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How reuse and recycling of end-of-life vehicles is achieved in Finland

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This thesis studies how the legislation regarding end-of-life vehicles reuse and recycling is achieved in Finland. Quantitative and qualitative goals for reuse and recycling has been set up for the treatment of end-of-life vehicles in the national legislation as well as in EU-legislation. According to legislation reuse and recovery of all end-of-life vehicles shall be a minimum of 95 % by an average weight.

The current state of the car dismantling business in Finland has been processed in this thesis. There has been some comparison to other countries as well. Some information has been gathered by interviews.

The Circular Economy has been reviewed especially from the car dismantling business point of view.

A quantitative study was conducted to this thesis. A questionnaire was open on the internet for members of the Finnish Car Dismantler's association (SAL ry) and for members of EGARA. The purpose of this study was to determine the car dismantler's vision of how the goals set up by the legislation are being achieved. Another purpose was to determine what factors are affecting reaching the goals and with what means reaching goals could be assured.

According to the results reuse and recycling are not being accomplished accordingly to the requirements of legislation. The legislation sets reuse as primary option. Currently this is not achieved, but vehicles are mainly crushed without opportunity for reuse. The main factors contributing to the lack of reuse in Finland are temporary deregistration, the net of Authorized Treatment Facilities, the consumers' unawareness and grey economy. The inadequate information received from car manufacturers affects the profitability of the business and the IDIS-system built to support the dismantling field does not serve its purpose. At present the Finnish statistics of end-of-life vehicles cannot be considered as reliable.

Keywords
Car dismantling, Circular Economy, legislation on end-of-life vehicles, car recycling.

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1 Introduction

Sustainable development and green values are a growing trend. Then what is sustainable development? According to the United Nations (United Nations 2015) “sustainable development meets the need of the present without compromising the ability of future generations to meet their own needs”. For long-term global development sustainable development consists of three pillars: economic development, social development and environmental protection.

Finland’s national strategy on sustainable development was renewed in 2013. On 3 December 2013 a Society’s commitment to sustainable development was made. This commitment aims to improve the impacts and performance of sustainable development policies and everyone has been invited. (Ministry of the Environment 2015) As of today more than 150 commitments have been made, all from downsizing the environmental footprint to deducting bio waste and saving energy. (Sitoumus2050.fi)

The ELV Directive and the national legislation of ELV’s also aim towards circular economy and sustainable development. The Finnish legislation was renewed and the new regulation came into effect on 12 February 2015.

1.1 Background

Having followed the car dismantling field as a spouse to an entrepreneur in the business a strong suspicion has arisen that the 95% target is not achieved in Finland. This thesis aims to determine if the goals set up by the legislation are being achieved and how different actors in the dismantling field consider the Government Decree on End-of-Life Vehicles and restraining the use of dangerous substances in vehicles 12.2.2015/123 and the Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles are being achieved in Finland and what the main challenges in the dismantling field are. The Finnish Dismantler’s Association, SAL ry, is the client of this thesis.

1.2 Key concepts

ATF = Authorized Treatment Facility
CoD = Certificate of Destruction. A certificate to the consumer that their vehicle has be deregistered.
EGARA = European Group of Automotive Recycling Associations. The umbrella association for the national associations of automotive recyclers in Europe. (EGARA 2015)

ELV = End-of-Life Vehicle. (European Commission 2015a)
Fluff = waste unsuitable for reuse, recycling and recovery. Consists mainly of certain plastics, rubbers and textiles (i.e. car seats, upholstery, plastics in engine compartment). (Stena 2015a)
POP's = (Persistent Organic Pollutants). Extremely durable organic compounds which migrates far from their source, are toxic and slowly disintegrating. (Ymparisto.fi 2015a) In ELV's POP's are mainly in plastics, car seats, upholstery and safety belts. For some contents has restrictions been set for POP's and the use of some will end during 2015.
Recovery = in the waste hierarchy this means using things and substances as material or energy. (EK 2015)
Recycling = in the waste hierarchy this means using material as raw material in production. (Lajitteluapuri 2015) In the car dismantling field this means recycling materials that are unsuited for reuse from a dismantle vehicle as raw material, i.e. metals.
Reuse = in the waste hierarchy this means using a redundant product turned into waste being recovered and used as such. (Lajitteluapuri 2015) In the car dismantling field this means that parts dismantled from ELV's reused in car repair or service as such or reconditioned.

2 The Circular Economy

The concept of Circular Economy cannot be traced into a single person or a certain point of time. Its practical applications to modern economic systems and industrial processes have gained momentum since the late 1970s. The generic concept has been refined and developed. The most influential schools of thought has been Cradle to Cradle. Performance Economy, Biomimicry, Industrial Ecology, Blue Economy and regenerative design. (Ellen MacArthur Foundation 8 July 2013)

John T. Lyle is considered as the founder of regenerative design. He was a landscape architecture professor, who challenged his students in the late 1970s to vision a community which daily activities were based on the value of living on the basis of the renewable resources at hand without affecting the environment. The regenerative design system does not produce waste but uses as input what in other systems would become waste. Regenerative design is not equal to sustainable design. Sustainable design aims to create products with a life-cycle as long as possible when regenerative design aims to create products that regenerate. (Ellen MacArthur Foundation 8 July 2013; California State Polytechnic University 2015; Regenerative Leadership Institute 2015)

Performance economy is linked with architect and economist Walter Stahel. Stahel introduced in 1976 in his research report, co-authored with Genevieve Reday, the vision of an economy in loops (or circular economy) and its impact on job creation, economic competitiveness, resource savings and waste prevention. Stahel has worked in the late 1970s at developing a “closed loop” approach to production processes. The “closed loop” of performance economy pursues four main goals: product-life extension, long-life goods, reconditioning activities and waste prevention. (Ellen MacArthur Foundation 8 July 2013)

William McDonough and Michael Braungart published in 2002 Cradle to Cradle: Remaking the Way We Make Things, encapsulating a journey of discovery about materials as biological or technical nutrients and their use periods and their evolution. The concept of Cradle to Cradle is to focus on the use of energy in the manufacturing process and to use renewable energy as energy resource. It also focuses on the use of water in the manufacturing process, the use of water shall be managed to maximize quality, promote healthy ecosystems and respect local impacts. (Cradle to Cradle Products Innovation Institute 2015a; Ellen MacArthur Foundation 8 July .2013) McDonough and Braungart created a framework for quality assessment and innovation: the *Cradle to Cradle Certified*™ Products Program. There are five quality categories that a product is looked through: material health, material reutilization, renewable energy and carbon management, water stewardship and social fairness. A product receives an achievement in each category – Basic, Bronze, Silver, Gold or Platinum – with the lowest achievement level representing the product's overall mark. (Cradle to Cradle Products Innovation Institute 2015b)

