seems impossible that a single Member State would establish such measures. Instead, it would be more meaningful that targets and measures to achieve more effective prevention are defined at European level. This applies in particular for (separate) reuse and recyclate content rates.

To what extent are there synergies and overlaps between the ELVD and other EU policy instruments?

To what extent does the ELVD support the overall EU policy goals?

To what extent are the Definitions in the ELVD coherent with other EU policies?

To what extent is the ELVD coherent with international obligations (i.e. from the Basel Convention and Stockholm Convention?

Across all the various overlapping policies, there is a broad level of coherence noted with the ELVD. The details per policy are listed below:

Circular Economy policy – Recyclability and recoverability under ELVD might need some adjustments to be more in line with the European Action Plan for the Circular Economy and thus referring more to high quality recycling, promoting that cars are better designed for recycling/reuse, increasing the use of recycled content materials in cars and distinguishing between potentially recyclable and recyclable under current conditions.

The majority of stakeholders agreed that the coherence between the Circular Economy (CE) Policy and the ELVD should be improved. The reason why some stakeholders perceived it as incoherent was due to the Circular Economy policy's broader focus. In the consultant's view, the ELVD supports the Strategy for the Circular Economy but amendments are needed to ensure a) reuse b) high-quality recycling (avoiding that backfilling is considered as recycling) and of course a better coverage of the ELVs and a decline of unknown whereabouts.

Waste framework Directive –The definition of reuse is not entirely coherent with the WFD but has proven to be practical for the sector. Definition of recycling is not coherent with the WFD: the definition in the ELVD is broader (as it includes backfilling), thereby not reflecting the level of ambition set out in the WFD. The ELVD does not refer to the term extended producer responsibility and does not establish minimum requirements in line with the provisions in the WFD on EPR.

Basel Convention and the Waste Shipment Regulation – the major challenge from the literature between the ELVD and these two regulations is the difficulty in distinguishing between a used vehicle and an ELV. ELVs are not allowed to be exported to non-OECD countries under these two regulations. To solve this, Guideline No 9 was created, however it is difficult to use in practice. This can create issues of 'used vehicles' being exported and EU authorities being unclear if they are reregistered or illegally scrapped. This was also noted by a consulted stakeholder. Overall, however, stakeholders perceived coherence, other than some referring to POPs that the ELVD did not address.

Stockholm convention and POP Regulation – Per se, there are no issues in the fact that these two pieces of legislation prohibit the flame retardant decabromodiphenyl ether (DecaBDE), when looking at the ELV substance prohibitions and considering the potential for overlap. This is supported by most stakeholders, with only a few referring to the fact that ELVD does not address POPs. Nonetheless, the decaBDE prohibition also applies to waste management and here there are concerns as to the proper implementation of the stipulations of the POPs Regulation. Shredder operators are of the opinion that SLF can be landfilled if the SLF does not exceed the threshold for brominated flame retardants given in the POP regulation. In contrast the consultants are of the opinion that the POP regulation requires a separation of decaBDE containing parts. In the POPs Regulation, it is obligatory to send the shredder fractions where these parts are directed to SLF, to the exclusively allowed treatment operations in Annex V of the Regulation (landfilling is not allowed). This obligation is to be fulfilled regardless of the concentration of this fraction, as dilution effects may not affect the intention to destroy the POP. The issues arise when recycling an old vehicle that includes this substance, meaning that the fractions created cannot be reused or recycled and may make it difficult to meet some ELV targets.

While amendments to the POP Regulation have the potential that recycling (and reuse) targets of the ELVD may be achieved or not, there is no linkage in the ELVD or the POP regulation. For good harmonisation, it should be investigated whether the target for recycling and reuse addressed under Article 7 of the ELVD is affected by current or future amendments of the POP Regulation.

WEEE Directive and RoHS Directive – There is a small incoherence between ELVD and the two directives. Though EEE is a different sector to ELVs, there is a certain overlap. Confusion is created over certain EEE equipment specifically designed for vehicles. This can be difficult to distinguish, which makes it difficult to know which legislation the EEE should be handled under. Regardless of which of the directives legally apply to such EEE equipment (car keys, vehicle navigation equipment), the larger concern is in which waste stream such equipment lands, seeing as RoHS restricts a larger number of substances than ELVD and contamination of the WEEE fraction needs to be avoided. Adsorption refrigerators removed from motor caravans are a positive example for this issue as though they are removed from ELVs and sent to recyclers of heat exchange equipment (WEEE), the directives are aligned in terms of the exemption for CrVI benefitting this equipment.
Stakeholders generally agree that the WEEE Directive is coherent with ELVD. However, a few noted evidence of overlap and misinterpretation within and between MS. Aligning the scope on EEE parts could help, particularly in order to ensure that relevant equipment is treated with the correct waste stream and contamination is avoided.

Batteries Directive – Generally, stakeholders perceived this to be one of the most coherent Directives with the ELVD. Nevertheless, two associations (one for batteries and one for EPR) requested that all responsibilities be moved to the batteries directive to simplify the policy field to the disagreement of the car manufacturers.

The literature shows there may be a few minor incoherencies. Only automotive batteries (starter and lighting/ignition power function) and electric vehicle batteries (industrial) are required to comply with the ELVD substance prohibitions. Portable batteries such as those used in car keys do not need to comply with these. There are different views as to whether such electric equipment used only within vehicles is in scope of ELV when it is not fixed into the vehicle (see above). However, if it is in scope, portable batteries would also need to comply with the substance prohibitions to ensure that mercury-based button cell batteries are prohibited here as well. There is also an issue with electric vehicles,

where batteries are also regulated through the Batteries Directive and where there is no clarity as to the responsibility on the costs of storage or transportation of end of life batteries from electric vehicles.

REACH Regulation – The literature shows no current discrepancies have arisen.

Directive on vehicle registration documents – The ELVD and Directive on the registration documents for vehicles (1999/37/EC) do not use a harmonised set of terms for issues such as `suspension´, `de-registration´, `temporary de-registration´ of vehicles and the `cancellation of a registration´ and `permanently cancelled' registration. These terms have effects on the relation of deregistration and CoDs to be issued: Today a vehicle can be (temporarily) deregistered and disappear without any need to issue or provide a CoD or other information on the whereabouts of the vehicle. As also recommended in Mehlhart et al. 2017, the consultants agree that there is a need for harmonisation of the terms and a need to establish a 'conclusive list of conditions when a permanent cancellation shall apply'.

Directive on the type-approval of motor vehicles regarding their reusability, recyclability and recoverability and ISO 22628 Road vehicles – The review of the coherence of Directive 2005/64/EC demonstrated some internal contradictions for the Directive 2005/64/EC. Contradiction might be derived between 'proven technologies' (even in development) as expressed in the Directive 2005/64/EC in Article 6(3) and 'potentially recycled' as applied for the definition of the 'recycling rate' in Article 4(16). This has direct effects on the achievement of the recycling targets of the ELVD: As far as technologies in development enabling potential recycling are not available if the vehicle becomes an ELV this would clearly jeopardise the achievement of the targets established by the ELVD.

European List of Waste – Finally the literature review showed that the European List of Waste provided several notes on when outputs of ELVs should be noted as hazardous or not. This is not an incoherence, however it was noted that this should be referred to and made coherent with a review of the ELV. Referring to the ELoW might facilitate coherent reporting.

6.15 EU Added Value

The questions covered under this section are:

What is the Added value resulting from the ELVD?

What is the Added value of the ELVD compared to what MSs could have been reached without the ELVD?

What would be the most likely consequences of stopping or withdrawing the existing EU intervention?

What is the Added value of the ELVD at EU and a global level (e.g. on the global automotive industry)?

6.15.1 *Analysis*

Before the ELVD entered into force, 10 Member States had implemented regulations and / or industrial voluntary agreements for ELVs. At that time, the EU was at risk of having different levels of environmental protection across the EU and there was also a risk that different national regulations for placing new vehicles on the market might hamper the functioning of the European Single Market. By introducing an EU Directive, environmental protection from the harm that poor treatment of ELVs could cause has been made more consistent across Member States, and vehicles sold in the EU market have to comply with certain substance prohibitions.

How the ELVD addresses the use or rather prohibition of hazardous substances is of relevance to the question of added value. According to Article 4(1) on prevention:

'Member States shall encourage, in particular:
(a) vehicle manufacturers, in liaison with material and equipment manufacturers, to limit the use of hazardous substances in vehicles and to reduce them as far as possible from the conception of the vehicle onwards, so as in particular to prevent their release into the environment, make recycling easier, and avoid the need to dispose of hazardous waste;
(b) the design and production of new vehicles which take into full account and facilitate the dismantling, reuse and recovery, in particular the recycling, of end-of life vehicles, their components and materials;
(c) vehicle manufacturers, in liaison with material and equipment manufacturers, to integrate an increasing quantity of recycled material in vehicles and other products, in order to develop the markets for recycled materials.'

In relation to added value, this article can be viewed negatively, listing various requirements for MS but not specifying how these are to be implemented. As the vehicle manufacturers deliver to the European single market, it is difficult (even impossible) for single Member States to establish specific requirements without hampering the single market. For example, prohibition of additional hazardous substances on the level of a single MS or even a few could have market impacts. The only measures for addressing this aspect that MSs have available, are related to the support for research. Consequently, there is arguably a need for a harmonised European approach e.g. proposing a minimum level of recycled content in vehicles (which would be impossible to establish on a national level).

Nonetheless, at EU level, Article 4(2)(a) also requires Member States to "*ensure that materials and components of vehicles put on the market after 1 July 2003 do not contain lead, mercury, cadmium or hexavalent chromium other than in cases listed in Annex II under the conditions specified therein*". . Though this article only requires that vehicles placed on the EU market are compliant with the substance prohibitions, the progress achieved here is also often implemented in vehicles marketed outside the EU, meaning that the benefits from the substance prohibitions can be expected to exceed

those achievable within the EU alone. Environmental benefits also accrue from the use of best practice in ELV treatment and depollution.

With regard to the implementation of a level playing field for the environmentally sound management of ELVs and the enforcement of the stipulations of the ELVD the situation is less clear. Currently the Directive has no means to deal with such issues. Several examples are provided in the bulleted list below:

- The reporting according to Commission Decision 2005/293/EC (European Union 2005a) laying down detailed rules for the monitoring of the reuse/recovery and reuse/recycling targets does not provide sufficient evidence on the recycling rates achieved. PST facilities are required to achieve the challenging recycling and recovery targets of the ELVD. However, the current data collection provisions do not ask for information on the PST capacity available in each Member State;
- The required collection rate of ELVs is implicitly 100% but no obligatory reporting or evidence on this is requested. Eurostat provides a form for a quality report, however the completion of this form is voluntary;
- Considering the large number of missing vehicles, many Member States are failing to establish (de)registration procedures ensuring that all ELVs are sent to ATFs. However, it is also possible that Member States only fail to ensure that this is properly reported;
- The ELVD does not establish minimum requirements regarding inspections of the sector. As demonstrated by experiences in France and UK, such inspections are needed not only for ATFs but also to identify if (small) garages and workshops carry out dismantling/ depollution activities without being registered as ATFs;
- Parts for reuse are offered (inter alia via internet sales) to consumers without a certificate or other documentation that demonstrate that such parts are dismantled by ATFs. Consequently it is easy for non-ATFs to benefit from selling reused parts without complying with the minimum standards required for ATFs;
- Member States often fail to follow the recycling/recovery rates if ELV are exported to other Member States.

The targeted survey asked 'is the value resulting from the ELVD additional, the same or lower than that which would have been created by Member State only/ national legislation? 44% felt that the ELVD created additional value. One respondent, a company from Czechia, thought it created a lower value. Additional comments received on the questions indicated that the main consequences of withdrawing the Directive would be more uncontrolled disposal of ELVs (by 40% of consulted stakeholders), and lower rates of reuse, recycling and recovery from ELVs (35% of stakeholders).

The targeted survey also asked if the ELVD affected the competitiveness of the EU car sector compared to the global car sector? 62% stakeholders did not know, and of those that did have an opinion there was a slight majority who thought that the ELVD did negatively affect EU competitiveness. Most of these stakeholders were from companies or businesses associations. Two dismantling companies highlighted that the ELVD imposes more obligations on ATFs than comparable legislation outside the EU.

A motorcycle trade association stakeholder mentioned that the prohibitions have affected the composition of components used in the motorcycle sector because the two industries often use common

parts. The same is true for some other types of vehicles not within the ELVD scope, meaning that there is some added value in terms of the composition of components in other vehicle sectors.

Regarding the competitiveness of the EU car sector compared to the global one, a batteries-related association mentioned that the ELVD increases uncertainty for European manufacturers of batteries and they presume also for the car industry. As they stated, if there is a lead ban only for EU cars this will have an impact on the competitiveness of the EU car sector. The consultants can only partially follow this assumption, as all manufacturers of vehicles, whether European or not would need to comply with the ban when placing vehicles on the European market. In parallel, the ban applies to vehicles and their parts placed on the EU market. Thus, were Ex. 5(b) of Annex II to expire, lead acid batteries could no longer be placed on the European market and this would affect suppliers of batteries when providing components to vehicles to be exported from Europe.

6.15.2 *Conclusions*

What is the added value resulting from the Directive in the making of cars e.g. standards for the manufacturing of cars and reuse of parts compared to what Member States could have reached acting alone at national, regional and international level?

Certain stakeholders outlined the fact that the ELVD has led to increased rates of reuse and recycling of ELV parts and materials, due to increased collection of ELVs. This is somewhat supported by an increase in the number of ATFs and recorded ELVs (which are linked to the ELVD), but the comparison with pre ELVD and a counterfactual is limited by a lack of data. Therefore, the increased collection of ELVs, as a result of the Directive, is EU added value. In addition, the prohibition of certain hazardous substances, which is due to the ELVD, ensures that more material from future ELVs is likely to be reused or recycled. The case can be made that the Directive could do more on some issues, for example on obliging higher standards on the eco-design of vehicles or by addressing additional aspects required of MS in Article 4(1) in a harmonised way, e.g. by proposing a minimum level of recycled content in vehicles.

What is the added value resulting from the Directive in the EU and worldwide with impact to EU e.g. what's the impact of the Directive to international manufacturers and end-of-life legislation worldwide?

The added value of ELVD is brought about by harmonisation of national conditions and substances' restrictions. However, the situation is less clear regarding the achievement of a level playing field for the environmentally sound management of ELVs and the enforcement of the stipulations of the ELVD. Most stakeholders perceive that the ELVD offers added value in comparison to what MSs would create through national legislation and without it there would be more uncontrolled disposals of ELVs. Some company and business associations are concerned about the EU vehicle sectors' competitiveness as a result of the ELVD, however this represents a minority opinion, and there is no evidence to support it.

7 Conclusions

We have summarised the conclusions against each group of questions. The Executive Summary further edits these conclusions.

7.1 Effectiveness

7.1.1 *Have the objectives and targets of the ELVD been met and monitored*

Targets and achievements

- Virtually all the Member States are meeting the 85% reuse and recycling target set by the ELVD (as of 2017);
- The elimination of the hazardous substances mentioned in the ELVD, namely lead, mercury, cadmium and hexavalent chromium, has also been broadly achieved, with lead acid batteries being the highest volume exemption that remains valid, though this is due for review in 2021;
- Most stakeholders report that uncontrolled disposal and illegal activities have also reduced, with a consequent increase in proper collection and proper recovery of environmentally damaging materials;
- The number of ATFs has increased, with 14,000 established in 2017 in the EU, up from 13,000 between 2011 and 2014;
- The establishment of the International Dismantling Information System (IDIS), which provides the dismantling information to the ATFs, could also be seen as a result of the ELVD.

Reporting

- The reporting on reuse targets is hampered by the lack of an explicit (separate from recycling) target and the different options available to the Member States on how to report reuse.
- Commission Decision 2005/293/EC gives details on the monitoring of reuse/recycling and reuse/recycling targets set out in the ELVD and provides a table to be filled annually by the Member States and submitted to Eurostat. However, the Eurostat standard questionnaire for Member States on the quality and validity of the data is voluntary. As a result, the content of the quality reports accompanying the data varies across the Member States and for several Member States it is not possible to validate the data submitted.
- Some key data is also not systematically reported, for example, no information is available on the available capacity at specific stages of ELV treatment capacities (like post shredder technology).

7.1.2 *The issue of ELVs of unknown whereabouts*

- Around 10 million ELVs are expected to become available for treatment each year. However, the numbers reported are around 6 million, leaving about 35% of the total, of 'unknown whereabouts' each year[56].
- There are a variety of reasons for these missing ELVs, some of which pose greater environmental risks than others. The reasons include disposal at non ATFs, treatment at ATFs

[56] *See*, Compliance Promotion Initiative to assess the implementation of Directive 2000/53/EC on end-of life vehicles (the ELV Directive) with emphasis on the end-of life vehicles of unknown whereabouts in: https://ec.europa.eu/environment/waste/elv/events_en.htm

but without a Certificate of Destruction being issued, ELVs exported as used vehicles out of the EU and storage of unregistered vehicles 'off road' (possible in some MSs).

- There is no conclusive data available to quantify which reasons are the most significant.
- The lack of a coherent vehicle registration approach between MSs means that it is currently possible for vehicles to effectively 'disappear'. Achieving a consistent and coherent approach to address this would require adjusting the vehicle registration/deregistration procedures in many Member States.
- Past efforts to stop the export of ELVs, declared as used cars, indicate that customs authorities are not able to support any approach to assess each individual export of a used vehicle[57]. This is because the number of (officially) exported used vehicles (around 1 million/year) is too high and inspection of these cars – *inter alia* supported by guidance like the waste correspondents' guidelines No 9 to the Waste Shipment Regulation[58], is challenging with the available staff capacity and multiple priorities for enforcement and customs officers.
- There is a lack of clear and systematic reporting between MSs on the re-registration or scrapping of cars imported from other MSs.
- In the opinion of a number of stakeholders, the Netherlands is a best practice example for distinguishing ELVs from used vehicles in shipment. The stakeholders noted that a vehicle becomes an ELV when it cannot be repaired for realistic costs in the country of export. Ireland and Italy are also adopting an approach with some similarities with the Dutch one.

Certificates of Destruction (CoDs)

- Article 5(3) of the ELVD states that it is mandatory to present a CoD in order to deregister an ELV. However, the ELVD does not limit the conditions for deregistering a vehicle for other reasons (e.g. to declare it 'off road' whatever its roadworthiness). The CoD is only one of multiple options to deregister a vehicle.
- The approach in Portugal where vehicle tax is levied until an ATF issued COD is provided for the vehicle appears to be the most comprehensive approach to this. It appears that this would work in some other Member States but would be difficult to implement in those Member States where vehicles can be registered as no longer 'on the road' and exempted from any vehicle tax.
- Financial incentives to dispose of ELVs at an ATF exist, e.g. a pay out scheme in Denmark.
- This can also be regulated by the vehicle registration system, as in the Netherlands, where a Producer Responsibility Organisation for ELVs (the only one in the EU) controls the information on ELVs and CoDs in close cooperation with the registration authorities.
- Member State national/regional government environmental departments often claim that the car registration legislation, which is typically the responsibility of their ministry of interior or ministry of transport, does not support the aim of ELVD (to ensure that ELVs are treated in ATFs and get a CoD) as this is seen as the responsibility of the ministry of environment.

[57] Buchert, M. et. al.: Verbesserung der Edelmetallkreisläufe – Analyse der Exportströme von Gebraucht-Pkw und -elektro(nik)geräten am Hamburger Hafen (2007), Commissioned by: Umweltbundesamt (Germany)
[58] https://ec.europa.eu/environment/waste/shipments/guidance.htm

7.1.3 *Extended Producer Responsibility*

EPR is a mechanism for helping achieve the polluter pays principle, under which original equipment manufacturers (OEMs) bear financial responsibility or financial and organisational responsibility when their products become waste.

- Unlike the Waste Framework Directive (WFD) and legislation on other waste streams (WEEE for example), the ELVD does not establish a full EPR system, so it is unclear how the costs should be distributed. This is likely to be putting ATFs at a cost disadvantage in comparison to illegal and unregistered facilities. Neither does it provide incentives for ATF to remove and recover some materials, in view of the costs linked to these operations;
- All Member States have transposed the provision that the delivery of the vehicle to an ATF must occur without any costs for the last holder/owner;
- There is evidence that indicates that dismantlers and shredders cannot always cover their costs and occasionally operate at a loss. However, this cannot be directly linked to the EPR system, as several other issues also contribute.