Industrial ecology strives also to create closed loop processes where waste is a material source. According to industrial ecology the focus should be on reducing the materials in a product, the products should be used more intensively, their service lives should be extended and products should be designed so that they are easily dismantled and the components reused. Failing reuse should the materials be possible to separate and recycled. (Clift, Allwood 18 March 2011)

Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies. The goal is to create products, processes, and policies—new ways of living—that are well-adapted to life on earth over the long haul. The core idea is that nature has already solved many of the problems we are grappling with. Animals, plants, and microbes are the consummate engineers. After billions of years of research and development, failures are fossils, and what surrounds us is the secret to survival. (Biomimicry Institute 2015)

Blue Economy is a philosophy, how economy and business models can be designed and implemented differently – at the level of enterprises, i.e. micro economically. The primary goal of Blue Economy is to find in nature examples of how organic recycling or reuse happens and to imitate this processes to find out where and how the waste we produce could be reused innovatively. (Blue Economy 2015; Singh Chabba 22 March 2013)

2.1 The meaning of circular economy

The Ellen MacArthur Foundation has with their report Towards the Circular Economy in 2012 made the probably largest impact on circular economy in terms of promotion and activity. In the foreword of the report Ellen MacArthur states that the circular economy gives us a framework to both challenge and guide us as we rethink and redesign our future. The circular economy is rapidly capturing attention as a way of decoupling growth from resource constraints. It opens up ways to reconcile the outlook for growth and economic participation with that of environmental prudence and equity. It is inspiring CEOs, politicians, engineers, designers and the next generation of leaders. (MacArthur 2014, 3) In the preface of the report Dominic Waughray, Senior Director of the World Economic Forum (2014, 4), states that certain materials, such as gold, silver, indium, iridium, tungsten and many others vital for industry could be depleted within five to fifty years. If we remain in our ‘business as usual’ mode, price volatility will continue to surge, alongside the probable inflation of key commodities. The economic case for the circular economy is tangible. The cost of remanufacturing mobile phones could (for example) be reduced by 50% per device if the industry made handsets that were easier to take apart, improved the reverse cycle, and offered incentives to return devices that are no longer needed. A shift to innovatively reusing, remanufacturing and recycling products could lead to significant job creation. 500,000 jobs are created by the recycling industry in the EU alone.

2.2 The main goals of circular economy

“A circular economy preserves the value added in products for as long as possible and virtually eliminates waste. It retains the resources within the economy when a product has reached the end of its life, so that they remain in productive use and create further value.” (Figure 1) A circular economy differs from the current linear ‘take-make-consume-dispose’ economy which is based on the assumption that resources are unlimited, available and affordably disposed. It is increasingly clear that the linear economy is not profitable from the sustainable economic growth point of view. Circular economy is expected to reduce hazardous and difficultly disposed waste. It is also expected to affect designing new products to be easier to repair, update, reuse or recycle, prolonging product lifecycle and to encourage the consumer to reduce and sort waste. (European Commission 2 July 2014) Sitra’s Mari Pantsar-Kallio (2014, 1) states in her preface of the report ‘Kiertotalouden mahdollisuudet Suomelle’ that circular economy is not only efficient use and recycling of materials but a totally new business model. The vision of circular economy is that there will no longer be waste but the surplus material is raw material for the following actor.

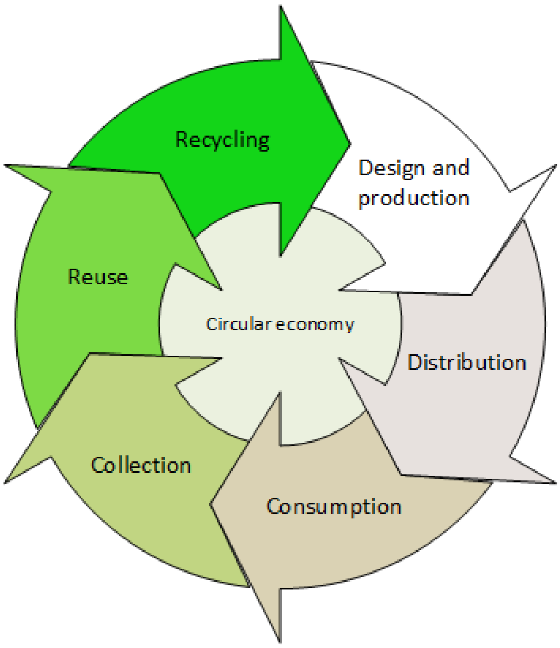

Figure 1. Circular economy – closed loop. (European Commission 6 August 2014)

2.3 Circular economy in the European Union

The European Union is striving towards circular economy and away from linear economy. In July 2014 the commission has presented the Circular Economy package. It was intended to change some Directives, including the Directive on ELV's. One of the main reasons for the proposal is the fact that the Union is currently losing a significant amount of secondary raw materials in the waste streams. The proposal has been withdrawn on 25 February 2015 with the intention to present a new, more ambitious proposal in 2015. (Vieuws 17 March 2015). The new package aims to improve Europe's competitiveness and resource efficiency. It also aims to fully take into account interactions and interdependence across the whole value chain rather than focusing exclusively on one part of the economic cycle. Circular economy eliminates waste and preserves a products value as long as possible. It also creates further value using a products resources even when its life cycle has come to an end. A roadmap for a Circular Economy Strategy has been presented in April 2015. The new proposal aims to establish a framework for the development of a circular economy. Circular economy is expected to add jobs, growth and investments in EU. It is also a part of the Commissions commitment towards sustainable development. (EUR-Lex 2 July 2014; European Commission 2015b; Hatzi-Hull, A. 9 May 2015)

2.4 Circular economy in the car dismantling field

The car industry is dependent of raw materials and certain precious metals. 60% of the global supply of lead goes into car manufacturing making the car industry the main consumer. According to some studies the reserves of lead will run out in 2030. The price of metal has increased significantly as the global demand has risen and there are shortages and supply challenges. In the car industry this means several millions in added costs year by year. Renault's Choisy-de-Roi factory has remanufactured and reconditioned automobile parts since 1949. At current they recondition a variety of parts such as injection pumps, gearboxes, injectors and turbocompressors. The remanufactured parts are exclusively for the vehicles currently in-use. The remanufactured pares are not only 30-50% cheaper than new parts they also have the same guarantee and they are submitted to same quality control tests as new parts. It is also the only available way in which to create a part which has otherwise been discontinued. (Ellen MacArthur Foundation 24 July 2013)

What does remanufacturing mean? Remanufacturing means an industrial process in which used products or components are restored as new. A remanufactured product or component fulfils the same requirements as a new in terms of appearance and performance, and is often given a guarantee. It might also be updated improving the old product. (Karvonen, I. etc. 2015) Reuse is defined in the Finnish legislation as a product or a part of a product to be used in the same purpose as it was originally designed for. Then where's the difference between reuse and remanufacturing? Car dismantlers do recondition parts, the parts are quality rated and given a guarantee. Is this reuse or remanufacturing? The matter is not relevant for the product per se, but as an interpretive issue it might cause distortions of statistics.

ReMaTec organizes annually the World Remanufacturing Summit. The Summit is international and introduces speakers from all over the world. In 2015 the Summit was in Amsterdam and one of the many speakers was Michael Lieder from the Royal Institute of Technology in Sweden. His vision of remanufacturing in relation to circular economy is that primary option is reuse when a products cycle from waste to use is as short as possible. Remanufacturing is from circular economy's point of view the next option and after reuse and remanufacturing recycling and recovery. (Figure 2) One principle of circular economy is that a product should be reused as much as possible, the closer you get to the beginning of the process, the less remains of the product. (KTH Royal Institute of Technology, 16. – 17 June 2015)

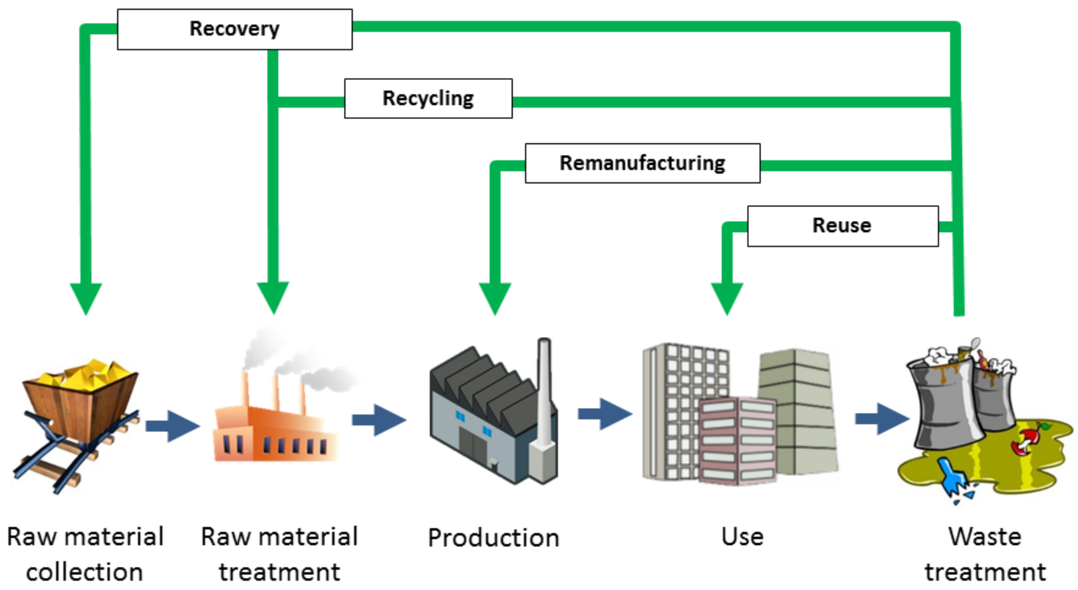

Figure 2. Circular economy and remanufacturing. (KTH Royal Institute of Technology, 16. – 17 June 2015)

Remanufacturing brings significant environmental savings. A remanufactured part saves compared to a new part a significant amount of energy, water, chemical products and waste production. (Figure 3) The factory in Choisy-le-Roi does not send any waste for landfill, 43% of the carcasses are reused, 48% are recycled in the company's foundries to produce new parts and the remaining 9% is valorised in treatment centres which means that the whole process is waste-free.

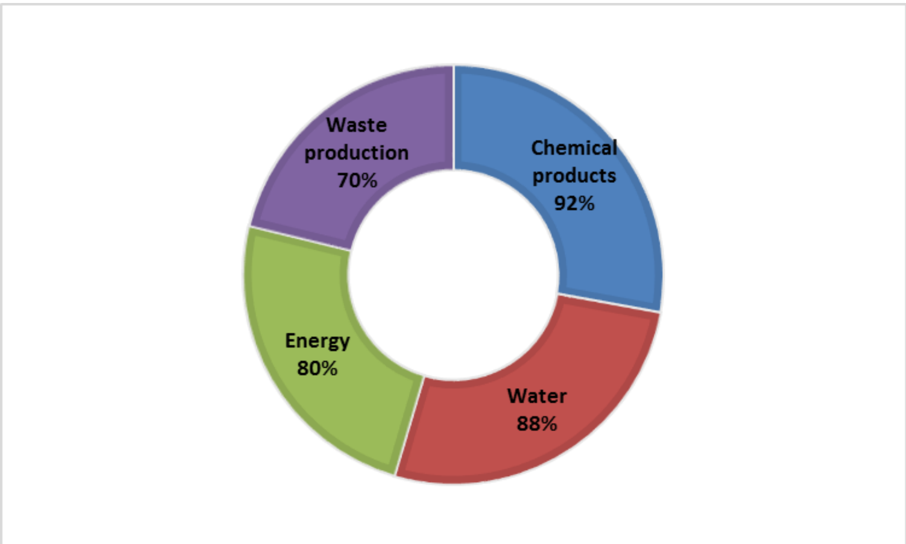

Figure 3. The savings of a remanufactured part. (Ellen MacArthur Foundation 24 July 2013)

The industry of remanufacturing car parts is an employer of the future. According to CLEPA's Wolfgang Meyer the automotive remanufacturing business is worth approximately 8 to 10 billion Euros in retail sales. Meyer claims that remanufacturing could only in the EU reduce emission by 400 kt CO_2, which is equivalent to saving 170 million litres of gasoline per year or emissions of 200,000 cars per year of absorption of 30,000 hectares forest per year. Currently there are 32,000 jobs in the remanufacturing industry and the number is increasing. Furthermore a remanufactured product fulfils at least the same requirements as an original product, has the same guarantee and due to savings of raw materials and manufacturing it is also more economical. (Meyer, W. 14 February 2014)