7.1.4 *Circular Economy Links*

A more circular economy impacts the entire life cycle of products, through promoting sustainable consumption and aiming to ensure that any resources used are kept in the economy for as long as possible[59].

- Most dismantlers do not carry out dismantling of glass, large plastic parts, wiring harness or electronic components before shredding as it is assessed as economically not viable. These materials are therefore generally not re-used or recycled but sent to incineration (with or without energy recovery) or landfills;
- Removal of some parts/materials before shredding does occur. Some are sold as replacement parts, some are recycled;
- Removal of parts for reuse is in line with the principles of the circular economy and is an ELVD objective, as it avoids the resources needed to recycle and remanufacture the material into a useable product. There are no concerns with OEMs reselling used parts after a remanufacturing process. ATFs who provide the product with a regular guarantee, do this to generate revenues to recover the cost for obligatory depollution and dismantling. However, private individuals who remove parts before bringing an ELV to an ATF and sell the parts (possibly via the internet), raises some consumer protection and safety concerns, and it appears that this market is not consistently regulated between Member States;
- One option is to prevent the private sale (on public platforms) of spare parts and a recent agreement in the UK requires audit of a part before going on an internet sales platform verifying that the seller is an ATF;
- Some materials are profitable to remove for recycling (e.g. catalysts, tyres, batteries). This is because the materials have a relatively high value and a market exists that supports their recycling;
- Some materials could be removed pre shredding and be better recycled (than is the case post shredder) – e.g. glass. The value of the material vs. the cost of removal appears to be preventing/restricting this and it is an example of the circular economy being constrained by economic barriers;

[59] See the EU's EU Circular Economy Action Plan. https://ec.europa.eu/environment/circular-economy/

- Making the removal of glass mandatory prior to shredding would increase material recovery but would add costs to the ELV treatment process. Although it is arguably a question for an impact assessment of future changes, there was some support for the inclusion of material specific recovery targets. The issue that would arise is that it would be acceptable and achievable at low or no cost for some materials (e.g. metals), but would impose additional costs for others (e.g. for high quality glass and plastics recycling);
- As indicated in other sections, the provisions in the ELVD on the design of vehicles for dismantling, re-use and recycling are very general, which is also the case of the provisions on the integration of an increasing quantity of recycled materials in new cars;
- There are no provisions in the ELVD on the use of Green Public Procurement to promote circular models in the automotive sector.

7.1.5 *Inspections*

- The ELVD does not require any minimum standard for inspections in the sector and does not require any reporting on inspection activities. Examples in UK and France demonstrate that inspections can identify a high number of illegal activities, but they also demonstrate that such inspection campaigns are costly to the administration and need continuity to achieve useful results;
- Obligatory inspections and minimum standards would strengthen the competitiveness of ATFs vs. unregistered facilities;
- Some stakeholders were of the opinion that authorities do not have enough staff/resources to fully execute inspections across ATFs, non-ATFs and exports. Some also feel that the technical knowhow to conduct such inspections is missing.

7.1.6 *Did the ELVD foster or hamper innovation?*

- It appears that the Directive does not hamper innovation according to the assessment tests suggested in the Better Regulation Guidelines. Achieving the targets for recycling has helped encourage innovation in dismantling, shredding, and sorting of ELVs;
- Stakeholders agree that the Directive has influenced the limiting of prohibited hazardous substances in vehicles, and made the recycling of ELVs and their materials and components easier;
- It does not appear that the ELVD has had a substantial (industry wide) positive impact on the design of cars, though there are some positive examples of design for recyclability and the use of recycled material in new cars. In the future, given the long durability of some electric vehicle components, innovative ways of reusing them could be incentivised if their recovery is facilitated, the current ELV provides no incentives for this type of innovation;
- The ELVD requires Member States to encourage manufacturers in this regard (i.e. regarding design for recycling and uptake of recyclables) and this would be better regulated at the EU level by setting concrete targets for such aspects, notably for strategic materials that are becoming relevant with electrification.

7.2 Efficiency

7.2.1 *Costs and Benefits*

- The cost and benefits associated with the implementation of the Directive cannot be easily estimated;
- The tables below collate the cost and benefit data that we have, and that we have asked / looked for but been unable to identify. The table also comments on which of these costs would exist without the ELVD, i.e. in the counter factual situation of no ELVD.

Costs as a result of the ELVD

- There are costs to the ATFs to operate to the standards required and to report. There are costs to the car industry in designing vehicles with recyclability in mind, in replacing materials previously used, and in providing information to dismantlers;
- Member States and local / regional authorities also face costs in collecting and reporting data. There is significant variation in these across Member States. This appears to be caused by differences in the level of reporting detail requested by national authorities, and difference in vehicle registration (and de-registration) procedures. While this could be considered an issue in terms of a non level playing field, in that ATFs in countries with lower reporting costs are at a comparative advantage, there is no evidence of these ATFs taking ELVs from other MSs and using these lower costs to their advantage;
- The distribution of costs between ATFs and OEMs is an important issue. There is disagreement and inconsistent data on the profitability of ATFs. OEMs consider that on average ATFs already operate at a profit, while the ATFs claim they lose money, but still process the ELVs properly (presumably to ensure compliance / avoid fines because economically they have no incentive to treat some ELVs). It seems likely that the treatment (and removal of parts for resale) of some (typically newer) vehicles subsidise the treatment of older ELVs which have a negative-value to the ATFs.

It appears that consumers are not faced with costs for the disposal of ELVs, but there remains some concern that this may not always be true for vehicles that have little or no value to car dismantlers.

Element	Total cost	Comment on extent to which the cost is ELV specific (vs. counter factual - no ELVD)
ATFs and shredders (source = EURIC unless otherwise stated)		
Reporting and monitoring	205 hours per year @ €35/hr for 14,000 ATFs = €100.5m/year	Hard to say how much would occur without ELVD. Some sites would be monitored by MS specific legislation.
Operating	€40 / ELV (Ademe average) for 6 million ELVs = €240m/year	Depends on the MS requirements. Likely that in some MSs costs are higher to comply with ELVD requirements.
Payments to ELV last owners	Highly variable (from €0 to €300 per ELV) average of €150 = €900m/year	Will vary by car, MS and ATF (depending on the value of the vehicle to them), could be higher if the MS in question set low treatment standards (If ELVD did not exist). ELVD only requires no charge (not payment).
Car industry (ACEA - estimated annual costs)		
IMDS	€107m/year	Set up as a result of the ELVD, but may have occurred anyway.
Take-back networks	€49m/year	May have developed as a result of other legislative and consumer pressure, but hard to know.
Dismantling Information	€3m / year	Set up as a result of the ELVD, but may have occurred anyway.
Consumer-Information	€1m/year	Set up as a result of the ELVD, but may have occurred anyway.
Member States (Average from data collected in this study)		
Reporting and Inspecting	6,400 hours per year @ €30/hour x 28 MSs= €5.4m/year	Some inspection and data collection would presumably occur without the ELVD, in virtually all MSs. Additional burden because of ELVD is hard to estimate. Low confidence in quality of reported data.

Benefits as a result of the ELVD

The benefits of the Directive can be distinguished as environmental, social and economic:

- Environmental benefits include the avoided damages in ecosystems due to hazardous substances and inappropriate handling of ELV fluids and other components. Indirect environmental benefit may include the lower environmental damage associated with resource extraction avoided due to recycling and reuse of materials and components from ELVs;
- Social benefits involve the avoided damage in human health due to exposure to hazardous substances and unregulated dismantling operations. Other social benefits include the employment and income generation for employees across the EU in the dismantling sector and other economic operators, the majority of which are SMEs;
- Economic benefits comprise business revenues for the dismantling and shredding sectors and for a number of other sectors that use secondary materials derived by ELV treatment. The creation of a more level playing field for most market participants (as all vehicle manufacturers have to comply, and all ATFs should operate to the same standard) across the EU can also be considered an economic benefit derived from the Directive.

Element	Total (€m/ year)	Comment on extent to which the benefit is ELVD specific (vs. counter factual - no ELVD)
ATFs and shredders (EURIC)		
Sale of recovered / removed parts	6 million ELVs treated per year, Ademe estimate of €130/ELV = €780m.	ELVD does nothing specific to make this easier (despite it being an ELVD objective), but it could be argued that the ELVD helps attract ELVs to ATFS, where the parts can be removed.
Sale of recovered materials (e.g. recycled steel)	6-million ELVs treated, 1088kg/ ELV, 70% Ferrous metal = 8.5 million tonnes @ €235/tonne = €1,998m	ELVs would still be scrapped and the profitable material would be recovered without the ELVD, but the ELVD arguably increases the number of ELVs that are collected. Handling of hazardous and non profitable materials would not be regulated at the EU level, creating the risk of diverse national approaches.
Car industry		
Consumer good will from role / contribution of OEMs to ELV collection costs and use of reclaimed material	Very hard to value, but some manufacturers do promote their green credentials (though nothing specific on the ELVD specific costs has been seen), so it is of interest and value to some consumers	Car manufacturers may well have done this anyway, via this or some other route.
Savings from use of recovered material	Maybe low (or even negative), as virgin material is often lower cost than recovered material	
Member States / citizens		
Removal of hazardous substances	Lead removal (for example) has been shown to offer clear benefits in other environmental policies. The same would be true for removal of the prohibited substances from ELVs.	Some (even most) MSs would have developed similar prohibitions, but EU wide action has standardised this and probably made the process quicker (and more thorough) in several MSs. EU wide prohibitions obliged OEMS to act on a market wide basis.
Avoidance of impact from recovered resources	GHG savings and other benefits from avoided extraction of virgin materials	Resource recovery likely to have sped up and occurred in more MSs with the ELVD than without it.
Level playing field within and between MSs	Benefits to citizens and legitimate businesses through competing on a fair basis within MSs and between MSs	Most MSs would have aimed to achieve this within their own borders, but the likelihood of consistency between MSs would have been lower
Savings on second hand vs. new parts	Consumers arguably benefit from access to recovered part, also avoids energy use in the manufacture of new parts. Though there are also risks in purchasing some critical used parts of unknown history.	Would have happened without ELVD. Role of ELVD in increasing this is unclear (not part of its original intention, but increased collection of ELVs arguably makes this easier)

- There is no evidence, nor any claims, of the ELVD as it is currently being implemented having a negative impact on the competitiveness of the automotive industry within the EU;

- The vast majority of the stakeholders consulted consider that the total benefits of the Directive outweigh its costs;
- A common observation of a number of stakeholders was that insurance companies are unduly absent from the implementation of the Directive. Since insurance companies sell ELVs in auctions (in large quantities) to the highest bidder and are mentioned as economic operators in the ELVD, if left unregulated this could become a significant channel of ELVs towards illegal operations, including export.

7.2.2 *Administrative Burdens*

- As described above the ELVD does impose some reporting and monitoring costs, however there is no clear evidence of any unnecessary regulatory burden or complexity;
- The most common suggestions for reducing the administrative burden concerned (de-) registration and notification systems;
- The (de-) registration systems in the Netherlands is regarded as an effective and efficient model that other MSs could emulate. In the Netherlands, only authorised market operators and stakeholders have access to update the vehicle status. This reduces the administrative burden and the amount of untracked exports of unregulated ELVs. It is not possible to prove the relative effectiveness of the Netherlands system in comparison to other systems by using data on the number of ELVs treated;
- The use of online reporting, of ELV statistics and of ELV deregistration was also highlighted as an effective way of reducing administrative burden.

7.3 Relevance

7.3.1 *Scope*

- The vast majority of the vehicle market (passenger cars and small lorries) is covered by the ELVD, but some gaps remain;
- Passenger vehicles make up the major share of vehicles currently operating in the market (76.3% as of 2016). It also appears that ATFs are not receiving a large number of non-ELVD vehicles for treatment but they can deal with those that they do receive. Stakeholders broadly support the inclusion of different vehicle types (lorries, buses, motorcycles), if they can be treated effectively under the ELVD;
- Their inclusion would also be justified by the overarching assumption of waste and environment policy that the disposal / treatment of all waste that poses a potential risk to the environment should be regulated and controlled;
- Although vehicle types not covered by the ELVD are covered by general waste provisions, these are not as specific as the ELVD, and hence miss positives, such as the opportunities to improve vehicle design, the obligation to be treated in ATF and the recovery of valuable resources;
- The industry notes a number of differences that were used to justify their original exclusion. These include: the relatively low numbers of vehicles (implying a smaller scale of risk than for cars), a high share (compared to cars) of SMEs involved in the manufacture (implying a large impact on SMEs, who have less resources to comply with the Directive), longer life vehicles compared to ELVD covered cars and hence more frequent export of used vehicles out of Europe;
- Expanding the scope of the ELVD to other vehicle types as motorcycles and lorries to the ELVD would require a full analysis of the impacts, with particular attention to the above reasons for their current exclusion;

- Another gap in scope noted by some, was small e-vehicles (e.g. e-scooters and bikes), though some of these (not type-approved two wheel vehicles) (e.g., pedelecs) are covered by RoHS and WEEE.

7.3.2 *Hazardous Substances in ELVs*

- The Directive empowers the Commission to amend Annex II on a regular basis, but there is no minimum frequency specified for evaluating exemptions;
- Other comparable Directives do specify a frequency for evaluating exemptions (e.g. the Restriction of Hazardous Substances Directive (RoHS) Directive specifies a maximum duration for exemptions of 5-7 years (depending on the category type), subsequently determining the frequency of evaluations);
- The presence of hazardous substances in vehicles is a potential risk to the environment that needs to continue to be prevented or managed and controlled where substitution is not yet possible;
- It can also hinder resource efficiency, as it can be an obstacle to the recovery and use of secondary raw materials;
- The current prohibition of hazardous substances under the Directive is still relevant, however a few areas appear to be suitable for potential adjustment:
  - The current criteria for justifying exemptions are viewed positively, though some stakeholders pointed out differences in relation to the criteria applied under the RoHS Directive, suggesting there is room for improvement.
  - Some felt that the frequency of amendments of the annex is too high. Most stakeholders recommend durations of seven years and above where substitutes are not available.
  - There is support for considering the necessity of prohibiting additional substances in the future, where this would support the reduction of risks to the environment as well as supporting resource efficiency.
  - It seems that most stakeholders would prefer this to continue to be addressed under both the ELV and the Batteries Directive.
- The enforcement and control of these prohibitions by the Member States is also an issue: in practice, it is often unclear which national authorities are competent to enforce these provisions, with a need for coordination especially between administrations in charge of Environment, administrations in charge of transport and type-approval, and administrations in charge of market surveillance.

Are there existing needs that are relevant to the management of end-of-life vehicles that are not adequately covered by the Directive or by any other instrument?

Issues raised include the inclusion of some Brominated Flame Retardants (BFRs). Although DecaBDE is covered under the Stockholm convention and the EU POPS legislation, other flame-retardants found in plastics are not. According to the consultants, this should therefore be covered, particularly as plastics that require flame-retardants are increasingly used as a light-weight material in ELVs.

7.3.3 *Increased use of electric, electronic and other components*

- Plastic, electronic and carbon fibre content in vehicles is increasing, and this is likely to continue;
- According to Directive 2005/64/EC, both require recyclability for the 85% of the vehicle weight target to be achievable. However, some of these components are difficult to recycle and

recover (e.g. carbon fibre). In addition, the mixing of such components (plastics, electronics…) with each other and with other streams during recycling can hamper the recycling of all material types;

- There is no information provided on electronic components that are beneficial to separate. This might be addressed through the substances of very high concern in articles and products (SCIP) database that the co-legislator mandated to ECHA to establish and maintain under the WFD.

7.3.4 *Increase in sales of electric or hybrid vehicles*

- By 2030 approximately a half of all passenger cars sold in the EU are predicted to be electric vehicles – EV or hybrid, (either Battery EV, Hybrid EV or plug in hybrid EV);
- Dismantling may become less profitable as costs for storage, training and equipment, and transportation may increase. The increased use of lightweight materials, electronic components, presence of critical raw materials (CRMs) in EVs (and other future vehicles) may also increase the cost and complexity of dismantling;
- It appears that the ELVD provisions for EPR are not sufficiently clear or detailed to ensure a fair share (e.g. between OEMS and ATFs) of the (economic) burdens expected from EVs;
- The costly components may be able to generate second-life income once dismantled and repaired (true for EVs and other future vehicles), this may outweigh the extra costs, but it is too early to reach a conclusion;
- For CRMs and generally for electronic and electrical parts in cars, there are issues for recycling that the ELVD does not currently sufficiently cover. For the latter there is not enough relevant information and no processes to inform ATFs what components should be separated to ensure the reclamation of strategic metals (gold, silver, palladium, tantalum and rare earths);
- However, the ELVD currently only addresses a total recycling target, with no additional targets for components containing rare earth metals.

7.4 EU added value

- The added value of ELVD is brought about by the harmonisation of national conditions, and the fact that the environmental risks associated with ELVs do not vary considerably between MSs limits the case for MS specific responses;
- There is added value from the substance prohibitions in the form of the decreased use of these in vehicles also sold outside the EU;
- The level of success in the achievement / enhancement of a level playing field for the environmentally sound management of ELVs and the enforcement of the stipulations of the ELVD is less clear;
- Most stakeholder believe that MS action alone would result in more uncontrolled disposals of ELVs;
- A minority of stakeholders had some concerns about the EU vehicle sectors' competitiveness as a result of the Directive, but there is no evidence to support this.

7.5 Coherence

Internal Coherence

- Generally, the Directive is regarded as internally coherent (i.e. it does not contradict itself);

- The literature suggests that Article 4(1) on prevention encourages MSs to (independently) limit hazardous substances (aside from those prohibited through the Directive), when this action would be better pursued at EU level.

Coherence with other legislation and policy

There is a broad level of coherence noted across all the various overlapping policies. However, there are a number of specific issues, as follows:

- *Waste framework Directive* – The literature highlights overlap and incoherence in the definition of the terms 'reuse' and 'recycling'. The ELVD also contains very general provisions on EPR, which do not take account of the definition and the minimum requirements for EPR schemes laid down in the Waste framework Directive. The definition of reuse is not coherent with the WFD but has proved to be practical for the sector;
- *Basel Convention and the Waste Shipment Regulation* – the difficulty in distinguishing between a used vehicle and ELV for export purposes. Although not an issue specifically tackled in those legal instruments, guidance such as the Waste Correspondents' Guidelines No 9[60] are difficult to use in practice. This can create issues of 'used vehicles' being exported and EU authorities being unclear if they are reregistered or illegally scrapped;
- *Stockholm convention and POP Regulation* – The presence of the flame retardant decabromodiphenyl ether (DecaBDE) and other POP-BDE in shredder residue (and how this should be disposed of) is problematic and can hamper recycling. The disposal and recycling options for materials contaminated with POPs such as DecaBDE which are separated from ELVs may impact the ability of ELV operators to fulfil the targets specified in the ELVD for recovery and reuse;
- *Directive on waste electrical and electronic equipment (WEEE) and RoHS Directive* – Some confusion exists over certain electric and electronic equipment (EEE) specifically designed for and installed in vehicles, which makes it difficult to know which legislation the EEE should be handled under. Aligning the scope on EEE parts could help remove extra work for ELV operators and clarify which devices or parts should be handled in which waste stream. This is also important as the RoHS Directive restricts substances that are not prohibited by ELV. Components used in vehicles but sent to treatment with WEEE could introduce contamination to the EEE waste fractions;
- *Batteries Directive* – The literature shows there may be minor incoherencies. Only automotive batteries (starter and lighting/ignition power function) and electric vehicle batteries (industrial) are required to comply with the ELVD substance prohibitions. There is also an issue with electric vehicles, where batteries are also regulated through the Batteries Directive and where there is no clarity as to the responsibility on the costs of storage or transportation of end of life batteries from electric vehicles;
- *Regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation* – The literature shows no current coherence issues. These could arise depending on which substances are added to REACH annexes in the future;
- *Directive on vehicle registration documents* – The ELVD and the Directive on the registration documents for vehicles (1999/37/EC) do not use a harmonised set of terms, which has effects on deregistration and the issuing of CoDs. A 'conclusive list of conditions when a permanent cancellation shall apply' is missing;

[60] https://ec.europa.eu/environment/waste/shipments/guidance.htm

- *Directive 2005/64/EC on the type-approval of motor vehicles regarding their reusability, recyclability and recoverability:* A Contradiction may exist regarding '*proven technologies*' (even in development) as expressed in Directive 2005/64/EC in Article 6(3) and '*potentially recycled*' as applied for the definition of the 'recyclability rate of a vehicle'' in Article 4(16) in the same Directive. This affects the achievement of the recycling targets of the ELVD as 'potentially recyclable' will not necessarily result in 'effectively recyclable' and as a consequence, the recycling targets of the ELVD may not be achieved. The Definition of recyclability and recoverability in Directive 2005/64/EC might need some adjustments to be more in line with the European Strategy for the Circular Economy, by referring more to high quality recycling and distinguishing between potentially recyclable and recyclable under current conditions;
- *Circular Economy policy* – Stakeholders perceived this as lacking coherence with the ELVD. This appears to relate to the Circular Economy policy's broader focus. The ELVD supports the Strategy for the Circular Economy but the ELVD does not sufficiently ensure waste prevention, material reuse (for example through mandatory use of recycled content) and high quality recycling;
- *European List of Waste* –The European List of Waste (ELoW) has several notes on when outputs of ELVs should be classified as hazardous or not. Currently there is no alignment of ELVD with the ELoW in this respect, though this could help facilitate coherent reporting.

Annex A – Evaluation Matrix

The first step in developing the evaluation matrix was to critically assess each sub-question and restructure the questions from the ToR and add additional evaluation questions as per the Better Regulation Toolbox. After this, the evaluation questions were refined by developing concrete indicators and **judgment criteria** for each so that (i) information can be collected and analysed and (ii) the evaluation question can be answered. The Better Regulation Toolbox contains detailed information on deriving indicators and judgment criteria and we have used this as a reference. The final step of the development of the evaluation matrix was to identify **the methods and sources** that will be used to collect and analyse evidence.

Table A-1 presents the evaluation matrix. In line with the Better Regulation Guidelines, stakeholders will be consulted to gather evidence for the evaluation. The planning of the engagement with stakeholders is summarised in a consultation strategy. This strategy links to the evaluation framework to identify the sources and stakeholders to be contacted and is include in Annex B. There has also been extensive data and literature review to answer the questions – the matrix also highlights which questions this has been a key part of the method

As stated in the section describing the intervention logic, it is important to stress that the baseline for the evaluation, i.e. what would be the situation in the absence of the intervention, will be developed as part of the assessment of the current situation. This is largely because that there was no formal impact assessment of the ELVD before it was implemented, which would have included a 'do nothing' option (which is the typical baseline for an evaluation), as this was not the required procedure at the time.

Table A-1 Evaluation matrix for the ELVD

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
Effectiveness					
1	**To what extent have the objectives of the ELVD been achieved?**				
1.1	*To what extent have the targets on ELVs, on reuse/recycling/recovery and on the elimination of the use of hazardous substances been met?*	1	• *Performance in terms of increase in recycling, reduction in the use of hazardous substances etc.*	• *Reuse/recovery/recycling rates* • *Amounts of hazardous substances still used or removed.*	• ***Data analysis*** *on judgment criteria* • ***Review of literature*** *on implementation reports, fitness check*
1.2	*To what extent have the provisions on prevention, collection, treatment, reuse, recovery, coding standards/dismantling information been implemented?*	3	• *Performance of MSs with regard to transposing ELVD into national policies* • *Performance of MSs with regard to implementing these national policies*	• *Implementation rates per MS* • *Stakeholder views on implementation*	• ***Review of literature*** *on national legislation, coding standards, implementation review* • ***Stakeholder input*** *from recyclers, MS officials etc. (at MS level)*
1.3	*To what extent can the achieved results/effects be credited to the ELVD?*	N	• *Assessment of (e.g.) stakeholder views and literature consensus on the extent to which results can be credited to the ELVD* • *Comparison to the baseline (when defined)*	• *List of drivers (e.g. political support, active research community) and barriers*	• ***Literature review*** *on contribution of other policies to targets* • ***Stakeholder input*** *from MS and EU officials, (re)manufacturers, recyclers, NGOs, academia*
1.4	*To what extent were the results expected?*	1	• *Difference between results and expectations* • *Any unexpected results?*	• *List of effects / expectations* • *Group expected and unexpected effects*	• ***Literature review*** *on intentions/ implementation of ELVD* • ***Stakeholder input*** *from EU officials, MS officials, academia*
2	**To what extent have the results been effectively monitored?**				
2.1	*Have the reporting data from Eurostat and the information provided in data accompanying national quality reports been effective for monitoring of the targets?*	17	• *Assessment of stakeholder views and literature on monitoring techniques* • *Monitoring performance (based on Eurostat data)*	• *List of monitoring techniques* • *Eurostat data* • *Views on monitoring of ELV data (Eurostat specifically)*	• ***Literature review*** *on implementation reports, fitness check* • ***Stakeholder input*** *from MS and EU officials (monitoring agencies) and (re)manufacturers, recyclers, NGOs, academia*
2.2	*To what extent does the current cooperation and data exchange between the national services and links with other relevant legislation serve the purpose of the ELVD?*	8	• *Assessment of stakeholder views* • *Involvement / performance of ministries in (de-) registration of vehicles*	• *Views on the current cooperation and data exchange* • Degree of involvement of ministries in *(de-) registration of vehicles*	• ***Stakeholder input*** *(targeted consultation and interviews) from MS and EU officials*

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
2.3	*To what extent are the current challenges for the communication of data on ELV for the compilation of statistics and the monitoring of target achievements addressed?*	2	• *Assessment of stakeholder views and literature*	• *Views on challenges on communication/data/ monitoring (specifically addressing PST and exported ELVs*	• ***Literature review*** *on implementation reports, fitness check* • ***Stakeholder input*** *questionnaire and interviews with MS and EU officials*
2.4	*To what extent have the current mechanisms to measure the performance in the implementation of the ELVD and to monitor the results (e.g. challenges with communication of data) been effective?*	16	• *Assessment of stakeholder views, literature and ATF data*	• *List of monitoring techniques* • *Views on monitoring of ELV data* • *The number of ATFs certified by EMAS*	• ***Literature review*** *on implementation reports (comparison between the Eunomia and ARGUS reports), fitness check* • ***Stakeholder input*** *(questionnaire and interviews) e.g. from monitoring officials, (re)manufacturers, recyclers, NGOs, academia*
3	**Which factors contributed to or hampered the observed achievements of the ELVD?**				
3.1	*To what extent are the provisions on Extended Producers Responsibility (EPR) sufficient in the ELVD to contribute to a good implementation of its objectives?*	19	• *Assessment of stakeholder views* • *How EPR is applied in other Directives, in comparison to how it is applied in the ELV.*	• *Views on the effectiveness of EPR provisions in the ELVD and in other Directives (to what extent do they leave room for interpretation?)*	• ***Literature review*** *on implementation reports and EPR elsewhere.* • ***Stakeholder input*** *from MS officials, manufacturers and ATFs*
3.2	*To what extent did the dismantling of parts before shredding affect the ELV targets and the quality of recyclates, in view of the objectives of the Waste Framework Directive (WFD) and the Circular Economy Action Plan?*	20	• *Performance in terms of the dismantling of parts and components for reuse/recycling* • *Assessment of stakeholder views and literature on relation between results and ELV targets*	• *Data on number and quality of dismantling of parts and recyclates* • *Views and data on market conditions (costs to dismantle) Evidence on relevance of the WFD and Circular Economy Action Plan*	• ***Literature review*** *on WFD and Circular Economy Action Plan* • ***Stakeholder input*** *from MS officials, remanufacturers, recyclers and dismantlers*
3.3	*What other factors contributed to or hampered the achievement of the objectives of the ELVD?*	4	• *Assess the differences between the ELVD's effects and expectations and assess the effect of a set of factors*	• *List of factors that contributed/hampered the ELVD* • *List of effects/expectations from ELVD*	• ***Literature review*** *on implementation reports* • ***Stakeholder input*** *from MS and EU officials, NGOs and motor industry.*
4	**Did the ELVD lead to other significant changes or results?**				
4.1	*Did the ELVD foster or hamper innovation?*	7	• *Assessment of views and literature on the relation between ELVD and innovation (both in car design and ELV treatment)*	• *List of ELV treatment techniques* • *List of vehicle design changes*	• ***Literature review*** *on implementation reports, material evolution* • ***Stakeholder input*** *(e.g. producers and processors) Case studies on pre vs.*

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
				• *Views on potential negative effect on innovation (e.g. chemicals policy)*	*post shredder recovery. (Pre shredder may be more innovative)*
4.2	*Did the ELVD undermine the achievement of the objectives of the raw materials and innovation policies?*	8	• *Performance on raw material use* • *Assessment of views and literature on interplay between the ELVD with raw materials and innovation*	• *List of ELVD achievements* • *List of raw materials and innovation results* • *Data on material use*	• ***Literature review** on raw material and innovation policies* • ***Stakeholder input** (targeted consultation) from EU officials and others involved in raw materials and innovation policies*
4.3	*Did the ELVD lead to other significant changes or results (aside of sub question 4.1 and 4.2)?*	5, 6	• *Assessment between causality of changes and ELVD (based on stakeholder views)*	• *List of potential changes caused by ELVD*	• ***Stakeholder input** (questionnaire, interviews)*
5	**What and to which extent did MSs implement measures to address the problems of "missing ELV" (e.g. cooperation mechanisms between MSs)?**				
5.1	*What measures and criteria were applied by MSs for shipments to distinguish ELVs from used vehicles?*	10	• *Assessment of stakeholder views* • *Performance of measures*	• *List of all measures and criteria, per MS* • *Views on implementation/ actual situation, correspondents' guideline No 9 (which distinguishes ELVs from used vehicles)*	• ***Literature review** on implementation reports/fitness check* • ***Stakeholder input** from MS customs services, NGOs*
5.2	*To what extent were implemented national Certificates of Destruction (CoD) systems designed to make sure that ELVs were dismantled at authorised treatment facilities (ATFs)?*	12	• *Performance of CoD systems* • *Assessment of stakeholder views*	• *List and quality of CoD systems*	• ***Literature review** on implementation report and the 2017 study[61]* • ***Stakeholder input** (e.g. questionnaire, registration and environmental authorities)*
5.3	*To what extent do the incentives adopted by some MSs contribute to ensure that ELVs are treated in legal ATFs and get a CoD?*	13	• *Performance of incentives* • *Assessment of stakeholder views and literature on actual situation/practical issues*	• *List of incentives (and best practices)*	• ***Literature review** on MS implementation* • ***Stakeholder input** (targeted consultation) from processors, ATFs, MS officials*
5.4	*How effective were inspections in the MSs in the ATFs to identity their legality?*	15	• *Assessment of views*	• *Views on inspections and success rate (best practices from specific MSs)*	• ***Stakeholder input** (e.g. public authorities from different MS)*

[61] Mehlhart, G.; Kosińska, I.; Baron, Y. Hermann, A. (2017): Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELVD) with emphasis on the end of life vehicles of unknown whereabouts, Study commissioned by the European Commission and carried out by Öko-Institut

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
5.5	*What and to which extent did MSs implement other measures to address the problems of "missing feedback"?*	9	• *Existence and performance of other measures*	• *List of other measures*	• ***Literature review*** *on MS implementation* • ***Stakeholder input*** *(e.g. public authorities from different MS)*
	Efficiency				
6	**To what extent are the costs involved proportionate, given the benefits which have been achieved?**				
6.1	*What are the costs and benefits (monetary and non-monetary) associated with the implementation of the ELVD for different players (e.g. public authorities, consumers?*	21, 22, 23	• *Identification and assessment of these costs and benefits*	• *Direct and indirect technical and administrative costs for the various actors and processes arising from the ELVD requirements (including competition with illegal operators)* • *Direct and indirect benefits for the various actors (including society as a whole) arising from the ELVD implementation*	• ***Data analysis*** • ***Review of literature*** *(e.g. studies from DE and FR)* • **Stakeholder input** *(targeted survey, interviews) from e.g. operators, processors, manufacturers, regulators etc. – to collect data for standard cost model assessment*
6.2	*To what extent are there distributional impacts of the costs and benefits resulting from the ELVD (e.g. on SMEs, different sectors, across MSs)?*	21	• *Quantitative assessment of costs and benefits* • *Assessment of stakeholder views and literature*	• *List of (in)direct technical and administrative costs (and benefits) per MS arising from the implementation of ELVD (indicate who incurs the costs/benefits - e.g. type/size of business/sector).* • *Qualitative / quantitative indicators building on impacts and benefits per MS.*	• ***Data analysis*** • ***Review of literature*** • ***Stakeholder input*** *(targeted surveys and interviews) from e.g. operators, processors, manufacturers, regulators etc. from different MS*
6.3	*How does the polluter-pays principle, applied as Extended producers Responsibility (EPR), affect the different operators involved and are the costs resulting from the EPR fairly allocated?*	29, 30	• *Assessment of distribution of costs amongst operators*	• *Description of the EPR effects on operators* • *(In)direct technical and administrative costs*	• ***Data analysis*** • ***Review of literature*** • ***Stakeholder input*** *from e.g. operators, processors, manufacturers etc. – to collect data, among other*
6.4	*To what extent were there (and what caused) differences in costs and benefits between MSs?*	25	• *Assessment of differences and graphic display of quantitative results where appropriate (e.g. labour costs, age of vehicle fleet)*	• *Description of specific examples of cost differences, reasons and consequences* • *Data on labour costs, age of vehicle fleet etc.*	• ***Data analysis*** • ***Review of literature***

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
					• ***Stakeholder input*** *(public and targeted survey) from e.g. operators, processors, manufacturers etc.*
6.5	*To what extent did the ELVD support the EU internal market and the creation of a level playing field for economic operators?*	32	• *Assessment of the size of the effect on the internal market, per element*	• *List of elements in the ELVD that contribute to supporting the internal market (e.g. minimum requirements)*	• ***Review of literature*** • ***Stakeholder input*** *from e.g. operators and particularly SMEs*
6.6	*What is the impact of the provisions in the ELVD and its harmonisation of requirements on the competitiveness of the automotive industry within the EU?*	33	• *Assessment of stakeholder views and literature* • *Assessment of differences between ELVD and legislation outside EU*	• *Competitiveness of EU automotive sector and other regions* • *List of similar regulations*	• ***Data analysis*** *competitiveness* • ***Stakeholder input*** **(***interviews and targeted survey) from e.g. operators and particularly manufacturers and producers*
7	**What factors influenced the efficiency?**				
7.1	Is there any evidence that the implementation of the ELVD has caused unnecessary regulatory burden or complexity?	24	• *Assessment of difference in costs compared to other comparable regimes* • *Assessment of stakeholder views on the regulatory burden*	• *Costs resulting from ELVD and (e.g.) costs prior to the ELVD implementation in the EU or costs in non-EU countries*	• ***Review of literature*** *on implementation* • ***Stakeholder input*** *(targeted survey and interviews) from e.g. operators, manufacturers, producers, insurance companies across MS*
7.2	*Are there any good or bad practices that can be identified in terms of efficiency in the achievement of results?*	31	• *Assessment of stakeholder views*	• *List of practices highlighted as good / bad*	• ***Stakeholder input*** *from e.g. operators, processors, manufacturers, MS and EU officials etc. (data analysis based on input)*
7.3	*How efficient is the exchange of information between the car registration and the environmental departments in the MSs?*	1	• *Assessment of type of information exchanged and processes (based on stakeholder views and literature)*	• *Description of the types of information exchanged between the relevant departments* • *Description of processes involved in the exchange of information*	• ***Review of literature*** *particularly the compliance promotion initiative and the study on missing whereabouts*[62] • ***Stakeholder input*** *(interviews, targeted survey) from e.g. public authorities from different MSs*
7.4	*How efficient has been the exchange of information/notification between the national authorities on re-registration of exported cars?*	14	• *Assessment of stakeholder views*	• *Description of processes involved in the exchange of information*	• ***Stakeholder input*** *(interviews, targeted survey) from e.g. public authorities from different MSs*

[62] Mehlhart, G.; Kosińska, I.; Baron, Y. Hermann, A. (2017): Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELVD) with emphasis on the end of life vehicles of unknown whereabouts, Study commissioned by the European Commission and carried out by Öko-Institut

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
	Relevance				
8	**How well do the objectives of the ELVD correspond to the current needs within the EU?**				
8.1	*Is there still a need for the ELVD?*	34	• *Assessment of stakeholder views and data on the potential impact of not having the ELVD*	• *Data on relation between ELV and environmental degradation (e.g. scrap pollution data)* • *Views of stakeholders on the (future) needs*	• ***Intervention logic*** • ***Literature review*** *on indicators* • ***Stakeholder input*** *(public consultation, targeted survey) from all stakeholders*
8.2	*Are there any needs relevant to the management of end-of-life vehicles that were not adequately covered by the ELVD or by any other instrument?*	37	• *Assessment of views on unaddressed needs of stakeholders and literature*	• *List ELVD results and other needs*	• ***Literature review*** • ***Stakeholder consultation*** *(public consultation, targeted survey) from all stakeholders*
8.3	*Are there opportunities to simplify the legislation or reduce unnecessary regulatory costs without undermining the intended objectives of the ELVD?*	36	• *Assessment on the impact of potential amendments to the ELVD*	• *List of potential amendments to simply ELVD*	• ***Literature review*** • ***Stakeholder input*** *(targeted survey, interviews) from e.g. from operators, processors, manufacturers, MS and EU officials*
8.4	*To what extent are the definitions in the ELVD still up to date?*	41	• *Assessment of definition and potential future changes*	• *Views of stakeholders on definition (and future developments)*	• ***Literature review*** *on (reports on) relevant directives* • ***Stakeholder input*** *from e.g. from operators, processors, manufacturers, MS and EU officials*
9	**To what extent can the ELVD appropriately cover the new challenges, changing environment and developments related to ELV?**				
9.1	*To what extent can the ELVD cover technological developments? (e.g. the growing share of electric vehicles)?*	38, 39, 40	• *Assessment of stakeholder views and literature on the relation between the ELVD and technological change in sector*	• *Data on take up of new approaches, and model projections of future take up* • *Views of stakeholders (focus on EVs)*	• ***Literature review*** *on technical developments in sector* • ***Stakeholder input*** *e.g. from operators, processors, manufacturers, MS and EU officials*
9.2	*To what extent can the ELVD cover new challenges for recycling that will contribute to better implementation of the aims of the ELVD?*	38	• *Assessment of up take of new approaches and stakeholder views*	• *Data on take up of new approaches (e.g. PST), and model projections of future take up* •	• ***Literature review*** *on recycling developments* • ***Stakeholder input*** *(interviews) from e.g. material recyclers, (re)manufacturers*

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
9.3	*To what extent is the ELVD addressing factors influencing EoL (strategies to reuse/recycling of materials, improved replaceability and repairability, remanufacturing and second use possibilities)?*	39	• *Assessment of stakeholder views and literature*	• *Innovative examples – possibly case studies*	• ***Literature review*** • ***Stakeholder input*** *(interviews) from e.g. material recyclers, (re)manufacturers*
9.4	*To what extent is the ELVD addressing the co-operation between producers and recyclers in order to achieve better recycling and resource use?*	40	• *Assessment of stakeholder views and literature*	• *Examples of cooperation (if data available)* • *Overview of stakeholder network*	• ***Literature review*** • ***Network analysis (if possible)*** • ***Stakeholder input*** *(interviews) from e.g. material recyclers, (re)manufacturers*
9.5	*Are the frequency and motivations for amending Annex II to the ELVD adequate?*	42	• *Assessment of the number of requests to change and the reasons to change*	• *No. changes requested and made to date*	• ***Literature review*** • ***Stakeholder input*** *(open public consultation, targeted survey) from e.g. material recyclers, (re)manufacturers, shredders ATFs*
9.6	*To what extent is the scope of the ELVD still appropriate?*	35	• *Assessment of stakeholder views and literature*	• *Views of stakeholders*	• ***Intervention logic*** • ***Literature review*** *on developments* • ***Stakeholder input*** *(interviews) from e.g. material recyclers, (re)manufacturers*
	Coherence				
10	**To what extent is the ELVD internally coherent?**				
10.1	Does the ELVD contain any internal incoherencies?	N	• *Assessment of potential incoherencies*	• *List potential areas of incoherence*	• ***Stakeholder input*** *(interviews) from e.g. material recyclers, manufacturers*
11	**To what extent is the ELVD coherent with other EU policy instruments and the overall EU and international policy goals?**				
11.1	*To what extent are there synergies and overlaps between the ELVD and other EU policy instruments?*	44, 45, 46	• *Assessment of stakeholder views and literature*	• *Description of any potential conflicts (e e.g. WSR; Directive 1999/37/EC on vehicle registration documents; ISO 22628 Road vehicles — Recyclability and recoverability; chemicals legislation)*	• ***Evaluations of other Directives*** *– e.g. WSR, ROHS, REACH* • ***Stakeholder input (open public consultation and targeted survey)*** *from e.g. EU officials, material recyclers, (re)manufacturers*