3 Treatment of ELV's in Finland

The car dismantling field is directed by the Finnish legislation. Not only the Decree on ELV's but the Waste Act 17.6.2011/646, the Act on Environmental Protection 27.6.2014/527 and Environmental Protection Decree 4.9.2014/713 affect the activities. In addition to the national legislation is the ELV Directive 2000/53/EC. The Act on Environmental Protection is meant to prevent pollution and danger of pollution of the environment, prevent and reduce emissions, ensure a healthy and pleasant, ecologically diverse and sustainable environment, support sustainable development and combat climate change and to prevent the generation and the harmful effects of waste. The purpose of the Waste Act is to prevent the hazard and harm to human health and the environment posed by waste and waste management, to reduce the amount and harmfulness of waste, to promote the sustainable use of natural resources, to ensure functioning waste management and to prevent littering. Based on the Act on Environmental Protection 83 § 4 paragraph and on the Waste Act the Finnish Government has given the Decree on end-of-life vehicles and restriction of hazardous substances in vehicles on 12 February 2015.

3.1 Producer responsibility

According to the Decree on ELV's 6 § the producers need to ensure that a minimum of 95% of ELV's shall be reused and recovered and a minimum of 85% of ELV's shall be reused and recycled. In difference to the Decree Article 7 (2b) of the ELV Directive does specify the requirement on average weight per vehicle. Article 4 (1b) of the ELV Directive defines the producers responsibility to primarily take into account dismantling, reuse and recovery, in particular the recycling, of ELV's, their components and materials. Section 48 of the Waste Act defines passenger cars, vans and similar vehicles to be covered by producer responsibility. A manufacturer or importer of these kind of vehicles or a party who imports vehicles on behalf of a domestic user is considered to be a producer.

In Finland the producer's responsibility is controlled by Suomen Autokierrätys Oy. Suomen Autokierrätys coordinates the statutory organizing and informing of recycling for its member organizations, which are passenger car, van and recreational vehicle manufacturers. (Suomen Autokierrätys 2015a).

Accredited recycling operators accept ELV's directly from consumers or from ATF's. Recycling operators in Finland are Eurajoen Romu, Kajaanin Romu, Kuusakoski and Stena Recycling. (Suomen Autokierrätys 2015a) To be accepted as an ATF an environmental permit is compulsory. New environmental permits are applied for from the municipality. A contract has to be made with one of the recycling operators. (Suomen Autokierrätys 2015b) The ATF's in Finland function in three different ways: 1. The ATF sends the ELV straight to the recycling operator, 2. The ATF pre-treats the ELV, i.e. removes the batteries, tires and fluids and sends the ELV to the recycling operator, 3. The ATF pre-treats the ELV, dismantles the reusable parts and sends what's left of the ELV to the recycling operator.

3.2 Environmental permit

The municipality is since 10 September 2014 the authority who grants environmental permits. (Ymparisto.fi 2015b) Authorized activity and permit compliance are supervised throughout the life cycle. The authority who grants the permit is also responsible for supervision, which means that the municipality supervises dismantlers activities and permit compliance. (Ymparisto.fi 2015c)

3.3 The recycling rate of a new car

The European Parliament has set in the 7 article (3 & 4) of the ELV Directive a demand to the car manufacturers that from 2015 onwards ELV's shall be re-usable and/or recyclable to a minimum of 85 % by weight per vehicle and are re-usable and/or recoverable to a minimum of 95 % by weight per vehicle. The French car manufacturer Renault has set up an experimental platform for recycling ELV's called ICARRE 95, short for Innovative CAR Recycling 95%. This project is being funded by the European Union. Renault is expected to handle up to 30,000 ELV's per year. The project is expected to contribute to the achievement of 95% recycling of ELV's by weight, 15-20% of the weight of an ELV to be reused as second-hand components, an increase in recycled materials used in car production by Renault from some 27,000 tonnes/yr. to more than 50,000 tonnes/yr. within 3-5 years and savings of up to 11,600 tonnes yr. of $CO_{2,}$ 18,000 tonnes/yr. of metals, 5,000 tonnes/yr. of plastics, 3,000 tonnes/yr. of glass and 250 tonnes/yr. of catalytic converters. (European Commission 2015c, 21)

3.4 The process of handling ELV's

When a vehicle reaches its end of life a consumer can bring themselves it to an ATF. (Figure 4) An authorized treatment facility, ATF, issues a certificate of destruction, CoD, and only then the vehicles last owners all responsibilities for the vehicle ends. (Suomen Autokierrätys 2015c) There are 279 ATF's listed. In addition to dismantlers there are for example car repair shops, towing companies, waste management companies, scrap steel companies and horse industry companies. (Suomen Autokierrätys 2015d) The recycling operators Kuusakoski Oy and Stena Oy offer consumers a cost free collection service. The consumer will get their CoD by mail after the vehicle has been collected. (Kuusakoski 2015, Stena 2015b)