#	Evaluation (sub) question	ToR	Judgment criteria	Indicators	Method/Source
11.2	*To what extent does the ELVD support the overall EU policy goals?*	43, 46	• *Assess the potential effect of the ELVD on different policy goals*	• *List of EU overall policy goals and ELVD effects*	• ***Intervention logic*** • ***Literature review*** *(other evaluations)* • ***Stakeholder input*** *from EU officials (view on policy overlap synergies and conflicts)*
11.3	*To what extent are the Definitions in the ELVD coherent with other EU policies?*	43, 46	• *Identification of definitions in conflict*	• *List of ELVD definitions and related definitions*	• ***Literature review*** *on alignment of policies* • ***Stakeholder input*** *from e.g. EU officials, (re)manufacturers and recyclers*
11.4	*To what extent is the ELVD coherent with international obligations (i.e. from the Basel Convention and Stockholm Convention?*	N	• *Assessment of stakeholder views and literature (alignment with WSR and POP-regulation)*	• *List of international obligations and ELVD objectives and results*	• ***Literature review*** *(WSR and POP-regulation evaluation)* • ***Stakeholder input*** *from e.g. EU officials, (re)manufacturers and recyclers*
EU Added value					
12	**What is the Added value resulting from the ELVD?**				
12.1	*What is the Added value of the ELVD compared to what MSs could have been reached without the ELVD?*	47	• *Assessment of views of stakeholders on benefits compared to the situation without the ELVD*	• *Views of stakeholders on benefits compared to the situation without the ELVD*	• ***Literature review*** *past evaluations of the ELVD – including the baseline assessments* • ***Stakeholder input*** *from e.g. MS and EU officials, (re)manufacturers, recyclers, NGOs, academics*
12.2	*What would be the most likely consequences of stopping or withdrawing the existing EU intervention?*	N	• *Assessment of the potential withdrawal - what would occur with just MS action?*	• *List of such potential consequences*	• ***Stakeholder input*** *from e.g. MS and EU officials, (re)manufacturers, recyclers, NGOs, academics*
12.3	*What is the Added value of the ELVD at EU and a global level (e.g. on the global automotive industry)?*	48	• *Assessment of views of stakeholders on benefits compared to the situation without the ELVD, but with international obligations*	• *List of global actions (comparable to ELVD)*	• ***Literature review*** *on past evaluations of the ELVD* • ***Stakeholder input*** *from e.g. MS and EU officials, NGOs, academics, esp global auto industry)*

Annex B – Consultation strategy – including questionnaires

Evaluation of the Directive 2000/53/EC on end-of-life vehicles Consultation Strategy

Context

Every year, end-of-life vehicles (ELV) generate between 7 and 8 million tonnes of waste in the European Union which needs to be correctly managed. Directive 2000/53/EC[63] on end-of-life vehicles (ELVD) aims at minimising the environmental impact of ELVs and to improve resource efficiency in the EU. It sets clear quantified targets for reuse, recycling and recovery of the ELVs and their components and pushes producers to manufacture new vehicles without hazardous substances (in particular lead, mercury, cadmium and hexavalent chromium), thus promoting the reuse, recyclability and recovery of waste vehicles.

The Commission has a legal obligation to "*review the ELVD, by 31 December 2020, and to this end, shall submit a report to the European Parliament and the Council, accompanied, if appropriate, by a legislative proposal*". Moreover, the ELVD "*should be reviewed and, if necessary, amended, taking account of (its) implementation and giving consideration, inter alia, to the feasibility of setting targets for specific materials contained in the relevant waste streams. During the review of Directive 2000/53/EC, attention should also be paid to the problem of end-of-life vehicles that are not accounted for, including the shipment of used vehicles suspected to be end-of-life vehicles, and to the application of the Correspondents' Guidelines No 9 on shipments of waste vehicles*".

Scope of the evaluation of ELVD

The evaluation will cover the application of the Directive in all Member States and the measures adopted by the Member States to address implementation issues with particular attention to the aspects where implementation has been more challenging, such as the "missing" ELVs. The evaluation will also cover all years of implementation of the Directive, from 2000 when it was first adopted until the present.

The evaluation will address, as required by the Better Regulation Guidelines, all standard evaluation criteria of effectiveness, efficiency, coherence, relevance and EU added value. When assessing the criteria, the evaluation will take due account of results of the 2015 Ex-post evaluation of the Five Waste Stream Directives[64], which assessed the degree to which the current waste legislation is "fit for purpose". It identified two main challenges for the ELVD: illegal ELV treatment operators and illegal ELV shipments. Other issues related to the coherence of the Directive with other legislation have also

[63] Directive 2000/53/EC on end-of-life vehicles. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02000L0053-20130611&qid=1405610569066&from=EN

[64] Ex-post evaluation of Five Waste Stream Directives Accompanying the document Proposal for a Directive of the European Parliament and of the Council reviewing the targets in Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, and 1999/31/EC on the landfill of waste, amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EC on waste electrical and electronic equipment; SWD/2014/0209 final; https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014SC0209 ; and for more contextual information see also http://ec.europa.eu/environment/waste/target_review.htm

been identified, particularly with the Waste Framework Directive, which was amended in May 2018, and with the Directive on the registration documents for vehicles (Directive 1999/37/EC).

Other issues which will also receive attention in this evaluation are:

- ✓ The emerging challenges from the increasing use of electric and connected vehicles, including interactions with other relevant legislation, such as the Batteries Directive and the Waste Electrical and Electronic Equipment (WEEE) Directive;
- ✓ The automotive sector as a significant source of plastic waste, as recognised by the EU's Plastic Strategy, which includes actions to assess regulatory or economic incentives to increase the uptake of plastic recycling from ELVs.

Consultation objectives

The objectives of the consultation are:

- ✓ To involve stakeholders in the policy evaluation process by gathering their views on the functioning of the ELVD and receiving suggestions for improvement;
- ✓ To collect additional data and relevant facts on the implementation of the ELVD beyond the materials already available;
- ✓ To identify all those parts of the ELVD that stakeholders consider negative, problematic or undesirable, including implementation problems, excessive administrative or regulatory burden, inconsistencies both within the ELV and with other legislation, duplications or overlaps, measures that no longer address present and future challenges, and gaps in the Directive that limit its ability to meet its objectives;
- ✓ To identify those parts of the ELVD that stakeholders consider positive and that worked well. To identify positive elements in the implementation of the ELVD in different Member States so that best practices can be highlighted and shared;
- ✓ To analyse potential divergences between Member States in the implementation of the ELVD across the EU, identify the reasons for these, and suggest appropriate measures for better harmonisation of rules.

Relevant evidence will be gathered as views and opinions, which will be qualitatively analysed, keeping in mind that they may be subjective. The assessment of the responses will be supported, to the extent possible, by facts and figures, and will identify both areas of agreement and areas of differences of views among stakeholders. The analysis will identify which of the stakeholders groups have similar and different views on each topic. The results will feed into the evaluation.

Relevant Stakeholders

The ELVD has implications for a wide range of stakeholders from Member States and their competent authorities, to various economic sectors and the general public. As a first step for this consultation process, it is necessary to identify all stakeholder groups that might be affected by the Directive or may be interested in the impact that ELVs have on the environment and economy.

The relevant stakeholder groups identified are:

- ✓ **Public authorities**: National governments and Member State competent authorities have a major influence on the functioning of the ELVD as they are the responsible for its implementation and enforcement. Ministries of Environment are expected to be the most relevant contact points in most Member States, but ministries related to the Member States'

economy, industrial development, and potentially health also have potential interest. Regional and local authorities may also have an interest in the management of end-of-life vehicles, and thus they will also be included in the consultation process. European and non-European organisations, agencies and committees and officials from relevant EU institutions, such as European Commission services will also be consulted;

- ✓ **Industry/business/associations**: The ELVD has implications for economic operators across the whole value chain of the automotive sector within and outside of the EU borders. These include producers, distributors, collectors, motor vehicle insurance companies, dismantlers, shredders, recoverers, recyclers, and other authorised treatment operators with regard to dealing with ELVs, including their components and materials. For the consultation activities, stakeholders from professional associations as well as individual businesses from the EU as well as outside of the EU will be targeted;
- ✓ **General public, consumers, environmental protection organisations**: The involvement of consumers is crucial, as the ELVD imposes certain rights and responsibilities on EU citizens, such as how to handle their vehicles when they reach their end of life. Environmental non-governmental organisations will be relevant for their contribution on waste management, pollution, circular economy, etc;
- ✓ **Other stakeholders**: Other stakeholders, mainly from academia and think tanks, who might have a special interest in the waste management or circular economy due to their academic or other research.

Consultation tools

This section presents a short summary of the main consultation methods and tools that will be used to engage with stakeholders:

- ✓ **Evaluation roadmap: An** evaluation roadmap setting the scope of the evaluation of the ELV was published for feedback on the Commission's 'Have yours say' website between 04 October 2018 - 01 November 2018. The 30 contributions received were taken into account when finalising the scope of the evaluation and will be reflected in the synopsis report;
- ✓ **Open public consultation (OPC):** The objective of the OPC is to gain as many views and opinions as possible on the achievements and challenges of the ELVD. It gives the opportunity to stakeholders that do not take part in other consultation activities, such as the general public and interested organisations, to contribute to the evaluation. The questions included in the OPC will cover topics that will contribute to the assessment of the five standard evaluation criteria. Due to the summer period in which the OPC will take place, it could run for 14 weeks (2 weeks more than the normal 12) starting in **June 2019;**
- ✓ **Targeted consultation through interviews**: Targeted interviews will be conducted tailored according to the gaps in the information collected during the targeted survey and OPC. The stakeholders consulted will be public authorities and economic operators;
- ✓ **Targeted consultations through surveys:** Small surveys will be carried out targeting key stakeholders from public authorities, both at EU and Member State level, and economic operators. The targeted surveys will be used to gather specific data to answer some of the evaluation questions, in particular under the criterion of efficiency (costs and benefits). The surveys are expected to run during **June and July 2019;**
- ✓ **Stakeholder workshop**: The objective of the workshop is to share the results of the OPC and targeted consultations and to receive opinions on how the Directive and/or its implementation process can be improved. Around 60 stakeholders from public authorities, both at EU and Member State level, economic operators, and other stakeholders, such as academics and NGOs, will be invited to participate. It will take place in **October 2019** in Brussels in English.

Table B-1 Summary of consultation activities for the evaluation of the ELVD

Consultation method	Stakeholder groups	Timing	Language regime
Stakeholder interviews	Public authorities Industry/business/associations	May 2019 & August-September 2019 February 2020	EN / FR & DE
Online survey	Public authorities Industry/business/associations	October 2019	EN / FR & DE
Open public consultation	Public authorities Industry/business/associations Consumers/environmental NGOs Other stakeholders	September 2019	EN / all EU languages
Stakeholder Workshop	Public authorities Industry/business/associations Other stakeholders	February 2020	EN

Language regime

The language coverage of the consultation varies among consultation activities:

- ✓ The OPC will be carried out in all official EU languages;
- ✓ The targeted consultation of stakeholders, which consists of stakeholder interviews and online surveys, will be carried out in English, French and German;
- ✓ The Stakeholder Workshop will be conducted in English.

Data protection

All consultation activities will be carried out in compliance with Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of individuals with regard to the processing of personal data by European Union institutions, bodies, offices and agencies and on the free movement of such data is applicable. Detail can be found on: https://ec.europa.eu/info/law/better-regulation/specific-privacy-statement_en

Use of the replies to the consultation activities

The outcome of all consultation activities will be summarised in a synopsis report, which will also be included as part of the final evaluation report.

ELV Evaluation - Open Public Consultation - questionnaire

Background context of the consultation

What is the Directive 2000/53/EC on end-of-life vehicles?

Every year, millions of vehicles in Europe reach the end of their life. If end-of-life vehicles (ELV) are not managed properly they can be a threat to the environment as well as a lost source of millions of tonnes of materials. Directive 2000/53/EC on end-of-life vehicles (ELVD) was adopted in 2000 to minimise the impact of end-of-life vehicles (ELVs) on the environment and to improve the environmental performance of all the economic operators involved in the life cycle of vehicles. The Directive has contributed to an increase in the number of Authorised Treatment Facilities (ATFs) and a proper treatment of all materials contained in end-of-life vehicles (ELVs). The high targets under the Directive (95% reuse and recovery and 85% reuse and recycling) have largely been met and a substantial reduction in the use of hazardous substances in new cars has been achieved.

Why is the Commission performing a consultation?

Article 10a of the ELVD establishes the legal obligation that '*by 31 December 2020, the Commission shall review this Directive, and to that end, shall submit a report to the European Parliament and to the Council, accompanied, if appropriate, by a legislative proposal*'.[65] The article also states that the ELVD "should be reviewed and, if necessary, amended, taking account of (its) implementation and giving consideration, inter alia, to the feasibility of setting targets for specific materials contained in the relevant waste streams. During the review of Directive 2000/53/EC, attention should also be paid to the problem of end-of-life vehicles that are not accounted for, including the shipment of used vehicles suspected to be end-of-life vehicles, and to the application of the Correspondents' Guidelines No 9 on shipments of waste vehicles".

As part of the 2010 Commission's Work Programme, the Commission undertook an ex-post evaluation of five waste streams to assess if the legislation is "fit for purpose" . End of life vehicles were one of the waste streams investigated, with the ELVD being assessed in 2014. Two major challenges have been identified For the ELVD: the illegal ELV treatment operators and the illegal shipment of ELVs. To address these issues, the Commission carried out a compliance promotion initiative to assess the implementation of the ELVD with an emphasis on the ELVs of unknown whereabouts. However, other points have also been identified such as the incoherence of definitions with other legislation such as the Waste Framework Directive which has been amended in May 2018 and the Directive on the registration documents for vehicles.

In addition, the EU's Plastics Strategy of January 2018 refers to the automotive sector as a significant source of plastic waste that could be recycled and to its strong potential for uptake of recycled content. Its actions include the assessment of regulatory or economic incentives for the uptake, in particular in the context of the evaluation/review of the ELVD. The assessment should also look into the influence and interaction of newly arising challenges such as electric and connected vehicles and with other legislative instruments such as the Batteries Directive or the WEEE Directive.

How will the replies to this consultation be used?

Your replies to this consultation will be used as part of the evaluation.

[65] Recital No 7 of Directive 2018/849/EU of 30 May 2018 amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment

General information about respondent

1. Please indicate the language of your contribution:

(Dropdown menu with all 24 official EU languages)

2. In what capacity are you completing this questionnaire?

☐ Academic/research institution

☐ Business association

☐ Company/business organisation

☐ Consumer organisation

☐ EU citizen

☐ Environmental organisation

☐ Non-EU citizen

☐ Non-governmental organisation (NGO)

☐ Trade Union

☐ National government/administration

☐ Regional government/administration

☐ Local authority

☐ EU institution or body

☐ Other

*If other, please specify:

(Text box)

3. Please indicate your name, the name of your company, organisation, or institution:

(Text box)

☐ If you prefer your contributions to remain anonymous, please tick this box.

4. If your organisation is registered in the Transparency Register, please give your Register ID number:

(Text box)

5. Please provide a contact email address (this will not be published):

(Text box)

6. Please indicate the location of your organisation

(Dropdown menu with all 28 MS)

*If other please specify:

(Text box)

7. If you represent the private sector, please specify your area of interest / activity (you can select more than one box):

☐ Vehicle producer / manufacturer / importer

☐ Vehicle dealer

☐ Vehicle repair workshop

☐ Insurance company

☐ Dismantling sector, Authorised Treatment Facility

☐ Shredder Operator

☐ Energy recovery sector

☐ Recycling sector

☐ Other (for example, exporter / importer of used vehicles)

*If other, please specify:

(Text box)

8. If you represent an economic operator, please specify the size of your organisation:

(Dropdown menu with scale "Micro" (1-9 employees), "Small" (10-49), "Medium" (50-250), "Large" >250)

9. If you represent an economic operator, please specify your approximate annual turnover:

(Dropdown menu with scale <€100.000, €100.000-1.000.000, €1.000.000-10.000.000, €10.000.000-50.000.000, >50.000.000)

10. In the following table you will find some questions regarding the extent of your familiarity with the subject of this consultation.

To what extent are you familiar with:	
10.a. The ELVD?	☐ Fully familiar ☐ To a large extent ☐ To some extent ☐ Not at all ☐ I do not know
10.b. The transposition of the ELV Directive in your country?	☐ Fully familiar ☐ To a large extent ☐ To some extent ☐ Not at all ☐ I do not know
How often do you encounter:	
10.c. The ELV Directive	☐ Daily ☐ Monthly ☐ Yearly ☐ Not at all ☐ I do not know
10.d. The transposition of the ELV Directive in your country?	☐ Daily ☐ Monthly ☐ Yearly ☐ Not at all ☐ I do not know

11. Publication privacy settings

The Commission will publish the responses to this public consultation. You can choose whether you would like your details to be made public or to remain anonymous by clicking the relevant box.

☐ **Anonymous:**

Only your type of respondent, country of origin and contribution will be published. All other personal details (name, organisation name and size, transparency register number) will not be published.

☐ **Public:**

Your personal details (name, organisation name and size, transparency register number, country of origin) will be published with your contribution.

☐ **I agree with the personal data protection provisions**

12. In the following table you will find some statements regarding the **deregistration of vehicles**. To what extent do you agree with them?

In your country, if you had to scrap your car:	
12.a. You would not incur any costs	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion
12.b. You would receive some payment that reflects the value of any components or material that can be recovered from the vehicle	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion
12.c. There would be adequate availability of collection facilities within your region	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion
12.d. The deregistration system established by your country is simple (i.e. not overly burdensome)	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion
12.e. The deregistration system obliges vehicle owners to indicate one of the following three options: export, off road storage or scrapping	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion☒
12.f. Certificates of destruction are always provided to the last registered owner of a vehicle which reaches the end of its life and is scrapped	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion
12.g. There are financial incentives (i.e. payments) that encourage vehicle owners / keepers to use authorised treatment facilities to dispose of their end of life vehicles.	☐ Strongly agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly disagree ☐ I do not know / no opinion

13. In the following table there are questions regarding vehicle repair:

In your country, if you repair your vehicle independently (Do It Yourself)	
13.a. Are there facilities that accept faulty parts dismantled from your vehicle?	☐ Yes - for free ☐ Yes - for a fee ☐ No ☐ I do not know / no opinion
13.b. Are there facilities that accept spent liquids removed from your vehicle?	☐ Yes - for free ☐ Yes - for a fee ☐ No ☐ I do not know / no opinion

14. **An increasing number of spare parts are sold via the internet. Please indicate if spare parts purchased via the internet in your country are accompanied with the following information:**
    ☐ The dismantler which dismantled the spare part from an ELV.
    ☐ The registration number of the dismantler, indicating that the dismantler is an authorised treatment facility and registered in the national registry.
    ☐ The vehicle Identification number (VIN) of the vehicle from which the spare part was removed.
    ☐ Spare parts sold are not accompanied with any of the information mentioned above.
    ☐ I do not know

15. Are you aware of any problems related to the disposal and treatment of ELVs in your country or region?
    ☐ Yes
    ☐ No
    ☐ I do not know
    *If yes, please specify:

(Text box)

16. Are there any issues relating to the management of end-of-life vehicles that are not adequately covered by the ELV Directive?

(Text box)

Other comments

If you wish to add further information, comments or suggestions, including examples of good or bad practice) – within the scope of this questionnaire – please feel free to do so here:

(Text box)

Annex C – Consultation synopsis report Introduction

The ELV Directive has been in force for 18 years. No substantial changes of the Articles were adopted for 17 years. With the adoption of the Waste Package in 2018, which also included a revised Waste Framework Directive, a review clause was established in Article 10a which states 'By 31 December 2020, the Commission shall review this Directive, and to that end, shall submit a report to the European Parliament and to the Council, accompanied, if appropriate, by a legislative proposal.'
In order to assess how well the ELVD has worked an evaluation has been carried. The evaluation groups the questions according to the evaluation criteria set out in the Better Regulation Guidelines[66], as interpreted in the Commission's evaluation roadmap[67] for this work, namely:

- ✓ **Effectiveness:** looking into the extent to which the actions defined under the Directive have been implemented and whether this has resulted in achieving the ELV objectives;
- ✓ **Efficiency:** assessing whether the obligations arising from the implementation of the Directive have been implemented in a cost-effective way and if there is a potential for further synergies to strengthen delivery while minimising costs and administrative burden, including impact on SMEs;
- ✓ **Relevance:** assessing whether the issues addressed by the Directive still match current needs (e.g. developments in terms of e-mobility or new hazardous substances) and contribute to solutions to issues addressed by wider EU policies on circular economy, plastics, resource efficiency, raw materials, etc;
- ✓ **Coherence:** assessing possible inconsistencies and overlaps of the Directive with the circular economy and waste legislation, in particular the Waste Framework Directive, REACH and the Batteries Directive and if the ELVD reflects the aims of this legislation such as the five step waste hierarchy, life-cycle thinking and resource efficiency;
- ✓ **EU added value:** of the Directive compared to what Member States could have reached acting alone at national, regional and international level.

Stakeholder Consultation Strategy

A stakeholder consultation strategy was proposed and agreed for this evaluation. This strategy is available in the main report. The objectives of the consultation are:

- ✓ To involve stakeholders in the policy evaluation process by gathering their views on the functioning of the ELVD and receiving suggestions for improvement;
- ✓ To collect additional data and relevant facts on the implementation of the ELVD beyond the materials already available;
- ✓ To identify all those parts of the ELVD that stakeholders consider negative, problematic or undesirable, including implementation problems, excessive administrative or regulatory burden, inconsistencies both within the ELV and with other legislation, duplications or

[66] https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
[67] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1912-Legislation-on-end-of-life-vehicles-evaluation

overlaps, measures that no longer address present and future challenges, and gaps in the Directive that limit its ability to meet its objectives.

- ✓ To identify those parts of the ELVD that stakeholders consider positive and that worked well. To identify positive elements in the implementation of the ELVD in different Member States so that best practices can be highlighted and shared.
- ✓ To analyse potential divergences between Member States in the implementation of the ELVD across the EU, identify the reasons for these, and suggest appropriate measures for better harmonisation of rules.

The strategy also identified potential stakeholders, in the following main groups:

- ✓ **Public authorities**: National governments and Member State competent authorities. European and non-European organisations, agencies and committees and officials from relevant EU institutions, such as European Commission services;
- ✓ **Industry/business/associations**: Across the whole value chain of the automotive sector, including producers, distributors, collectors, motor vehicle insurance companies, dismantlers, shredders, recoverers, recyclers, and other authorised treatment operators;
- ✓ **General public, consumers, environmental protection organisations**: Consumer rights and obligation, plus NGOS and other civil society stakeholders.

Stakeholder process

The consultation method agreed were an open public consultation, targeted consultation with sector experts (via interviews and a survey) and a workshop to present and refine the draft findings.

We used a **targeted online survey** to obtain input on the broad range of topics examined in the evaluation. The online questionnaire was developed in consultation with the Commission services and was pilot tested with five stakeholders.

The survey was launched on September 25th 2019 and remained open for 8 weeks, until November 22nd. A total of 72 stakeholders responded to the targeted questionnaire coming from a range of stakeholder groups (Table C-1). Most responses came from authorities (mainly national and regional) followed by individual businesses and business associations. There were fewer responses from representatives of the civic society, including environmental organisations, NGOs, academic experts and trade unions. There were no responses from consumer representatives.

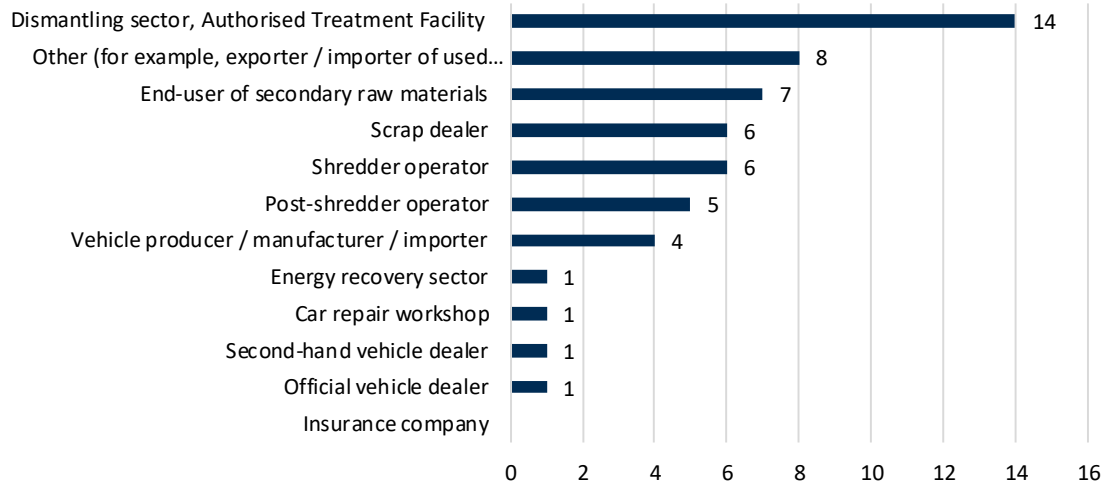
Table C-1 Respondents to the targeted survey by type

Stakeholder type	Number of responses	Share of total
Authorities	**34**	**47%**
National	20	28%
Regional	10	14%
Local	4	6%
Industry	**21**	**29%**
Individual enterprises	12	17%
Business associations	9	13%
Civic society	**10**	**14%**
Environmental organisations/NGOs	4	6%

Stakeholder type	Number of responses	Share of total
Academic/research organisation	2	3%
Trade unions	1	1%
Individual citizens	3	4%
Other/non-identified	**7**	**10%**
Total	**72**	**100%**

In terms of the responses from industry sector, most respondents were from the dismantling sector (ATFs) (see Figure 4-1). However, we obtained input from all parts of the supply chain directly or indirectly affected including both vehicle manufacturers, dealers and importers as well as those involved in the processing stages (end-users of secondary raw materials, scrap dealers and shredder operators). The only gap was the absence of responses from the insurance sector.

Figure C-1 Private sector stakeholders' ELV areas of operation

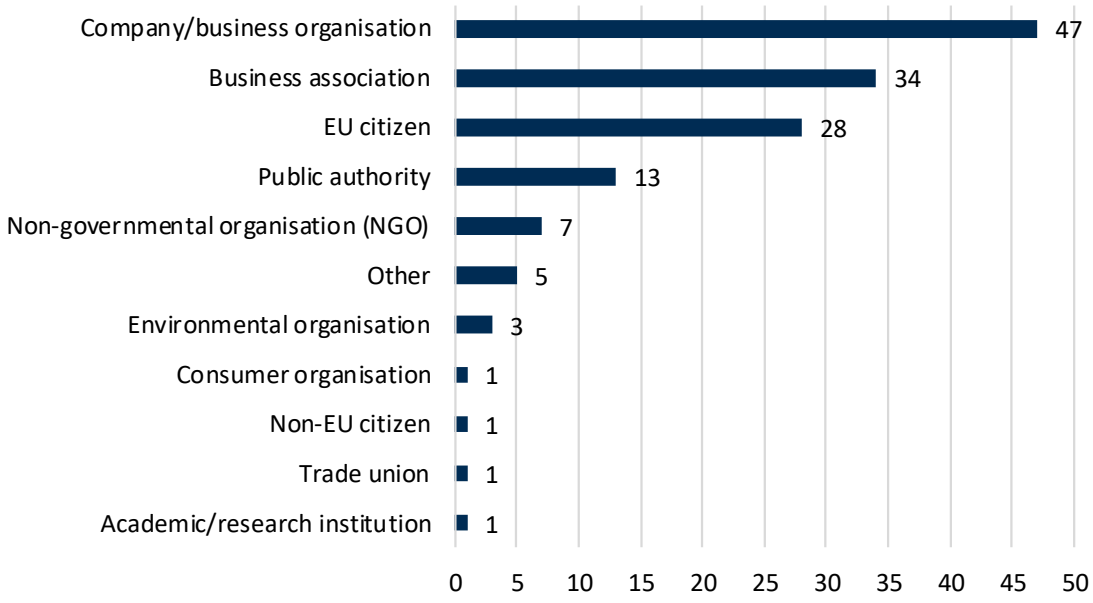


In addition to the survey, **interviews** with a selected number of stakeholders were conducted. These were intended to supplement the input from the survey, and to offer those stakeholders who wished to provide input via interview a route to take part.

A total of nine interviews were conducted out of the total of 19 organisations contacted. These included four interviews that were conducted during the initial stages that assisted in the development of the survey questionnaire and provide some initial output. A number of stakeholders did not respond to our invitation for an interview despite the multiple requests. Nonetheless, the interviewees do represent a range of stakeholders including business associations, one European EPR organisation, one European ATF company, and one national authority.

In addition to the targeted consultation an **open public consultation** was conducted by the Commission, running from 6 August 2019 – 29 October 20195 (12 weeks). In total, 141 responses were received. The breakdown by stakeholder type is presented in Figure 4-2.

Figure C-2 Responses to the OPC by type (n=141)



In order to supplement the input of the stakeholder consultation, we organised a stakeholder workshop on February 5th 2020. The workshop took place after the consultation had been completed and once we have had developed a first analysis of the findings. The objective of the workshop was to present the results of the OPC and targeted consultations to stakeholders, present our initial/emerging findings and receive input that could help us fill in information gaps.

A total of 71 stakeholders from authorities, industry representatives (economic operators and their representatives at Eu and national level) and other stakeholders, including NGOs and academic experts participated.

Table C-2 Participants in the stakeholder workshop by type

Stakeholder type	Number of participants	Share of total
National Authorities	**20**	**28.2%**
Industry	**50**	**61.9%**
Individual enterprises	16	22.5%
Industry associations	28 (14 EU and 14 national)	39.4%
Civic society	**4**	**5.6%**
Environmental organisations/NGOs	3	4.2%
Academic/research organisation	1	1.4%
Other/non-identified	**3**	**4.2%**
Total	**71**	**100%**

The following topics were covered during the workshop:

- Introduction to the purpose of the evaluation, as well as an overview of the evaluation roadmap and the expected timeframe (presented by DG ENV);
- Presentation by the study team on the analysis of the implementation of the Directive and the preliminary findings by evaluation question, followed by a Question & Answer session;
- Initial summary of the feedback received from stakeholders during the interactive session, followed by conclusions and closing remarks.

The workshop participants were invited to contact the study team to provide further feedback on the evaluation and were encouraged to reflect on what may be needed in the future. We used this input to validate and revise the findings in the preparation of the Final Report.

The study had a website to publicise events and share results https://www.elv-evaluation.eu/ The detailed minutes of the workshop are available on this website.

Stakeholder inputs

The final report contains detailed reports of the OPC, targeted survey and workshop results. This section summarises the responses from the targeted survey, OPC and interviews.

Effectiveness

Has the ELVD done what it was intended to do?

Question 13 - From your experience, to what extent do you agree that the ELVD has led to the following changes or results?

Stakeholders perceive that the Directive has led to a decrease in uncontrolled disposal and an increase in the reuse, recycling and recovery of material from ELV and their components.

Stakeholders were less clear on whether the ELVD has contributed to the smooth operation of the internal market. Most were neutral to this statement (n=23), with the next largest groups either agreeing or having no opinion (n=16 for both).

Question 14 - whether the Directive led to any significant changes or results

It was seen as leading to an increase in proper collection systems for ELV, particularly owing to its influence in increasing the number of quality ATFs (n=12).

It was seen as slightly reducing illegal operations in the ELV sector (n=6).

Question 15 - factors hampering the achievement of the ELV

- Illegal operations were noted by most respondents as hampering the implementation of the Directive, particularly owing to improper export and treatment of vehicles. This was seen as being combatable with better MS enforcement of the Directive (n=12).

Interviews

Reduction of uncontrolled disposal of ELVs an increased recycling reuse and recovery of ELV components achieved by the Directive (according to the majority of stakeholders). One battery association noted that disposal of batteries is only issue to address still.

Several stakeholders less clear that the Directive achieved a smooth operation of the internal market. Illegal operations and enforcement vary across MS and therefore effect market competitiveness (as noted by an EU EPR organisation and an ATF). This factor further was seen as the main issues hampering the achievements of the Directive.

Greek country specific issue. ELVs with missing essential components can still be processed at an ATF for a small fee. This can incentivise removal of essential parts without justification (car accident etc.). This therefore fosters illegal and profitable disposal of such parts. Legal justification for missing parts was recommended as being necessary to stop such practices.

Extended Producer Responsibility (EPR)

Question 16 - To what extent do you agree that vehicle producers currently bear the cost of the ELVD implementation according to EPR provisions

Lithuanian stakeholders and public authorities (particularly regional administrations) believed vehicle producers bear the costs of the Directive.

Companies were the most likely to disagree with this statement, the key explanation for this is likely to be that many of them are recyclers and ATFs. {*raises the question - if they are bearing the costs how do they continue to operate?*}

Question 17 – if vehicle producers don't bear most costs of the directive then who does?

Dismantlers (n=29) and shredders (n=21) were perceived by most stakeholders as bearing the main costs of the Directive. With another large group believing vehicle producers do (n=25).

There were a large number of open responses that noted that there are shared costs across different stakeholder types, however most focused on shredders and dismantlers (n=8).

Question 18 – if shredders and dismantlers are meeting implementation costs – what effect is this having?

A variety of stakeholders noted that such costs lead to more informal/fraudulent activities related to the purchase and dismantling of ELVs. This was because their financial viability is reduced by increased costs. They therefore have to make ends meet in other ways.

Question 19 - How likely do you think illegal operations (such as the illegal disposal of refrigerants from air conditioning) are to be found in the following ELV destinations / treatment routes?

DIY and small car repair workshops were perceived as being more likely to be involved in illegal operations. ATFs were not deemed as likely.

Question 20 - To what extent are the following obligatory treatment operations for depollution of end-of-life vehicles established in your country?

The removal of batteries, fluids and potentially explosive materials were noted as being almost 100-75% established as obligatory treatment operations across EU MS.

High response rates came from Belgium and Czechia (two of the three highest response MS types). Lithuania (the MS with most responses - typically wrote 'I do not know' for all three).

Interviews

Stakeholders split into two main camps on the topic of EPR systems in various MS. Those who believe that:

- Manufacturers **do not bear the cost** for the delivery of all the ELVs to an ATF without any costs to the last holder/owner (often citing it falls onto ATFs to finance, or some stating it's the responsibility of dismantlers and shredders); and
- Manufacturers **do pay** for cost of delivery of ELVs to the ATFs gate.

Stakeholders noted that illegal operations are less likely to occur in ATFs, whereas such operations are more of a problem in small car repair workshops and the DIY sector. These sectors have lower enforcement as they pose a smaller environmental risk (according to a Dutch stakeholder),

- *Circular Economy Links*

Question 21 - To what extent are the following treatment operations before shredding intended to promote the recycling of end-of-life vehicles, established in your country?

Treatment operations noted as promoting recycling pre-shredding processes included: the removal of catalysts (65% of stakeholders), tyres (60%) and metal components (34%).

On several other operations there was a relatively high "I do not know" response, including removal of secondary metals (56%), glass (36%) and metal components (34%).

Question 22 - Do you think it is important to remove other parts before shredding in order to promote a higher rate of recycling?

A majority of stakeholders thought it was important (53%) including recyclers, a branch organisation, national and regional administrations.

Batteries, fluids/oils and electronics were seen as the most important parts that should be removed.

Stakeholders also elaborate why some materials (listed in the bullet above) are not removed. This included low economic viability (n=8 including companies and experts), and a lack of obligations in the Directive (n=3 mostly national governments).

Interviews

When asked why some treatment operations before shredding were not equally established in Europe, stakeholders discussed the following materials:

- **Glass**: glass removal is completely absent from Greece (according to a Greek stakeholder), however a glass association noted every MS has the facilities/capacity to recycle, a lack of recycling could therefore be due to the higher price of recycled material.
- **Plastic components**: Again they are not removed due to the costs and low value of recycled materials.
- **Copper**: such as that found in wiring (therefore constituting precise recycling practices) has high extraction costs.

Motor cycle industry stakeholders noted they are practicing with aiding the Circular Economy, even though they are not forced to by the Directive. The inclusion of motorbikes would create a level playing for the market – however it could endanger bike users to bikes with lower-grade parts.

- *Inspections of ELV treatment facilities and implementation*

Question 23 - How useful and effective are the inspections carried out by the national authorities of the facilities mentioned in the box below in your country?

- ATFs was the only option were stakeholders believed inspections were useful and effective [fully (n=17), to a large extent (n=14), or to some extent (n=13)], with few stakeholders stating "not at all". Non-ATFs and exporters of used vehicles had a more mixed response.
- Some stakeholders (two public authorities and an NGO) are of the opinion that authorities do not have enough staff/resources to fully execute inspections across ATFs, non-ATFs and exports.

Question 24 – Would specific waste management targets per material, such as a specific rate for aluminium, plastic, glass, improve the implementation of the ELVD?

- There were mixed reactions, however more (43%) stated it would improve the implementation of the Directive. Eight stakeholders (including recyclers, experts and public authorities) noted it would lead to incentives for higher recycling, create a level playing field across EU and would lead to better ecodesign in car design.

Interviews

An EPR organisation and an association noted inspections of ATFs were thorough and useful. A Greek stakeholder noted that in Greece inspections are less thorough.

On the need for specific material waste management targets stakeholders were generally against this as it would require existing secondary material markets for this – which is not the case for many materials. However a glass association was in favour of this for glass components.

- *Innovation*

Question 25 - From your experience, to what extent do you agree that the ELVD has caused a change in the design of vehicles in the following aspects:

- Stakeholders perceive that the Directive has had a positive influence, by limiting restricted hazardous substances in vehicles (Ca, Hg, Pb, Cr(VI)) (22% strongly agree, 41% agree).
- Open responses noted that legislative harmonisation (particularly with the Batteries Directive) was sought after.

Question 26 - Do you think the ELVD fosters or hampers innovation? (both in car design and ELV treatment)

- Few stakeholders perceive that the Directive hampers innovation for either car design or ELV treatment.
- 40% believed that is fosters ELV treatment innovation. Examples included the 2015 recycling targets which (in combination with complex plastic car designs) foster the development of post-shredder technologies and complex plastic recycling of ELVs.
- Less conclusive on car design with a mixed response (either no impact or fosters innovation).

Interviews

The dismantling of ELVs and their components has become more difficult. However the Directive did foster innovation in ELV treatment, as considered by stakeholders.

Efficiency

- *Costs and benefits*

Question 27 - With regard to the relationship between the cost of dismantling and the value of the parts recovered from end of life vehicles, are any of the components mentioned in the non-exhaustive list below profitable to remove from ELVs?

- Profitable components to remove included: Pb-acid batteries (70% of stakeholders agree), catalysts (66%), metal components (Cu, Al, Mg) (55%), engines (48%), and gear boxes (48%). Electronics were mentioned as a component missing from the list.

Question 28 - Please estimate your staff and other costs related to the ELVD

- Hard to draw broad conclusions about resource use by stakeholder types. Data is lacking and quite varied.
- It was clear that companies (recyclers and ATFs) do spend more resources (on average) on technical compliance than other stakeholder types.
- Public authorities seemed to have higher costs across most categories, but particularly for Data collection, and Technical compliance.

Question 29 - For those with experience in more than one Member State (MS), do these costs vary between MSs?

- Most stakeholders "did not know" whether costs varied between MS (73%).
- Only stakeholders that know are EU associations.
- Nine stakeholders pointed out that the main issue of varying costs is labour costs.

Question 30 - Has the ELVD caused any unnecessary regulatory burdens or complexities?

- Most stakeholders do not know and an even split said both yes and no (35% and 33% respectively).
- Three companies noted the overlap of ELVD and Battery Directive caused a concern about burdens in this respect.

Question 31 - Do you have any suggestions for reducing the administrative burden?

- Most pressing concern (although only noted by 5 stakeholders) was to digitalise the (de-)registration system to make it less of a burden.

Question 32 - Regarding the intended objectives of the ELVD, to what extent do you agree with the following statements: a) The ELVD has helped to protect the environment; b) The ELVD has helped to protect human health; c) The ELVD contributed to a level playing field for companies involved in vehicles and their end of life

- Most stakeholders noted it had performed positively on all the above statements (with very few disagree or strongly disagree responses – Agree being the largest responses for all).
- The highest consensus was for the ELVD helping to protect the environment which received 25% of stakeholders strongly agreeing and 48% agreeing.
- The least positive category was c) on the Directive creating a level playing field for companies involved with ELV (the highest response was split between agree and I do not know n=17 for both).