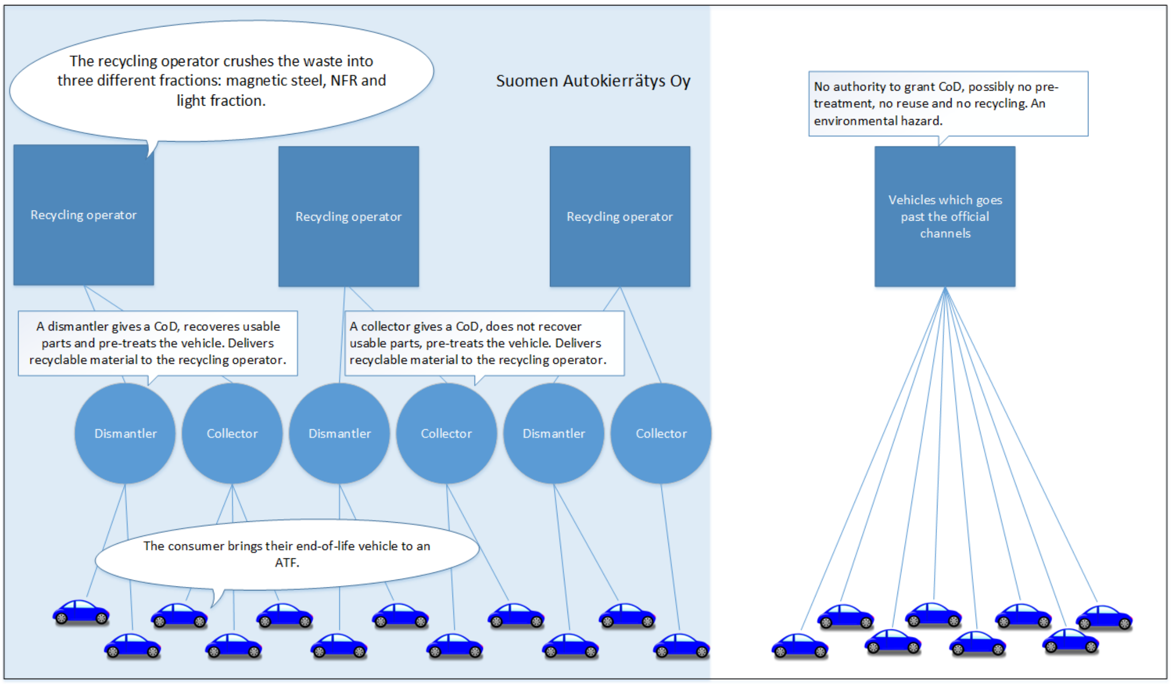

Figure 4. The handling process of ELV's. (Suomen Autokierrätys 2015c; Suomen Autokierrätys 2015d; Kuusakoski 2015; Laine 15.5.2015)

In 2014 62,869 CoD's were issued. 57,873 was for passenger cars. The average scrapping age was 20.4 years. Only just over 60% of the ELV's are recycled as the law requires using the official collector's network. Delivering an ELV to another than an ATF might cause the vehicle not to be deregistered. For a vehicle to be deregistered a CoD is always required and a CoD can only be issued from an ATF. Unofficial operators does not necessarily operate as the law requires for example pre-treating a vehicle. (Autoalan tiedostuskeskus 2015)

3.5 Dismantlers handling ELV's

Dismantlers receive and even collect for free ELV's from consumers. Additionally the dismantlers procure stock buying damaged vehicles from insurance companies. Some of the dismantlers also procure damaged vehicles from abroad. The Decree on ELV's 7 § requires when storing and pre-treating ELV's that parts which are fitted to be reused to be primarily removed and storage so that they can be prepared for reuse and not until secondary to send parts and materials which are unfitted for reuse to be recycled or otherwise recovered. According to Laine (15 May 2015) the reuse that the law requires can only be achieved at dismantlers. He claims that the current recycling system ignores the Decrees obligations on glass and plastics for example. There is no one who will pay for dismantling these so the vehicles are delivered to the recycling operators without dismantling the glass and plastic parts ignoring the environmental aspect all together.

The ELV's are pre-treated at the dismantlers. The vehicle is dried, i.e. fluids such as brake fluids and oils are removed. Tires, batteries and catalysts are removed and explosive parts such as air bags are removed or otherwise defused. (Suomen Autokierrätys 2015e) The fluids are collected in their own tanks. Fuels collected from dismantled cars are mainly used by the company. Waste oil is delivered to Ekokem who treats the oil and returns it as regular oil to lubricant industry's disposal. A prerequisite is that the clear and black oils are separated and kept apart. (Ekokem 2015, 2-3) Other fluids are collected in their own tanks and a collector collects them when needed. There are own acid proof containers for batteries. There are own recycling channels for batteries and catalysts and they are recyclable as such. The reusable parts are dismantled and stored at the dismantlers. Whole vehicles are stored until a certain amount of parts are reused. The rest is delivered to the recycling operators for recycling and recovery. The inventory turnover varies from car to car. The knowledge and craftsmanship of the dismantlers settles the possibility for reuse. (Laine 15 May 2015)

The automotive industry has developed a system called IDIS (International Dismantling Information System) to promote the environmental treatment of ELV's at treatment operators. The system includes vehicle manufacturer compiled information. The legal obligations of the ELV Directive are met with IDIS. The use of IDIS is free of charge. The system development and improvement is supervised and controlled by a consortium of automotive manufacturers form several countries including 71 car brands and 2027 modes. (IDIS 2015)

3.6 The responsibilities of a consumer and scrapping bonus trial

According to the Waste Act 58 § a holder of a vehicle has to deliver a vehicle meant to be scrapped to a collector or handler authorized by the producer. An owner of a vehicle is eligible to hand over his vehicle free of charge to any authorized collection point. (Suomen Autokierrätys 2015f) If a vehicle is not fit to drive a collection point can collect it. There might be a charge for the collection. The collection point determines the charge. (Suomen Autokierrätys 2015g) The consumers' obligations and responsibilities of the vehicle ends only receiving a CoD. Only handing over to an ATF guarantees the vehicle to be deregistered. (Trafi 2015a)

There is a scrapping bonus trial in Finland during 1st July 2015 – 31st December 2015. A consumer can receive a scrapping bonus towards the purchase of a new car or caravan if he or she scrap a vehicle belonging to them that is over 10 years old and replaces it with an as yet unregistered vehicle producing carbon dioxide emissions of 120 g/km or less. The bonus is 1,500 euros and it is funded by the State and automotive industry. The State contributes 1,000 euros and the automotive industry 500 euros for each scrapped vehicle. (Trafi 2015b)

There was criticism about the trial after a few weeks already. According to an article in Ilta-Sanomat (13 July 2015) had the newspaper Uusimaa interviewed Kim Stenström from Autotalo Laakkonen who had commented that there will be no such lift to the automobile trade as was hoped for. The conditions are too strict. Kristian Laakso from Uudenmaan Autopurku Oy claimed that the campaign was misunderstood as the customers were expecting to get the scrapping bonus in cash. Autoalan Tiedotuskeskus has in turn published a release on 27 August 2015 according to which the scrapping bonus trial has been a success. The budget of 3 million euros has run out at the end of August. In July alone 6,434 CoD’s have been issued which is 22.5% more than in July 2014. (Autoalan Tiedotuskeskus 28 August 2015) In Kymmenen Uutiset 21 July 2015 was reported that the scrapping bonus trial was a success. The news interviewed Harri Keinänen from Romu Keinänen Oy. He stated that there had been an increase in delivered ELV’s. Keinäinen is an ATF, but not a dismantler. They remove tires, batteries and fluids after which the rest is delivered to recycling operators for scrapping. (Katsomo.fi 21 July 2015, Romu Keinänen 2015) There are no statistics over the vehicles received by dismantlers. In the light of previous information an assumption can be made that not nearly all the vehicles which were scrapped in the trial have went through the dismantlers in which case the reuse required by law has not been accomplished.