Question 33a - To what extent do you agree with the following statements on the costs and benefits of the ELVD? It has increased the income for the different operators of the sector

- Most stakeholders 'do not know' across all categories. Unclear to analyse.
- Based on a smaller amount of data, it seems some stakeholders perceive ATF stakeholders to be gaining an increased income and vehicle producers as receiving a decreased income as a result of the Directive (however based on less than 25% of respondents – as most wrote "I do not know".
- Those that (strongly) disagreed that the ELVD led to increased income of car manufacturers were unsurprisingly in the automotive production industry. Similarly, on income of ELV treatment sector, it was mostly recycling companies and associations that (strongly) disagreed and the automotive sector that agreed.

Question 33b - To what extent do you agree with the following statements on the costs and benefits of the ELVD? It has reduced costs (e.g. through harmonisation of rules) for the different operators of the sector

- Similar response to the previous question – most do not know.

- Very small amount of stakeholders that do not perceive ATFs and vehicle manufacturers as having increased costs. In both cases it was stakeholders from the relevant sector that stated their costs had not been reduced.

Question 34 - To what extent do you agree with the following statement on the costs and benefits of the ELVD? The benefits (economic and environmental) outweigh the costs of its implementation

- Many stakeholders (32 responses or 56% of total responses) noted that the Directives' benefits outweighed the costs. Very few (4%) disagreed with this.
- National governments and business associations were more like to agree and companies were most likely to be neutral on the topic.

Interviews

One stakeholder noted on the relationship of cost of dismantling and the value of the parts recovered of an ELV that Li-ion batteries should be regulated better under the Batteries Directive. This was because although the market functions properly (and informally) now, there are risks if the market grows in the future, which it is predicted to do. Some costs created for stakeholders who have to monitor coherent and overlaps of ELV, Batteries and Chemicals Directives for the use of automotive batteries.

General mixed opinions on the costs and benefits of the Directive. Different stakeholders with different interests and market operations perceive the Directive to negatively effect their sector and positively effect (or be neutral) to other sectors.

- *Simplification opportunities*

Question 35 - Can you identify any opportunities to simplify the legislation or reduce unnecessary regulatory costs without undermining the intended objectives of the ELVD?

There was no large consensus on one/two issues. However several varying opinions were presented, the largest of which are presented here.

Simplified reporting (n=2), monitoring and controlling systems (n=5), better harmonisation and enforcements of CoDs (n=5), harmonised legislation (make the Directive a Regulation) (n=6), harmonise vehicle (de-)registration (n=6).

Interviews

Stakeholders

Effectiveness/Efficiency: Communication and data transfer

Question 36 - How well does the cooperation and data exchange work within and between Member States services on De-registration of vehicles, Provision of Certificates of Destruction, Data on vehicle recycling (including PST) and ELV monitoring, Export of used vehicles, and Re-registration of exported / imported vehicles

- The area perceived as having the most/best cooperation and data exchange **within MSs** was the **data on vehicle recycling and ELV monitoring**, while the areas with the least cooperation and data exchange were the **re-registration of exported / imported vehicles** and the **export of used vehicles.**

- The areas with the most cooperation and data exchange **between MSs** were sharing of **data on vehicle recycling and ELV monitoring,** whereas the areas with the least cooperation and data exchange between MS were the **export of used vehicles** and the **de-registration of vehicles**.

Question 37 - What measures and criteria were applied by your Member State for shipments to distinguish ELVs from used vehicles when vehicles are shipped out of the territory of the MS to another MS or outside the EU? (If you are able to answer for more than one MS please do so) (This question should include any views you have on the implementation/ actual situation, effectiveness of correspondents' guideline No 9.)

- The Netherlands was suggested as the best practice example. In the Netherlands a vehicle becomes an ELV when it cannot be repaired for realistic costs in the country of export. In Italy, a provision will enter into force and will oblige exported cars to pass a roadworthiness test in the previous 6 months before an export to another country is possible. Dublin City Council (the designated national competent authority for Ireland) has developed guidance, which incorporates the provisions of Guidelines No. 9 and enforces the requirement to have mechanical certification for all used vehicles and used vehicle parts.
- The enforcement of the guidelines was highlighted as the main problem. The fact that the guidelines are legally non-binding and the lack of shipment inspections contribute to the lower enforcement.

Question 38 - What measures (for example use of CoD to deregister vehicles, or financial incentives etc.) are applied by your MS (and/or any other MS you are aware of) to ensure that if a Certificate of Destruction (CoD) is issued the related ELV is dismantled at an authorised treatment facilities (ATFs)?

- In Portugal, a road tax (IUC - Imposto Único de Circulação) is levied, each year, to the owners of all registered vehicles until a valid CoD is presented. In the Netherlands the ownership concept ensures that owners of vehicles pay taxes on use until official deregistration. In Germany, penalties are used to ensure that CoDs are required to send ELVs to official ATFs. Stakeholders mentioned that in Belgium and Czechia, there are no financial incentives to ensure the use of CoDs.
- It was mentioned that financial incentives are only effective when they are linked to CoDs

Question 39 - What are your views on the incentives offered by some MSs to ensure that ELVs are treated in legal ATFs and get a CoD?

39.a Pay-out scheme kind of deposit refund scheme, where the last owner benefits by receiving an extra pay out

- This measure was mostly seen as effective (effective n=22, ineffective n=6, don't know n=22);
- The level of the initial deposit is important, as if it is too low it provides no steering effect towards legal ATFs and if its' too high it incentivises early scrapping of vehicles.

39.b Termination of ongoing taxes levies if the vehicle is finally deregistered or exported

- This measure had even higher percentage of acceptance than the above (effective n=29, ineffective n=3, don't know n=18);
- This measure is used in the Czech and Dutch systems. Stakeholders mentioned that they are effective systems as they were easy to implement and comprehensive.

Question 40 – Are you aware of other types of MS measures to address the problems of vehicles going missing from the system?

- Most stakeholders that provided a concrete answer referred to the termination of ongoing taxation when presenting an ELV with an official CoD at a legal ATF.

Question 41 – It has been observed that the whereabouts of a significant number of end of life vehicles is unknown. Please rank the following potential reasons for these 'missing' vehicles.

- This question was not analysed because some respondents did not really rank the options but chose only some preferred options. Some options had 45 responses and others 27, so it was not possible to make a ranking.
- However, with these statistical inconsistencies in mind, we can infer that the three reasons for the missing vehicles that were ranked high are that 1) the ELVs are scraped in the country of origin but not deregistered, 2) ELVs exported to other Member States as used vehicles. Never registered in the receiving Member State instead scraped in the receiving Member States but without data exchange with the Member State of origin, 3) Used vehicles exported outside the EU and not deregistered in the Member State of origin.

Question 42 – Annex II of the ELVD lists materials and components that are exempt from Article 4(2)(a) regarding the restriction for the use of lead, mercury, cadmium or hexavalent chromium.

a. Are the criteria "according to technical and scientific progress" for amending Annex II to the ELVD adequate?

- Most of the stakeholders (48%) stated that they did not know. Otherwise, more stakeholders believed the criteria were to a large extent adequate (26%), with only 6% of stakeholders saying they were not at all relevant.
- Stakeholders mentioned that socio-economic aspects should be further considered together with the "technical and scientific" aspects (i.e. whether a scientific alternative is economically and practically viable)

b. Annex II to the ELVD has been updated frequently with an average of 2 years. Is the frequency of the review of exemptions listed in Annex II to the ELVD by the Commission adequate?

- Most stakeholders did not know (40%), another large group believed they were sufficient (35%) and a number of stakeholders noted the reviews were too frequent (24%);
- From those who said is sufficient, 58% are national or regional administrations, and from those who said too frequent, 60% were either companies or business associations.

Interviews

- Within the Netherlands, data exchange seems to work very well, while within Greece very badly. Between MS, both stakeholders agreed that data exchange is problematic, except maybe for the data on vehicle recycling and ELV monitoring.
- The issuance of a CoD as a measure that ensures that ELVs are dismantled in legal ATFs works well in the Netherlands as it is inspected by the Dutch inspection authority. In Greece, due to the lack of inspections to identify illegal operations, the CoD does not necessarily mean that ELVs have been treated legally.
- In terms of the incentives that could be used to ensuring that ELVs are treated legally, the interviewees indicated that a pay-out scheme would not work in the Netherlands, but it could work in Greece. The termination of ongoing taxes / levies once the vehicle is deregistered was considered as the most effective. Insurance premiums as incentives were suggested by one

association. According to that the last owner would be obliged to annually pay insurance until he/she can provide a CoD or a proof of sale.

Relevance

- *Future relevance*

Question 43 - What do you think will be the impact on ELV procedures (i.e. waste management costs and the regulatory needs) of the following changes that are expected to occur (and/or continue) during the next five to twenty years (multiple answers were allowed).

43.a Increase in sales of electric or hybrid vehicles

- More than 50% of the respondents said that this will increase waste management costs for ELVs and 30% mentioned that this will require changes in regulation;
- The most significant impact will come from the rising interest in electric/hybrid vehicles. Stakeholders mentioned that this among others will require new technology and processes for vehicle disposal and increased requirements on the ATFs, meaning that producer's responsibility will have to be strengthened;
- Other stakeholders mentioned that electric/hybrid vehicles will increase the revenues of the recycling sector due to the higher recovery of valuable metals.

43.b Increased use of lightweight materials in vehicles (i.e. plastics)

- 42% of stakeholders believe this will increase waste management costs for ELVs and 25% mentioned that this will require changes in regulation;
- Recycling of lightweight materials, such as carbon fibres and plastics, will be an issue, and thus it was suggested that their separation before shredding should be enforced. The increased use of such materials may render the 95% recovery target impossible to be achieved. The ELVD can function as an instrument to balance the trade-off between lightweight material use and recyclability.

43.c Increased use of electronic components in vehicles

- Almost half of the respondents believe that this will increase waste management costs for ELVs and 22% mentioned that this will require changes in regulation;
- Some stakeholders mentioned that increased use of electronic components in vehicles will increase dismantler's revenue through trade of used parts.

43.d Other changes to vehicle design and/or use

- Economies of scale will be a determining factor whether the cost of ELV treatment will increase;
- Technological development should increase the life of vehicles and car-sharing will reduce the need for cars, which may reduce the ELV management cost.

Question 44 - Are there any other issues or changes in context that you think the current ELVD should be adjusted in order to address?

- There is a need for a clear definition of what an ELV is, mainly a distinction of ELVs from used vehicles. Harmonisation of definitions with the Waste Framework Directive were also raised. Harmonisation of the Directive among the MS was mentioned.

- The involvement of different stakeholder types in the Directive was raised. In particular, it was mentioned that the role of insurance companies has to be enhanced. Greater responsibility of vehicle manufacturers in the implementation of the Directive was also mentioned.

Interviews

- Increase in sales of electric/hybrid vehicles will increase future waste management costs, according to an ATF company, while an association and an EPR organisation mentioned that it will require changes in regulation.
- Lightweight materials may also lead to increased costs of ELV treatment, according to the ATF company. The EPR organisation mentioned that treating such materials is highly energy intensive, and as such change in regulation to allow GHG monitoring might be necessary.
- Both the ATF company and the EPR organisation mentioned that the increased use of electronic components in vehicles will increase the waste management costs.
- Regarding the future adjustments of the ELVD, the EPR organisation and the ATF company mentioned that insurance companies need to be involved more in the implementation of the Directive. The ATF company also brought up the need for a system to address the unregulated trafficking of spare parts.

- ***Scope***

Question 45 - What are your views on extending the scope of the ELVD to include motorcycles, buses, and trucks?

- More than 60% support of including all three vehicle types in the scope of the Directive.
- Those in favour mentioned that all these vehicles have comparable vehicle documents and produce comparable waste streams, therefore they could be included in the Directive's scope.
- Those against argued that trucks and buses usually do not end their life in Europe, but exported and used in non-EU countries.

Interviews

- There was no strong opposition to adding motorcycles, buses, and trucks in the scope of the Directive.
- The association related to motorcycle manufacturers mentioned that the Directive was prepared without having motorcycles in mind and thus it would require significant adjustment. According to them, the lead time and phase-in are the most important factors if the Commission decides to add motorcycles in the scope f the Directive.

EU Added Value

Question 46 - Is the value resulting from the ELVD additional, the same, or lower than the value that would otherwise have been created by Member State action only through national legislation?

- 44% of respondents thinks the Directive has added value, while 25% thinks is the same. From those who responded that there is added value (n=26), 40% believe that if the Directive was not in place, there would be more uncontrolled disposal of ELVs and 35% believe that there would be lower reuse, recycling, and other forms of recovery of ELVs and their components.

Question 47 - Does the ELVD affect the competitiveness of the EU car sector compared to the global car sector?

- Most respondents did not know (62%) and 23% answered that it does affect its competitiveness. Those who said it does affect competitiveness mentioned that the ATF requirements are more strict than in any other non-EU country and that the Directive causes business uncertainty for battery and car manufacturers.

Interviews

- A Greek stakeholder mentioned that the value of the Directive is additional to what would be the case without the Directive and that the consequence of not having the Directive would be more uncontrolled disposal of ELVs and lower reuse, recycling, and other forms of recovery of ELVs and their components.
- A batteries-related association mentioned that ELVD increases uncertainty for European manufacturers of batteries and they presume also for the car industry.

Coherence

Question 49a - Is the ELVD coherent with the Basel Convention?

- The majority of the respondents perceived the ELVD to be coherent with the Basel Convention (57%) and only 3% of the respondents (n=2) think that it is not coherent.

Question 49b - Is the ELVD coherent with international obligations as referred to in the Stockholm Convention?

- A large group of the respondents also found the Directive coherent with the Stockholm Convention (40%), while 9% of the respondents (n=6) thought it is not.

Question 50 – IS the ELVD coherent with the 50.a WEEE Directive, 50.b Batteries Directive, 50.c RoHS Directive, 50.d POP Regulation, 50.e REACH Regulation, 50.f Circular Economy policy, 50.g Waste Shipment Regulation, 50.h Directive 1999/37/EC, and 50.i ISO 22628?

- The most perceived coherent policies were the Batteries Directive and the WEEE Directive. The least perceived coherent policy was EU Circular Economy Policy.

Interviews

- A batteries-related association expressed the desire for automotive batteries to be removed from the ELVD and to be solely addressed by the Batteries Directive, highlighting that the ELVD duplicates the Batteries Directive and REACH and it is not coherent with the principles used in RoHS Directive.
- The EPR organisation had the same opinion about the Batteries Directive. They also mentioned that there are some issues with the WEEE recast from 2018, which causes a high burden for car importers to work out the electronics in these vehicles, as it is not clear if these are regulated by the WEEE or the ELVD. In addition, they claimed that although the circular economy is a good goal, it should be recognised that it is not easy to be achieved for complex products like vehicles.

OPC Responses

Questions 1-8 on the deregistration of vehicles (n=141 per question)

- Stakeholders perceive that there are adequate facilities in their region for collection of ELVs (strongly agree: n=64 and agree: n=49).
- Stakeholders perceive that deregistering their vehicle would not incur costs (strongly agree: n=59, agree n=24).
- Stakeholders perceive that certificates of destruction are provided to the last owner of a vehicle before EoL (strongly agree: n=46, agree: 30).
- They were positive that payments received reflect the components recovered from ELV (strongly agree: n=41, agree: n=37)
- The deregistration system is perceived as simple (strongly agree: n=37; agree n=39).
- Stakeholders only strongly disagreed with the fact that financial incentives are provided to encourage proper disposal at ATFs (strongly disagree n=37, disagree n=18).
- Finally stakeholders were unsure about issues of deregistering a car in country A and registering the same car in a second country but not receiving deregistration proof from country A (unsure: n=88).

Question 9 on the facilities that accept defective parts or used liquids removed from vehicles

- The 65% of respondents said that if repairing their vehicle independently, there would be facilities to give their defective vehicle parts without a fee, as opposed to the 24% of the respondents that would only find such facilities that would accept parts only with a fee.
- The 46% of respondents mentioned that there would be facilities in their country of residence to accept used liquids from the vehicle for free and 45% said that they would have to pay a fee.

Question 10 - An increasing number of spare parts are sold via the internet. Please indicate if spare parts purchased via the internet in your country are accompanied with the following information

- Most stakeholders (34%) noted that spare parts are not sold with any information on their origin or that they were unaware of the issue (31%).
- Some stakeholders (16%) mentioned that they can see the name of the dismantler who dismantled the spare part from an ELV, while 10% of the respondents said that the vehicle Identification number (VIN) of the vehicle from which the spare part was removed is known and 10% said that the registration number of the dismantler, which indicates that the dismantler is an authorised treatment facility and registered in the national registry, is known.

Question 11 - Are you aware of any problems related to the disposal and treatment of ELVs in your country or region?

Most stakeholders perceive there are some issues with disposal of ELVs in their country/region (61%). Only a mere 20% noted they thought there were no issues.

Germany, Spain, France and Denmark represented countries that had proportionally higher numbers of stakeholders that noted problems with disposal

Issues included illegal and black market operations, lack of enforcement, problems with recycling systems and issues identifying the last registered owner.

OPC Open responses

- The issues of **illegal and black market ELV operations** and a **lack of enforcement** was a key issue brought up by the following stakeholders: companies/business organisations, public and business associations. They believe that these issues should be more explicitly covered by the Directive;
- Concerns were raised over **recycling** of specific materials not being well addressed in the legislation. Current practices miss crucial and efficient technologies and often lead to lower quality secondary materials. This issue was mainly discussed by EU citizens and company and business organisations;
- **Reuse and repair** were also deemed vital to be strongly integrated into the Directive. Stakeholders noted that there needs to be a larger EU market for the renovation (upgrade) of vehicles, spare parts and general repair of ELVs.
- **Other topics included** the broadening of the scope of the Directive, tackling missing vehicles, end producer responsibility, digitalisation, registration and deregistration and EU policy synergy.

Use of Stakeholder inputs

The draft and final report include the key points taken from the consultations for each evaluation question. The report shows where these inputs have been used to triangulate and/or supplement the information from literature and data in order to carry out the analysis.

Annex E – Workshop report

Date: Wednesday 5th February 2020. 10:00 – 17:00

Location: Centre Albert Borschette (CCAB), 36, Rue Froissart, 1040 Brussels.

Purpose: To present the initial findings of the evaluation, based on the public and targeted consultations and literature review that we have recently completed. We would like to receive comments and feedback on these findings plus any other issues that stakeholders would like to raise. Any additional inputs received during the workshop (or immediately after) will be used to help improve the evaluation report.

It is important to point out that this evaluation is looking at the historic performance of the Directive. Therefore, although suggestions to improve the Directive are welcome, the analysis of any future changes would be the subject of separate work that may come in the future.

Agenda	
10.00	Registration & coffee/tea
10.30	**Introduction by the Commission**
10.45	**Introduction of the project (goals and process) and Q&A (Trinomics)**
11.15	**Presentation & Discussion on *Effectiveness (Trinomics & Öko)***
12.45	Lunch
13.45	**Presentation & Discussion on *Efficiency (Trinomics & Öko)***
14.30	**Presentation & Discussion on *Relevance (Trinomics & Öko)***
15.00	**Presentation & Discussion on *Coherence & EU added value (Trinomics & Öko)***
15.30	Break
15.45	**Presentation and summary of the successes and challenges identified with the Directive and implementation process**
16.45	**Summary of main conclusions, feedback sessions and thanks**
17.00	End of the workshop

Introduction

Mattia Pellegrini (European Commission, DG ENV B.3 – Head of Unit) provided an introduction to the importance of the issue of End-of-Life Vehicles (ELV) and the increasing importance of environmental issues in the political agenda of this coming decade.

The ELVD background

The ELVD was adopted in 2000 to prevent waste from end of life vehicles and to promote reuse, recycling and other forms of recovery of ELVs and their components and to improve the environmental performance of all economic operators involved in the life cycle of vehicles (eco-design).

The goal is to have vehicles manufactured in such a way that they are easier to recycle and to standardise treatment requirements with legal permits and the necessary equipment to prevent pollution. The scope of the Directive is **vehicles in category M1 and N1**.
There were changes to the ELVD, following the first Fitness Check in 2014. It highlighted two major challenges: illegal ELV treatment operators and illegal shipments of ELVs. There was a compliance promotion initiative to assess implementation in 2018. Following this there were amendments of the Directive in 2018 ensuring a review of the directive by the end of 2020 (Article 10a), the consideration of the feasibility of setting targets for specific materials and to pay attention to ELVs not accounted for, including shipments of used waste vehicles suspected to be ELVs.

The Evaluation of the ELVD started in March 2019 (with a contract of 12 months). **It is looking back at the performance of the Directive**. It views the 5 key evaluation questions, effectiveness, efficiency, relevance, coherence and EU-added value. The Commission's report on the evaluation will be published in the second semester of 2020.

Focusing on the future: the evolution will be followed by an Impact Assessment (IA) and the Commission's proposal for the review of the ELVD.

Workshop introduction

Rob Williams (Trinomics) provided a brief introduction on the agenda for day of the workshop, as can be seen in the agenda, at the start of this paper.

Throughout the course of the workshop the polling and Q&A application Slido[68] was used. Therefore these minutes also include information collected via this application. There were roughly 87 attendees at the workshop. From this, a total of 60 stakeholders participated in the Slido polling. Numbers varied per question and this will be noted throughout the minutes.

The first question via Slido asked in what capacity stakeholders were participating in the workshop. 60 stakeholders responded. The majority where either business associations (35%), companies (27%), or national or regional governments (20%). A much smaller group of participants were NGOs (7%), academics (3%), EU citizens (2%), EU institutions (2%), or Other (5%).

They were then asked which areas of ELV operation were most relevant to them. The largest response was Other (28%). Following this the responses were: vehicle producers/manufacturer/importer (23%), Authorised Treatment Facility (ATF) (21%), End-user of secondary raw materials (12%), shredder operator (7%), post-shredder operator (2%), scrap dealer (2%), energy recovery sector (2%), second-hand vehicle dealer (2%), car repair workshop (2%).

Progress and plan

This was followed by a more detailed overview of the evaluation study, it's progress and future plan. The details of the information here can be found in the PowerPoint presentation that accompanied the workshop. The purpose of this workshop was then provided. This can be seen at the start of these minutes.

[68] See https://www.sli.do/.

Effectiveness

Georg Mehlhart (Oeko-Institut) provided an overview of the data from the literature review and the consultations on general effectiveness of the ELV-Directive. The details of the information can be found in the PowerPoint presentation that accompanied the workshop.

Following this, stakeholders were provided with a chance to provide feedback on issues they disagreed with, were missing from the study or issues that stakeholders have contradictory evidence for. This feedback is presented below.

Mattia Pellegrini (European Commission) mentioned that there are number of good practices on the issues on illegal export of ELVs as used cars. These included Italy and Ireland, where cars are obliged to have passed a roadworthiness test prior to their export; and the Netherlands, where cars are assessed for potential repairability. It was asked whether there is a correlation of data here on these good practices and a reduction of exports of used cars (and subsequently fewer 'missing' vehicles). It was stated that such data could be disaggregated during the IA for a future ELVD. Dutch and Italian Member State stakeholders noted that their systems had only been recently implemented and it was therefore too early to know if such a correlation exists. EuRIC echoed the need to require roadworthiness tests as a mean to distinguish between ELVs and used cars, to put an end to loopholes resulting from ELVs exported as used cars. A representative of EuRIC mentioned being unaware that Ireland has introduced a similar measure as Italy but in any case, stressed that it was a positive one.

A stakeholder from ECOBAT asked if there were any links noted in the study with the ELVD and the Waste Electrical and Electronic Equipment (WEEE) Directive. They noted that they are aware of examples of ELVS being exported as used vehicles, also being filled with WEEE, therefore the two issues are linked. However, it was noted that although the issues are linked, it is not something that can be addressed within the ELVD.

A representative of EuRIC provided information on the cost for depollution. They noted that in France several studies have shown that ATFs have an average cost of €40 per ELV for treatment, whereas car manufacturers only have a cost of €4.5 per ELV for dealing with tyres etc. A member of the French environment ministry noted that these studies are available on the European Commission's website and contain useful economic data on ELV treatment.

From Slido, one stakeholder queried the presentation stating that Poland had 13 shredders. The stakeholder was unclear where these are registered as, according to them, there are only 6 shredders registered in the government database.

Exclusion/restrictions of hazardous substances

Yifaat Baron and Georg Mehlhart (Oeko-Institut) provided more detailed information from the study on the effectiveness of the Directive on the exclusion and restriction of hazardous substances. This included a discussion on material specific requirements (plastics, glass and metal components).

Following this, stakeholders were provided with a chance to provide feedback on issues they disagreed with, that were missing from the study or issues they have contradictory evidence for. This is presented here.

Mattia Pellegrini (European Commission) asked whether there is similar data from other car models (other than the Golf which is analysed in the study), in regard to plastic contents of vehicles. He stated that from French studies, it seems that recent vehicles seem to have a plastic content of 14%, whereas contemporary end-of-pipeline cars have a plastic content of 15%, with an increase expected in the future.

The German Environment Agency asked why the recycling definition within the ELVD has not been aligned with the Waste Shipment Regulation (WSR), after the revision of the Circular Economy Package. Definitions for reuse and preparation for reuse were also requested to be considered as they were both relevant for the waste hierarchy. They further asked if only the components or the whole vehicle could be reused. It was noted by the project team that this will be covered under the section on coherence. However, for the latter point, it was noted that parts and complete vehicles can be reused.

A stakeholder from RECHARGE had questions on how we assess new hazardous substances. They noted that the study presentation made no reference to a database based on REACH requirements. It was noted by the study team that this database is on our radar, however due to its recent release it is not covered by the study.

A stakeholder from the European Federation of Glass Recyclers (FERVER) noted that glass is not recycled due to Annex 1 of the ELVD. Here the Directive notes that it is not mandatory to recycle glass. This was suggested by the stakeholder to be amended.

On Slido, stakeholders were asked - assuming substitutes for hazardous substances are still in the development stages - how long should an exemption be renewed for? Ten stakeholders provided a response for which most stakeholders noted the exemption should be renewed for 7 years (40%). Following this, stakeholders stated 2-3 years (20%), 5 years (20%), 10 years (10%), and I do not know (10%).

Stakeholders were then asked if negative impacts of substitutes on the environment or on health should be considered in the justification of exemption. Five stakeholders provided a response, all of which stated “yes”.

Finally, on discussing what framework should be used to restrict substances in vehicles in the future, 18 stakeholders provided a response. Most believed it was relevant for the ELVD (39%) and the Batteries Directive (33%). Other stakeholders noted the REACH Regulation (11%) and Other (17%).

Efficiency

Rob Williams (Trinomics) provided a presentation on the study’s results on the efficiency of the ELVD. It was noted that the study is short on data and this section therefore requires further inputs from stakeholders. Efficiency was noted as mainly focussing on the costs versus the benefits of the Directive.

Following this, stakeholders were provided with a chance to provide feedback on issues that they disagreed with, that were missing from the study or issues they have contradictory evidence for. This is presented here.

The German Environment Agency had a question regarding a statement which claimed that certain stakeholders perceive that ATFs can cover expenses with income they make from selling spare parts. The agency noted that, at the moment, prices for dismantled hulks are not competitive in Germany due to issues for shredders with disposing of Shredder Light Fraction (SLF). They also highlighted that it is important to keep in mind the costs of illegal ELV treatment and exports for efficiency. Illegal activities require a detailed examination, according to the environment agency, as their effects (i.e. unpaid taxes and environmental damages from poor treatment) are not likely to be small.

A stakeholder from ACEA noted that car manufacturers do a lot on recycling and Research and Development (R&D). They acknowledged there are costs in the treatment of ELVs, however, they are working on reducing these costs. Nevertheless, they stated that they cannot ensure anything. Furthermore, they questioned the figure of €200 per ELV for the last owner, as presented in the slides. They stated that economic viability for treatment is different across the EU, depending a lot on local markets and steel prices for component and secondary raw material sales. It was clarified by the consultants that the €200 figure was based on the French studies discussed previously. The German Environment Agency outlined that the high figure could be due to registered ATFs having to compete with the illegal sector, creating major market distortions.

A Slovakian environment ministry representative noted that Slovakia has an electronic Certificate of Destruction (CoD) system linked with (de-)registration. They further asked that if there had been research into EU countries and whether interventions helped to cover ATF costs. The consultants noted this has not been dealt with in the study.

A representative of EuRIC noted that it is difficult to provide data on costs for ATFs. This is due to the fact that they can only provide ranges or averages from a variety of their member organisations across the EU and of the differences between Member States.

A private consultant noted that the study should not underestimate the costs incurred by Original Equipment Manufacturers (OEMs). Most of them have ELV departments with high head-counts and ELV managers. Furthermore, it was noted that, in many Member States, the ELV collection companies (associations) and importers of vehicles require inspections done by consultants.

A representative of Italy noted that the reporting costs for ELV treatment increase when a country raises its ambition on recycling and reuse. They stated that not all countries collect data within the same level of detail, meaning that costs can vary and therefore lead to misunderstandings in the study.

The omission of insurance companies in the study presentation was noted by a representative of EuRIC. They noted insurance companies are an active and important part of ELV management (as they are the last owners of any cars damaged beyond repair in accidents). They stated that they were ignored by the first ELVD and that this lack of inclusion *indirectly* feeds illegal ELV activities – i.e. through their involvement in unregistered online sales of ELVs. A representative from the French Environment and Energy Management Agency noted that a possible solution is to link insurance payments to CoD so that only the presentation of a CoD will allow the insurance payment to cease. It was highlighted that is done in Czechia and was deemed a positive solution. This was further supported by a representative of EuRIC explaining that, to stop paying the insurance premium, a validly issued CoD, sale or export must be presented otherwise the car insurance cannot be terminated. The German Environment Agency

additionally noted that it should be obligatory to note the status of a vehicle (waste or non-waste) and that online platforms should be made legally responsible for the illegal trade on their platforms.

On Slido, two stakeholders noted that they do not agree with the reported perception that ATFs can cover their costs via the sale of spare parts. They noted that benefits and prices are decreasing every year. Another stakeholder noted that manufacturers bear costs for maintaining take-back networks, compliance assurance and for R&D for recycling technologies. A final stakeholder noted that costs (and benefits) should be shared along the recycling chain for ELVs.

Stakeholders were asked if there was anything missing from this section – e.g. actors who incur costs, types of costs and level of costs and benefits. Two stakeholders noted that the costs and damages to the environment of illegal ELV treatment are missing. One stakeholder suggested to focus more on Extended Producer Responsibility (EPR) – and if it is being fully applied (as a principle) in the ELVD. One stakeholder stated that the benefits of flame retardants should be considered (i.e. flame prevention and the slowing down of fires). On this topic, another stakeholder noted that more hazardous substances need to be clearly assessed. Finally, costs for take-back networks was noted by one as missing. {***N.B. – if any stakeholders can provide cost data on the issues mentioned above (and in the table below – please do so***}

- Who bears direct costs?
  - WE have ATFs, Local and national government, what others should we include, and what costs do they incur?
- What are the cost components? (e.g. staff and equipment, plus?), we have the following stages/ aspects that incur costs. Are there others?
  - Reporting (to meet the Directive's requirements)
  - Data collection (additional requirements)
  - Monitoring (on an ongoing basis)
  - Technical compliance (e.g. clean up equipment)
- Is data on these costs available? If so please provide whatever detail is available

The tables below summarise what we collected via our targeted consultations:

Data collection				
Stakeholder Type	**Country of Origin**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (ATFs)		100-200 depending on the country	12-60 depending on the country	100.000
Recycler/ATF	*3 MSs*	100 – 4,000	6-120	0 – 500,000
National government/administration	*4*	16-5,000	10 - 35	10 – 7,900
Regional government/administration	*3*	145 – 10,600	33 – 5,000	123 – 1,100

Reporting				
Stakeholder Type	**Country of Origin**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (ATF)		10-40 depending on the country	12-60 depending on the country	-
Recyclers (ATFs)	6 (3 MSs)	50 – 4,000	5 - 1200	50 – 500,000
National government/administration	5	8 – 5,000	10 - 35	10 – 6,700
Regional government/administration	4 (3 MSs)	5 – 10,600	30 – 2,300	123 - 1100

Monitoring				
Stakeholder Type	**Country of Origin**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (ATFs)		20-40 depending on the country	11-60 depending on the country	-
Recyclers (ATFs)	5 (3 MSs)	200 – 4,800	5 - 120	150 – 500,000
National government/administration	4	300 – 2,500	10 - 35	5
Regional government/administration	5 (4 MSs)	5 – 10,600	30 - 123	3 – 10.200

Technical compliance				
Stakeholder Type	**Country of Origin**	**Hours per year**	**Cost per hour (€)**	**Other costs (€ per year) (e.g. software or training)**
EU Recycling Association (ATFs)		10,000 variable depending on the country	14-35 depending on the country	-
Recyclers (ATFs)	5 (3 MSs)	100 – 20,000	5 - 100	100 – 500,000
National government/administration	3	300 – 4,000	10 - 35	0 - 20
Regional government/administration	5 (4 MSs)	145 – 10,600	33 - 134	20 – 1,100

Relevance

Rob Williams (Trinomics) provided an outline of the study's findings to date on the topic of relevance of the ELVD. The information is in the PowerPoint presentation from the workshop.

Following this, stakeholders were provided with a chance to provide feedback on issues that they disagreed with, that were missing from the study or issues and/or that they have contradictory evidence for. This is presented here.

Mattia Pellegrini (European Commission) asked if there are figures on the total volume of waste streams for lorries, buses and motorcycles. It was noted that this information is important for identifying gaps and, subsequently, whether there is a need for the legislation to cover these vehicle types. It was further noted that another end of life vehicle stream not covered by the legislation is aeroplanes. It was asked whether stakeholders had opinions on this topic (whilst clearly stating that this does not mean that they were necessarily up for consideration). Ships were outlined as being covered by other legislation and are therefore irrelevant for the ELVD.

A representative from the European Motorcycle industry stated that they have issues assessing the number of vehicles not used anymore by owners. The general trend suggests that vehicles are either unused on private property or are dismantled or sent to shredders by end users. Therefore, they noted that it's hard to assess the quantity of motorcycle ELVs, nevertheless it is assumed that these would not pose a large environmental risk. The Commission responded and noted that regardless of the size of impact a zero waste and zero pollution aim should be sought.

The German Environment Agency pointed out a second gap in the market of waste vehicles: e-vehicles (e-bikes, unicycles, e-scooters, wheelchairs). There was a discussion on whether they were under either the ELV or WEEE Directives. A representative of the European Motorcycle association noted that in the WEEE Directive (paragraph 4d) does not exempt 2-wheelers of any type, that are not 'type approved'. Nevertheless, as e-vehicles are owned by private citizens, it was noted that the ELV waste streams they

generate need to be regulated. The European shredder association noted that the LI-ion batteries in e-vehicles are causing issues of fires in WEEE facilities. They have data that will be shared after their work is finalised. The Commission noted that this is being looked into with the revision of the Batteries and Accumulators Directive.

A member of the European shredder association noted that - in the context of ELV treatment - trucks, buses and cars have similarities. They are open to discuss their inclusion; however, they are more motivated on focusing on current priority issues – e.g. finding ELVs/vehicles of unknown whereabouts. In a similar vein, an Italian representative noted that Motorcycles in Italy are mostly treated to the same standards as cars. Therefore, the inclusion of motorcycles in the Directive should not be a large issue for Italy. They noted that there would have to be consideration that the recycling and reuse amounts will be lower (i.e. the amounts in weight will be different). A member of Volvo noted the same for trucks and buses and the inclusion of them in the ELVD would add value to it.

Aeroplanes were not considered relevant for this Directive, by the shredder association, as they are very different to treat and collect compared to other vehicles. The German Environment Agency agreed and stated that aeroplanes are less of a concern as they are owned by large businesses who are more likely to properly dispose of their ELVs. The Commission noted that they are not necessarily going to include aeroplanes, however there is a requirement to consider how to deal with them.

The European aluminium association noted that the presentations statement, that an increase in the use of light-weight materials will increase costs, is too broad. They noted that non-ferrous metals actually have the opposite effect. A researcher from Chalmers University noted that they provide research in the role of critical materials in vehicles. They are collaborating with the JRC who will provide projections of the data in the European context. They noted that electronics are not the only important issue, but that steel and aluminium alloys also need to be modelled in regard to their impacts.

The European Commission noted that the ELVD also includes issues that take place during the design of cars and onwards. However, design is likely another issue that may be necessary to discuss in more depth (under other Directives). A representative from the Spanish environment ministry stated that we should be aware of the Waste Framework Directive (WFD), in which all things are noted as waste (such as trucks and motorcycles). But within the WFD the design of products is not covered and could be considered. EuRIC noted that this is a broad issue and it's best to focus on the types of vehicles and fractions that are currently covered by the Directive.

On Slido, stakeholders were asked whether they agreed with what was presented. One stakeholder noted that batteries need to be addressed in the Directive. Two noted that the transportation of HV-batteries is covered by manufacturers (and OEMs) not dismantlers and that the increase of light-weight material does not necessarily correlate with fewer revenues. A third stakeholder noted that on the topic of future recycling targets, that such targets need to be linked to battery packs and battery recycling yield (efficiency).

Two stakeholders provided responses on issues that the presentation was missing. The first noted that the ELVD has been proven as a good tool – therefore it should be extended to other vehicles to ensure the same good practice across more ELV types. The second noted that safety aspects are omitted. They

believe that OEMs should provide rescue information on electric vehicles that should be available to first line emergency services.

EU added value

Rob Williams (Trinomics) outlined the study's findings to date on the topic of EU added value of the ELVD. The information can be found in the PowerPoint presentation.

Following this, stakeholders were provided with a chance to disagree with anything that had been presented, provide feedback on issues that were missing from the study and/ or provide any contradictory evidence regarding the issues that had been presented. This feedback is presented here.

On the issue of 'level playing field' and online sales, a representative from Galloo noted that many spare parts today are sold online, via various platforms. There is no traceability on such platforms, which therefore needs to be reviewed. They stated that in the US you cannot sell spare parts (online or offline) for a vehicle without being registered as a commercial company. This was suggested as a possible solution for Europe. A representative from the French environment agency noted that there is a lack of data and that we need to know what happens to spare parts after they are sold.

A workshop participant noted that she thinks the EU situation is doing very well with regard to dealing with ELVs. They noted it would be useful to also show this positive aspect (e.g. tonnes of resources recovered as a result of the ELV).

From Slido, four stakeholders provided additional comments on the topic of added value. The first noted that before the ELVD's scope is extended there must be added value demonstrated for improving waste management. Two stakeholders noted that the harmonisation of implementation of the Directive in Member States was required (particularly for vehicle registration and deregistration). A stakeholder outlined the need to focus on socio-economic aspects in the study.

Coherence

Rob Williams (Trinomics) and Yifaat Baron (Oeko-Institut) provided an outline of the study's findings on the topic of EU added value of the ELVD. The details of the information here can be found in the PowerPoint presentation that accompanied the workshop.

Following this, stakeholders were provided with a chance to provide feedback on issues from the presentation that they disagreed with, the were missing and/ to that they have contradictory evidence for. This is presented here.

On the issue of small e-vehicles, the German Environment Agency representative noted that scooters without seats are included in the WEEE Directive, however three wheelers and scooters with seats are not covered. This highlights a gap of coverage that should be dealt with. Furthermore, they noted that a significant amount of SLF needs to be disposed of securely (i.e. incinerated not landfilled) as it contains Persistent Organic Pollutants (POPs). They asked if post-shredder separation is legal. It was responded by the consultants that only the European court could decide on the legality of this issue.

A consultant in the ELV field provided a comment on the dismantling of batteries (as noted in a bullet from the PowerPoint). They noted that the bullet should state the "removal" of batteries instead. Furthermore, in another bullet point, it was noted that it is good to include a definition for second life.

On the topic of techniques for density separation, a representative from Galloo provided some comments. They noted that separation is an option to separate (post shredder) plastic fractions with flame retardant. The heavier fraction that contains traces of the flame retardant are then treated according to the POP Regulation (i.e. incinerated not landfilled). It was further noted that this denser fraction includes a share of Polyvinyl chloride (PVC) plastics with a chlorinated fraction, which could be recycled. It was estimated that some 10-15% of this recyclable plastic was lost to this fraction. A member of EuRIC noted that they gather most types of plastic. They noted that they have two experts represented at the Basel convention and that the discussion had moved to the international level. They stated that they have a lot of literature to share on this issue.

The German Environment Agency representative raised an issue on the coherence of the WFD and ELVD. They also noted that nothing has been mentioned on EPR. They highlighted that the WFD has exemptions in article 8a of the Directive and it could be useful for the ELVD. A stakeholder from Hutchinson France asked - on the topic of EPR – that if their name is on a vehicle part, are they regarded legally as the producer? A consensus was not reached on this issue.