3.7 Grey economy

In Finland a registered vehicle can be temporarily deregistered. Deregistration is marked in the registry and during deregistration there is no vehicle tax. (Trafi 2015b) If an ELV is not taken to an ATF and no CoD is issued will the vehicle remain in the vehicle registry. This distorts the vehicle registry and enables grey scrapping business. Annually an estimate of 40,000 ELV’s disappears past legitimate channels. The grey economy in the dismantling field is estimated up to 15-20 million euros. The biggest concern are though the environmental issues. The oil and fluid load of the vehicles passing the legitimate channels are estimated up to 355,000 litres annually. In addition to fluids batteries, acids and tires from these vehicles are not addressed accordingly. (Taloussanomat 27 January 2013; Tiilikainen 19 April 2013) In Finland there are several companies who announce that they are collecting ELV's and even buying them and then ship them to Africa. (Suomen Romukone Oy 2015, Uyanna Export 2015) Some of these companies can even be ATF's when the last owner of the vehicle can receive a CoD but the vehicle might be registered in another country to traffic use. Exporting the vehicles does not remove the environmental issue but transfers the issue to even unsupervised circumstances causing the local environment and population long-term disadvantages. (Youtube 24 January 2013)

3.8 Future challenges

There has been great changes in the car dismantling field in just a couple of years. Stricter goals set by legislation and requirements of environmental legislation set challenges for the industry. The legislation is under constant change and the environmental view will set even more demands for the recycling industry in the future. The next change in legislation that will affect the dismantling industry regards POP's.

The Regulation 850/2004 of the European Parliament and of the Council on persistent organic pollutants has been changed on 17 December 2014 and the changes has come into effect on 18 June 2015. The Finnish Environment Institute is planning a guide on how to implement the Regulation on POP's in practice. On 14 April 2015 a discussion for stakeholders has been kept where treating POP included waste has been up for discussion. POP's in ELV's are mostly in plastics, as in car seats and hard plastic parts. Limits for using POP's has been set and the use of them has been mostly forbidden. In practice there is no comprehensive data of the compounds. Compounds are expected to appear in products which are becoming waste with a delay up to decades. In ELV's they are expected to appear until year 2025. The separation of POP-plastics has in the discussion been given three alternative solutions; separating plastics manually, separating plastics from the crush and as the third alternative no separation, crushing plastics with the fluff. In the car dismantling industry manual dismantling would mean a significant increase of expenses as the manual dismantling is time consuming. Discussing POP's with Commissionaire Artemis Hatzi-Hull and EGARA's General Secretary Henk Jan Nix it became clear that other EU countries does not manually dismantle plastic parts. (Häkkinen 14 April 2015; Laine 15 May 2015; Suomen Ympäristökeskus 2013)

4 Treatment of ELV's in other Nordic Countries

The Swedish Car Dismantlers association, Sveriges Bilåtervinnares Förbund (SBR), held a Nordic Conference for Car Dismantlers in Stockholm 8-9 May 2015. The conference included a visit to a Swedish car dismantling, Allbildelar, and to a recycling operator, Stena. The presentations dealt with the challenges in the dismantling field as well as from the dismantlers and environmental experts as recycling operators view. The car dismantling field is like in Finland directed in other Nordic Countries by the national legislation and in addition by the EU legislation. Even if Norway is not a part of the European Union they do comply with the ELV Directive. (Sveinsvoll, S. 9 May 2015)

Finland and other Nordic Countries comply with the ELV Directive. The ELV Directive was one of the five Waste Stream Directives assessed in the ex-post evaluations. DG Environments' Artemis Hatzi-Hull (2015) presented the outcome of the ex-post evaluation and stated that the main goal of the ELV Directive is to ensure appropriate management of the annually generated 8-9 million tons of ELV waste in the EU by reducing the waste arising from the ELVs and their toxity, by increasing the reuse/recycling/recovery rates and by ensuring appropriate treatment of waste in environmentally sound conditions. In the evaluation was noted good progress towards achieving the objectives and targets in reducing ELV waste and hazardous substances. Reuse, recycling and recovery rates have increased and furthermore it has been ensured that ELVs are treated in environmentally sound conditions. The environmental and economic benefits outweigh the costs associated with the implementation of the ELV Directive and treatment costs are compensated by the high value of materials, but there is still a need for new cost-efficient technologies to be developed. The implementation has been associated with environmental benefits such as reduction of abandoned ELVs and an increase of ATFs. It has also been associated with economic benefits such as a promotion of resource efficiency via incentives for innovation in vehicle design and ELV treatment and a reduction of waste disposal costs. The ELV Directive was found to be coherent with other EU waste legislation even if the legal base differs across the ELV, Packaging and Batteries Directives and there are different approaches to reaching targets. The ELV Directive has been found to be up-to-date with current needs and it plays a key role in reaching a resource efficient Europe. According to the commissionaire two major challenges remain: the collection and treatment of ELVs by illegal operators and the illegal shipment of ELVs. Based on the evaluation the assessment of the effectiveness of the Directive depends highly on the information communicated by Member States. Some doubts remain about the reliability and comparability of statistics across Member States, notably because of the use of different reporting systems and calculation methods. The commission has decided on 17 October 2001

(2001/753/EC) concerning a questionnaire for Member States reports on the implementation of Directive 2000/53/EC of the European Parliament and of the Council on end-of-life vehicles. The questionnaire should be modified so that the data were reported to more detail. The changing composition of vehicles is another challenge related to efficiency. This may require improved recyclability of materials and lead the recycling industry to use new, potentially more costly recycling methods. (European Commission 18 April 2014)

Maria Ljunggren Söderman (9 May 2015) from Chalmers University of Technology presented their research project which main goal was to find more resource effective recycling methods for ELVs. The projects short term goal is to achieve 95% recycling rate and to increase profitability to the field. The long term goal is to add sustainable material use in the society, ensure availability of resources and maintain low submissions. The project, called Realize, is ongoing during 2012-2015 and is funded by the Swedish Foundation for Strategic Environmental Research, Mistra. (Realize 2015) The project has worked towards reaching the 95% target. In a car dismantling experiment 225 cars has been dismantled. The cars have been dismantled to the point that nothing has been left in the carcass. The fluids, glasses, catalysts, batteries and reusable parts have firstly been dismantled. The rest have been dismantled and categorized in 12 different treatment points; 4 points for plastics, 2 points for rubber mats, 4 points for electronic parts, one point for aluminium and one point for combustible parts. The results from the experiment suggest that the 95% target can be reached increasing dismantling. More detailed dismantling increases the quality of the material which in turn increases the demand. The economic efficiency is dependent on for example the demand of dismantled plastic parts and on dismantling time. It was also discovered in the experiment that more information is needed from the manufacturers. The current information is very limited. All in all they experienced that there are great opportunities in for example intensifying work habits and transports, better access to information and the maturity of the market of recycled plastics.

Other speakers of the conference were Børge Madsen from Dansk Autogenbruk (DAG), who spoke of the Danish car dismantling and current issues in the Danish car dismantling field, EGARAs General Secretary Henk Jan Nix, who spoke of the goals and role of EGARA and Stena Recycling AB’s Production Manager Kristofer Sundsgård, who spoke of Stena Recyclings operations and of the co-operation with Bilretur. Additional speakers were Anna Henstedt from Bil Sweden, who spoke of the aspiration to add co-operation between dismantlers and retailers, Charles Berkow from the Swedish Ministry of the Environment and Energy, who spoke of the environmental priorities of Sweden and Olaf

Brastad from Bellona in Norway, who spoke of the development of use of electronic components in car production, the increase of materials in vehicles and the challenges of the reuse and recycling of the whole vehicle.

Based on the presentations and personal discussions it can be concluded that the challenges of the dismantling field are very similar in all Nordic Countries. The biggest concern was in all countries the vehicles passing the official network. From circular economy's point of view the Realize project is significant. The outcome of the experiment supports Laine's (15 May 2015) vision that a more detailed dismantling and sorting is to be expected in the car dismantling field. More detailed sorting also signifies more accurate reuse and recovery and decreases the amount of waste ending up crushed.

5 Research

The basis for the research was the author’s assumption that the 95% target is not reached. The research method selected for this thesis was quantitative. The basic set of the enquiry was selected as all members of SAL. An international aspect was sought by contacting EGARA. The General Secretary of EGARA, Henk Jan Nix, agreed to send the enquiry to the members of EGARA. EGARAs member are, apart from Norway and Switzerland, members of the European Union. Norway and Switzerland both comply the ELV Directive 2000/53/EC. (Sveinsvoll, S. 9 May 2015; United Nations 25 March 2014, 15)

The data has been collected electronically with Webropol. SALs Chairman and EGARAs General Secretary helped drawing up the questionnair. One questionnair was made for SALs members and one for the members of EGARA. The questionnairs were identical but for one exeption. The Finnish dismantlers were asked if they had been dealing with associates in question 24. This question was not in the English questionnaire as the associates vary from country to country. There were only a few mandatory questions. The questions regarding IDIS were mandatory to the purpose of the respondents not beeing obliged to answer the refining questions if the respondent did not use IDIS or was not familiar with the system in general.

The cover letter to the enquiry was sent by e-mail to the members of SAL on 25 May 2015. An e-mail was also sent to Suomen Autokierrätys, recycling operators and the supervisory authority. The enquiry has been open for response during the period of 25 May – 7 June 2015. 24 dismantlers and 2 associates responded to the enquiry.

EGARAs General Secretary has sent an e-mail concerning the enquiry on 28 May 2015 to the members. Attached to the e-mail has been a cover letter with a link to the enquiry. A reminder has been sent on 11 June 2015 in addition to which the response time has been prolonged until 21 June 2015. The questionnaire has been sent to Denmark, Estonia, Ireland, France, The Netherlands, Norway, Poland, Sweden, Switzerland and The United Kingdom. In total were there 85 responses from 7 countries. Estonia, France and The United Kingdom did not respond to the enquiry.

The enquiry was sent to all members of SAL, in total to 61 dismantlers. 40% of the members responded to the enquiry, so the results can be considered as fairly good. Single questions response rates vary between 22 and 24. There can be no conclusions made from the associates’ responses as there were only 2 of them.

There can be no conclusions made from the answers from the other countries. The results can be considered as merely guidelines (Poland, 25% of all members) or merely single opinions (for example Sweden and Switzerland, 1 answer) depending on the amount of responses.

6 Results of the research

There were a total of 111 responses to the enquiry. There were 26 responses from Finland, of which 24 from dismantlers and 2 from associates. The associates' responses are not taken into consideration in the analysis of the results as there has not been an enough comprehensive sample. As we can see from figure 6 the most responses came from Poland. 55 of the respondents came from Poland. Additionally there were responses from Netherlands, from where there were 15 responses, from Norway and Ireland 5 responses, from Denmark 3 and from Switzerland 1. There was 1 response from Sweden, which came after the deadline.

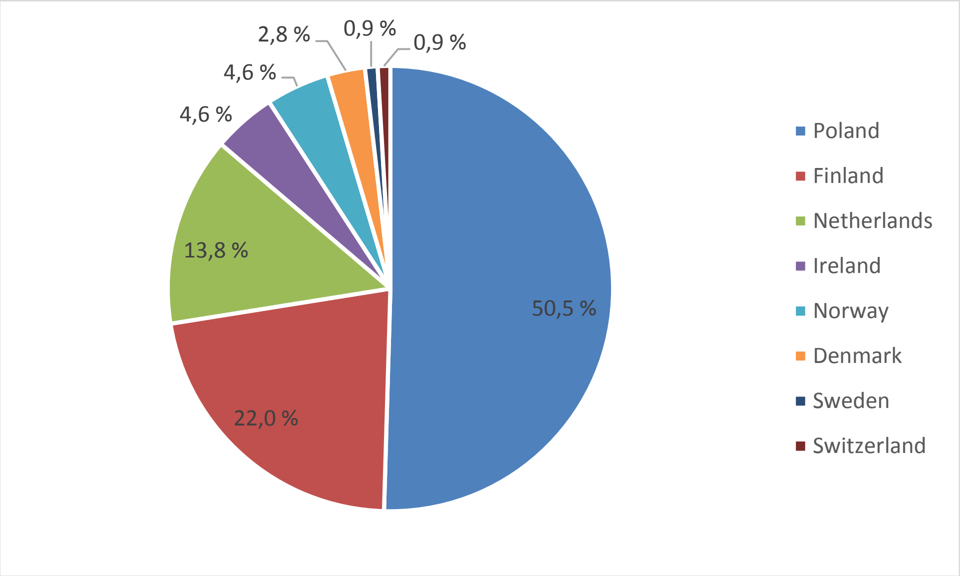

Figure 6. Responses by country. N = 109

6.1 Background information

In the first part of the questionnaire background information of the company was enquired: the number of employees and what marketing channels were used. In Finland dismantlers are mainly small family businesses. (Laine 15 May 2015) This vision is supported by the responses to the enquiry. In Finland the dismantlers employed in average 4 persons. The biggest number of employees was 12. The variation between countries was quite big, the one who responded from Sweden had 35 employees. The biggest variation in number of employees was in Poland. The biggest employer of the Polish respondents and of the whole enquiry had 37 employees, but there also were small companies in Poland which had only 1 employee.