On Slido, stakeholders mentioned a couple of issues where they disagreed with the presentation. One stakeholder noted that there is no mention of the lack of coherence between the ELVD and the European Green Deal and Circular Economy Action Plan. A second stakeholder noted that it was mentioned that for EU coherence there should be a minimum content of recycled materials present in vehicles. However, the stakeholder noted that this should only be true for plastic fractions but not other fractions. A stakeholder noted that the criteria for exemptions from heavy metal restrictions are very different between the ELVD and the Restriction of Hazardous Substances (RoHS) Directive, which needs to be aligned.

Stakeholders provided three comments on issues that were missing from the presentation (via Slido). They noted that the Circular Economy Action Plan could be made coherent with the ELVD if the latter included waste prevention measures. They stated that they think a definition for second life should be added to the Directive. A third stakeholder wrote that batteries require a dedicated and coherent approach on their treatment, regardless of whether that was included in the Batteries or ELVD.

A Slido poll asked waste management sector stakeholders if they though ELV shredders were aware of the prohibition of landfill disposal of SLF containing DecaBDE. Only five stakeholders provided a response, from which many said 50-25% of operators are aware (40%), and the rest noted either that they do not know (40%), or 25-0% of operators are aware (20%).

A second poll asked what framework should be used to restrict additional substances in vehicles in the future. Ten stakeholders provided responses, of which 90% noted it should be the ELVD. Only one stakeholder stated "Other", noting the Batteries Directive should have been provided as an option.

Summary of feedback received

A summary of the inputs received throughout the workshop were created and presented by Rob Williams (Trinomics). This can be seen in the PowerPoint presentation.

Following this, stakeholders were provided with a chance to provide any final feedback on issues that were missing from the discussion throughout the course of the workshop. This is presented here.

A member of the European recycling association noted that the Directive could be better focus on the quality of plastic or creating synergies between shredders and other industries. They further noted that another missing point is any inclusion of the requirements on vehicle design (e.g. to design for ease of recycling).

One stakeholder from Sweden noted that there needs to be a focus on how to get more ELVs for proper treatment and on how to avoid illegal treatment. They suggested focusing on incentives. They stated that Sweden has lots of ELVs that are temporarily deregistered and never brought back into the system. They believed an incentive could ensure they are brought to ATFs. EuRIC noted that any incentives should use a carrot and stick approach (and could be insurance based, like in Czechia). ACEA noted that on shared responsibility (also for OEMs) there is a legal duty to return vehicles to ATFs. Therefore, it shouldn't be necessary to provide an incentive for something that is a legal obligation.

The shredder association noted that we need to focus on recycled content targets for plastics in new vehicles. They can provide these recycled plastics currently, however, there needs to be official legislation to ensure a scale-up of market use. A representative from Galloo noted that recycled plastics are used by some manufacturers, for example in the Renault Scenic. Renault were regarded as a leader in this field (using roughly 30% of its plastics from recycled contents). The German Environment Agency noted that there should be a standardised methodology to calculate the percentage of recycled content required in a vehicle, otherwise they noted it would be difficult to have such a target. A stakeholder from the EU Steel association noted that there are targets for recycled contents, but they are incorporated in ecodesign legislation (but this approach could be transferred). They noted that it is a complicated thing to calculate, as the secondary raw material markets are not the same for every material. ACEA noted that on quotas and volumes that details on all models of cars and models of components are required to achieve any targets. They noted that an 85% target is a tremendous success for recycling of such a complex product. The shredder association mentioned that there is a standard for measuring recycled content in energy related products (pre- and post-consumer content). They noted this approach could be transferred to new vehicles.

The Italian Member State representative noted that any changes to the ELVD should be clear and easy to implement, allowing for a homogenous treatment of ELVs in all Member States.

The German Environment Agency representative stated that the Directive does not mention the quality of recycling. They noted that this should not just avoid backfilling but ensure high-rates of plastic and metal recycling. It should also aim to avoid downcycling (i.e. copper contamination in steel).

Next steps

Rob Williams (Trinomics) noted that the PowerPoint presentation will be sent around to everyone, following the workshop. It was noted that these minutes would be drafted and circulated to the attendees to provide additional comments (and to provide evidence for such comments).

The deadline for providing comments was 15 days.

Following this, the internal reporting will be completed in the next couple of weeks, which will lead to the European Commission publishing their official evaluation. The issue for them is prioritising the issues discussed about the ELVD (many of which were discussed at the workshop).

Artemis Hatzi-Hull (European Commission) closed the workshop, emphasising that the evaluation is retrospective. It therefore looks at what has been achieved since the Directive was in place (i.e. assessing its performance). The next step will be an Impact Assessment, on how to change the Directive. This will lead to a revision of the Directive. This will include an amendment of the official decision on reporting.

Finally, it was noted that the European Commission website[69] has extensive literature on this issue (from EC and MS studies).

List of attendees

This list only includes those that signed in on the registration sheet and does not provide the number of stakeholders per organisation.

Figure E-1 List of attendee organisations/stakeholders

Attendee stakeholders
Ambit
Arcadis
Association of European Automotive and Industrial Battery Manufacturers (EUROBAT)
Association of the German Insurance Industry
BASF
Berzelius Metall
BIL Sweden
Cantabria Business Transportation Group (Agrupación Empresarial de Transporte de Cantabria)
CarTakeBack
Chalmers University
Copper Alliance
Department of Environment, Food and Rural Affairs (UK)
Derichebourg
DETOMSERVE
Ecostandard (ECOS)
Environment and Resource Authority (Malta)
Environmental Protection Agency (Denmark)
Environmental Protection Agency (Sweden)
European Aluminium
European Automobile Manufacturers' Association (ACEA)
European Electronics Recyclers Association

[69] See, https://ec.europa.eu/environment/waste/elv/events_en.htm.

Attendee stakeholders
European Environment Bureau
European Federation of Glass Recyclers (FERVER)
European Group of Automotive Recycling Associations
European non-ferrous metals association (Eurometaux)
European Recycling Industries' Confederation (EuRIC)
Exide technologies
FEBELAUTO
Federal Association for Secondary Raw Materials and Waste Management
Federal Environment Agency (Germany)
French Automobile Manufacturers Committee (CCFA)
French Environment and Energy Management Agency
Galloo
Hutchinson Group
International Bromine Organisation (BSEF)
International Lead Association
Japan Automobile Manufacturers Association
Kreab
Mazda Europe
Ministry of Climate (Poland)
Ministry of Environment (Lithuania)
Ministry of Environment (Romania)
Ministry of Environmental Protection and Energy (Croatia)
Ministry of the Ecological and Inclusive Transition (France)
Ministry of the Environment (Finland)
Ministry of the Environment (Slovakia)
Ministry of the Environment and Food (Denmark)
Ministry of the Environment and Spatial Planning (Slovakia)
Ministry of the Environment, Waters and Forests (Romania)
National Association of Vehicle (Associazione Demolitori Autoveicoli)
National Automobile Federation (FNA)
Nissan
Oeko-Institut
Polymers
Portuguese Environment Agency
ELV Consultant
Public Waste Agency of Flanders (OVAM)
RECHARGE Batteries
The European Association for Electromobility (AVERE)
The European Steel Association (EUROFER)
The Ministry for Ecological Transition and Demographic Challenge (Spain)
The Motorcycle Industry in Europe
The Professional Federation of Recycling Enterprises (FEDEREC)
The Spanish Association for the environmental treatment of out-of-use vehicles (SIGRAUTO)
Toyota Europe
Transport & Environment
Trinomics
ValorCar
Volkswagen
Volvo Group
Wolniewicz
Yahoo!
ZVEI

Annex F – Bibliography

Maccario et. Al. (2020): Rapport Annuel de l'Observatoire des Véhicules Hors d'Usage – Données 2018; publisher: A Mars 2020.

ACEA et al. (2016): Information Letter to Suppliers on the Phase Out of Decabromodiphenyl Ether (Cas No. 1163-19-5) from Automotive Reach Tf, 2016. Online verfügbar unter https://www.acea.be/uploads/publications/20160704_Information_Letter_to_Suppliers_on_DecaBDE.pdf.

ACEA (2020). End-of-Life Vehicles Directive: potential inclusion of trucks and buses. Position Paper. Available at: https://www.acea.be/uploads/publications/ACEA_Position_Paper-End-of-Life_Vehicles_Directive_Trucks_Buses.pdf

ADEME 2015. TERRA SA – DELOITTE – BIOIS - EVALUATION ECONOMIQUE DE LA FILIERE DE TRAITEMENT DES VEHICULES HORS D'USAGE – 2015 – Synthèse. 40 p.

ADEME 2017 Annual Report End-of life vehicles 2015, France 2017

ADEME (2018). Presentation of results of the ADEME's survey about the treatment by ATF of other end-of-life vehicles than cars and light industrial vehicles.

ADEME (2018b) Survey about the treatment by ATF of other end of life vehicles than cars and light industrial vehicles

ADEME (2020): Rapport Annuel de l'Observatoire des Véhicules Hors d'Usage – Données 2018
Alonso Raposo, M. (Ed.), Ciuffo, B. (Ed.), et al. The future of road transport - Implications of automated, connected, low-carbon and shared mobility, EUR 29748 EN, Publications Office of the European Union,Luxembourg, 2019, ISBN 978-92-76-14318-5, doi: 10.2760/668964, JRC116644

ANERVI (2011). Document on the characteristics of industrial vehicle scrapping facilities. Asociacion Nacional De Empresas de Reciclaje de Vehiculos Industriales

ARGUS – Statistics and Information Systems in Environment and Public Health GmbH (November 7th, 2016): Implementation of Directive 2000/53/EU on end-of-life vehicles (the ELVD) with emphasis on the end-of-life vehicles with unknown whereabouts. Summary report on the implementation of the ELVD for the periods 2008-2011 and 2011-2014 ("Lot 2"). Berlin, Germany.

Baron, Y.; Gensch C-O.; Moch, K.; Deubzer, O. (2018): Review in the light of scientific and technical progress of exemptions 8(e), 8(f)(b), 8(g) and 14 and re-evaluation of entry 8(j) of Annex II to Directive 2000/53/EC (ELV Pack 3) - Under the Framework Contract: Assistance to the Commission on technical, socio-economic and cost-benefit assessments related to the implementation and further development of EU waste legislation, prepared for the European Commission, DG ENV, by Oeko-Institut e.V for Applied Ecology in cooperation with Fraunhofer Institute for Micro-Integration (IZM). Available online

under:
https://elv.exemptions.oeko.info/fileadmin/user_upload/Final_Report/ELV_PACK_3_Final_20191001_amended_Published_20191107_French.pdf.

Baron et al. (2016): 8th Adaptation to scientific and technical progress of exemptions 2(c), 3 and 5 of Annex II to Directive 2000/53/EC (ELV) - Final. Report for the European Commission DG Environment under Framework Contract No ENV.C.2/FRA/2011/0020. Unter Mitarbeit von Baron, Y., Gensch, C-O. and Moch, K. Hg. v. European Commission, DG ENV. Oeko-Institut e.V for Applied Ecology in cooperation with Eunomia Research & Consulting Ltd. Online verfügbar unter https://elv.exemptions.oeko.info/fileadmin/user_upload/Consultation_2014_1/20160216_ELV_Final_Gen_Ex_2c__Ex_3_Ex_5.pdf.

Bartels, Pieter (2016): ELV glass: Re-cycling or Re-covery? 16th International Automobile Recycling Congress IARC 2016. FERVER. Berlin, Germany, 15.03.2016.

Bartlett, Emily S.; Trasande, Leonardo (2014): Economic impacts of environmentally attributable childhood health outcomes in the European Union. In: European journal of public health 24 (1), S. 21–26. DOI: 10.1093/eurpub/ckt063

BIOIS et al. (2014): (Ex-post evaluation of certain waste stream Directives, Final report. Prepared for the European Commission - DG Environment,. Unter Mitarbeit von Mudgal, S., Fedrigo, D., Kong, M., A., Lambert, S., Lecerf, L., Mitsios, A., Pahal, S,, Van Acoleyen, M., and Watkins, E. Bio Intelligence Service, Arcadis and the Institute for European Environmental Policy (IEEP).

COM(2015) 614 final: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Closing the loop - An EU action plan for the Circular Economy. Online verfügbar unter https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1453384154337&uri=CELEX:52015DC0614.

Elliott, T.; Hudson, J.; Gillie, H.; Watson, S.; Lugal L.; Almasi, A. (2019): Final Report on the Implementation of Directive 2000/53/EC on End-of-Life Vehicles. For the period 2014–2017.

European Chemicals Agency (2016): Cost and benefit assessments in the REACH restriction dossiers. ECHA-16-R-07-EN. Online verfügbar unter https://echa.europa.eu/documents/10162/13630/cost_benefit_assessment_en.pdf/b780a657-b4aa-4274-8c74-3a80bae8e883.

European Union (1999): Council Directive 1999/37/EC of 29 April 1999 on the registration documents for vehicles, OJ L 138, 1.6.1999, p. 57; last amended by Directive 2014/46/EU of the European Parliament and of the Council of 3 April 2014, OJ L 127,29.4.2014, p. 129.

European Union (2000), Directive 2000/53/EC on end-of life vehicles, last amended by Directive (EU) 2018/849

EuropeanUnion (2000b): Commission Decision 2000/532/EC replacing Decision 94/3/EC establishing a list of wastes, OJ L 370 p. 44

European Union (2005a): COMMISSION DECISION of 1 April 2005 laying down detailed rules on the monitoring of the reuse/recovery and reuse/recycling targets set out in Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles. 2005/293/EC, vom 1st April 2005. In: *Official Journal of the European Commission* (L 94/30).

European Union (2005b): Directive 2000/53/EC on end-of-life vehicles - Guidance Document. Version 1.

European Union (2005c), Directive 2005/64/EC of 26 October 2005 on the type-approval of motor vehicles with regard to their reusability, recyclability and recoverability and amending Council Directive 70/156/EEC, OJ L 310, 25.11.2005, p. 10

European Commission, 2020, Study on the EU's list of Critical Raw Materials Publication s Office of the European Union, Luxembourg

Goldenman, G.; Holland, M.; Lietzmann, J.; Meura, L.; Camboni, M.; Reihlen, A. and Joost Bakker (2017): Study for the strategy for a non-toxic environment of the 7th Environment Action Programme - Final Report, prepared by Milieu Ltd, Ökopol, Risk & Policy Analysts (RPA) and RIVM for DG Environment, European Commission, available under: Online verfügbar unter https://ec.europa.eu/environment/chemicals/non-toxic/pdf/NTE%20main%20report%20final.pdf.

Groke, M.; Kaerger, W.; Sander, K.; Bergamos, M. (2017): Optimierung der Separation von Bauteilen und Materialien aus Altfahrzeugen zur Rückgewinnung kritischer Metalle (ORKAM). In: *Umweltbundesamt, UBA Texte* (02/2017).

IEA (2018) Global EV Outlook.

IHS et al. (2015): The Availability of Automotive Lead-Based Batteries for Recycling in the EU. A joint industry analysis of EU collection and recycling rates 2010-2012, prepared by information company IHS. Unter Mitarbeit von IHS, EUROBAT, ACEA und JAMA, KAMA, ILA. Online verfügbar unter https://www.ila-lead.org/UserFiles/File/Newsletter%20files/IHS_eurobat_report_lead_LoRes%20FINAL.pdf.

(JRC, 2017) https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/critical-raw-materials-and-circular-economy-background-report

JRC, 2019. The future of road transport - Implications of automated, connected, low-carbon and shared mobility. doi:10.2760/9247

For example: JRC 2020, Critical materials for strategic technologies and sectors in the EU – A foresight study. Authors: Bobba S, Carrara S, Huisman J, Mathieux F, Pavel C is under publication

Lieberwirth, H.; Krampitz, T. (2015): Entwicklungstendenzen für den Einsatz von Leichtbauwerkstoffen im Fahrzeugbau und Auswirkungen auf das Recycling. In: *Recycling und Rohstoffe* (Band 8).

Mc Kenna (2014): European Auto Shredder List and Map. An interactive map of auto shredding plants in the 28 member states of the European Union plus Norway.

Mehlhart, G.; Möck, A.; Goldmann, D. (2018): Effects on ELV waste management as a consequence of the decisions from the Stockholm Convention on decaBDE. study, commissioned and funded by ACEA, the European Automobile Manufacturers.

Mehlhart, Georg; Kosinska, Izabela; Baron, Yifaat; Hermann, Andreas (2017): Assessment of the implementation of Directive 2000/53/EU on end-of-life vehicles (the ELV Directive) with emphasis on the end of life vehicles of unknown whereabouts. Hg. v. European Commission. Öko-Institut e. V., Germany. Freiburg, Germany. https://www.oeko.de/fileadmin/oekodoc/ELV_Report_European-Commission_Oeko-Institut.pdf

Mehlhart, Georg; Merz, Cornelia; Akkermans, Lars; Jordal-Jorgensen, Jorgen; (Keine Angabe) (2011): European second-hand car market analysis. Final Report. Hg. v. Öko-Institut e. V. Darmstadt, Germany.

Monier, V.; Salès, K.; Lucet, L.; Benhallam, R. (2017): Annual Report End-of life vehicles 2015. Annual Report of the End-of-life vehicle sector observatory – 2015. France.

Nedellec, Vincent; Rabl, Ari (2016): Costs of Health Damage from Atmospheric Emissions of Toxic Metals. Part 1-Methods and Results. In: Risk analysis : an official publication of the Society for Risk Analysis 36 (11), S. 2081–2095. DOI: 10.1111/risa.12599.

Pinasseau, Antoine; Zerger, Benoit; Roth, Joze; Canova, Michele; Roudier, Serge (2018): Best Available Techniques (BAT) Reference Document for Waste Treatment. Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control). Hg. v. Publications Office of the European Union. Luxembourg (EUR 29362 EN, JRC113018).

Ramboll (2019) STUDY TO SUPPORT THE REVIEW OF WASTE RELATED ISSUES IN ANNEXES IV AND V OF REGULATION (EC) 850/2004.

Sander, Knut; Kohlmeyer, Regina; Rödig, Lisa; Wagner, Lukas (2017): ELV: Recovery Rates and High Grade Recycling. 17th international Automobile Recycling Congress IARC 2017. Ökopol, Germany; Umweltbundesamt, Germany. IARC 2017 Berlin. Berlin, Germany, 22.03.2017.

Schneider, Jürgen; Karigl, Brigitte; Neubauer, Christian; Tesar, Maria; Oliva, Judith; Read, Brigitte (2010): End of life vehicles: Legal aspects, national practices and recommendations for future successful approach. Hg. v. European Parliament - Directorate General for Internal Policies. Brussels, Belgium.

Swinburn, Tracy (2014): Economic Impacts of Lead Exposure and Remediation in Michigan. University of Michigan School of Public Health Risk Science Center. Online verfügbar unter https://www.ecocenter.org/study-finds-lead-abatement-sound-economic-investment-michigan, zuletzt geprüft am 24.01.2020

Tuddenham, Mark; Hempen, Susanne; Bongaerts, Jan C. (1996): END OF LIFE VEHICLES (ELV): Current basic data reflecting the overall ecological and economic context of the ELV issue. Final report. Institute for European Environmental Policy (IEEP).

Zangl et al. (2010): Adaptation to scientific and technical progress of Annex II to Directive 2000/53/EC (ELV) and of the Annex to Directive 2002/95/EC (RoHS). Contract No. 07.0307/2008/517348/SER/G4, Final Report - revised version. Unter Mitarbeit von Zangl, S., Hendel, M., Blepp, M., Liu, R., Gensch, C-O and Deubzer, O. Hg. v. European Commission, DG ENV. Oeko-Institut e.V – Institute for applied Ecology in cooperation with Fraunhofer Institute for Reliability and Microintegration (IZM),. Online verfügbar unter https://elv.exemptions.oeko.info/fileadmin/user_upload/Final_Report/Corr_Final_report_ELV_RoHS_28_07_2010.pdf.

Zoboli, Roberto; Barbiroli, Giancarlo; Leoncini, Riccardo; Mazzanti, Massimiliano; Montresor, Sandro (2000): Regulation and innovation in the area of end-of-life vehicles. Hg. v. European Commission JRC-IPTS und Enterprise DG. Instituto Di Ricerca Sulla Dinamica Dei Sistemi Economici, IDSE; Consiglio Nazionale delle Ricerche, CNR. Milan, Italy.

Trinomics B.V.
Westersingel 34
3014 GS Rotterdam
The Netherlands

T +31 (0) 10 3414 592

KvK n°: 56028016
VAT n°: NL8519.48.662.B01

Trinomics