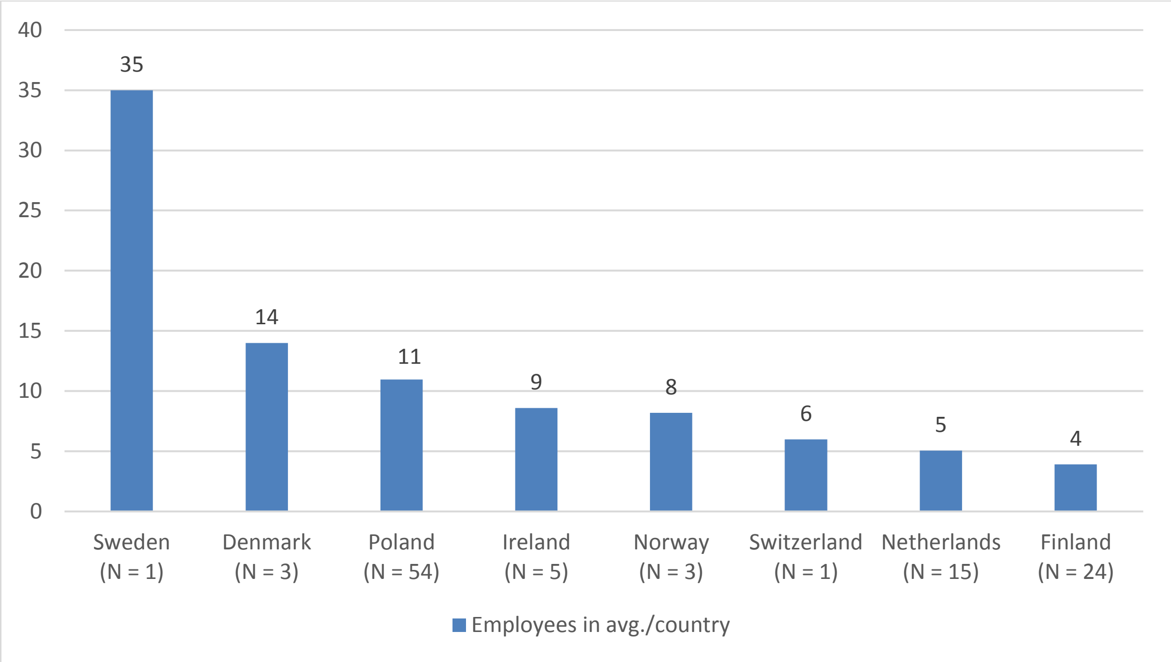

Figure 7. Employees in average. N = 108

The most popular marketing channel was own websites. A total of 76.4% of the responders had their own websites. Local newspaper and internet advertising were also quite popular, both of them were used for marketing by over 60% of the respondents. 5.7% of the respondents marketed in TV and 6.6% in a nationwide newspaper. Other marketing channels were billboards, newsletter mail, bannery and brochure.

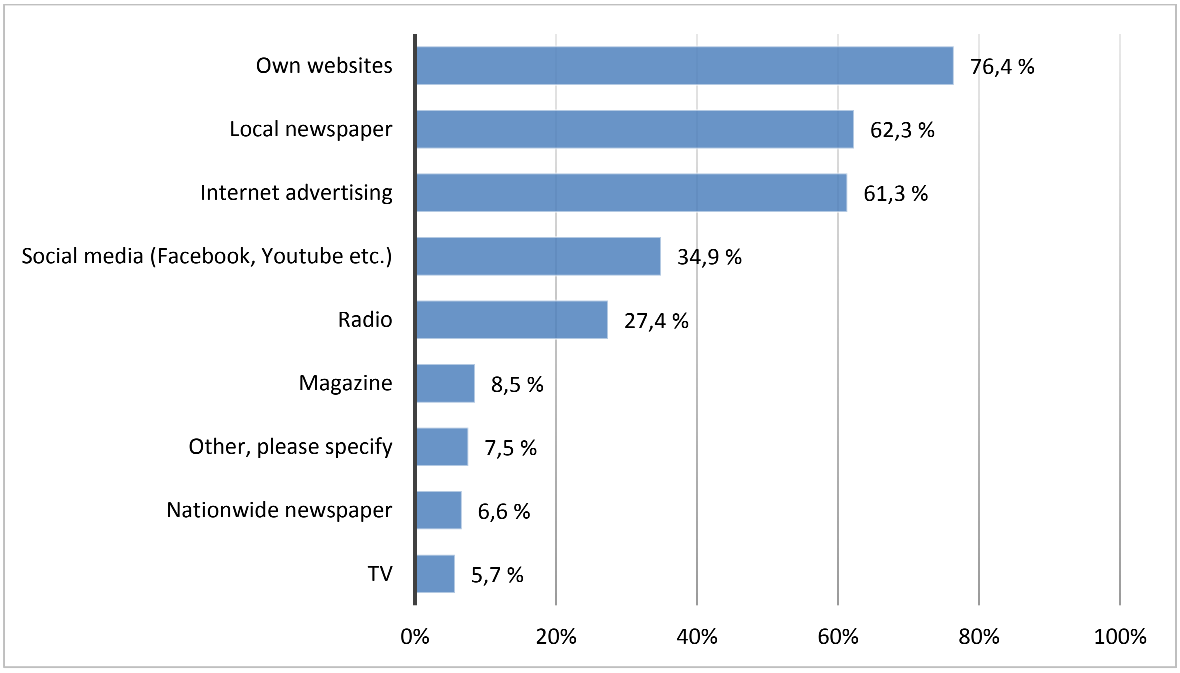

Figure 8. Marketing channels. N = 106

According to Laine (15 May 2015) does the Finnish dismantling companies have a lot of other activities besides dismantling due to the small size of the operation. Other activities besides dismantling were enquired in question number 4. According to the answers most of the Finnish dismantlers has other activities besides dismantling, only 13.0% did not have any other activities as seen in figure 9. Similar results came from the other countries as well, only 14.7% did not have any other activities besides dismantling. Car sales was the most common activity, 34.2% had car sales as other activity. Tire sales was the second most common, 32.9% of the respondents from other countries had tire sales as other activity.

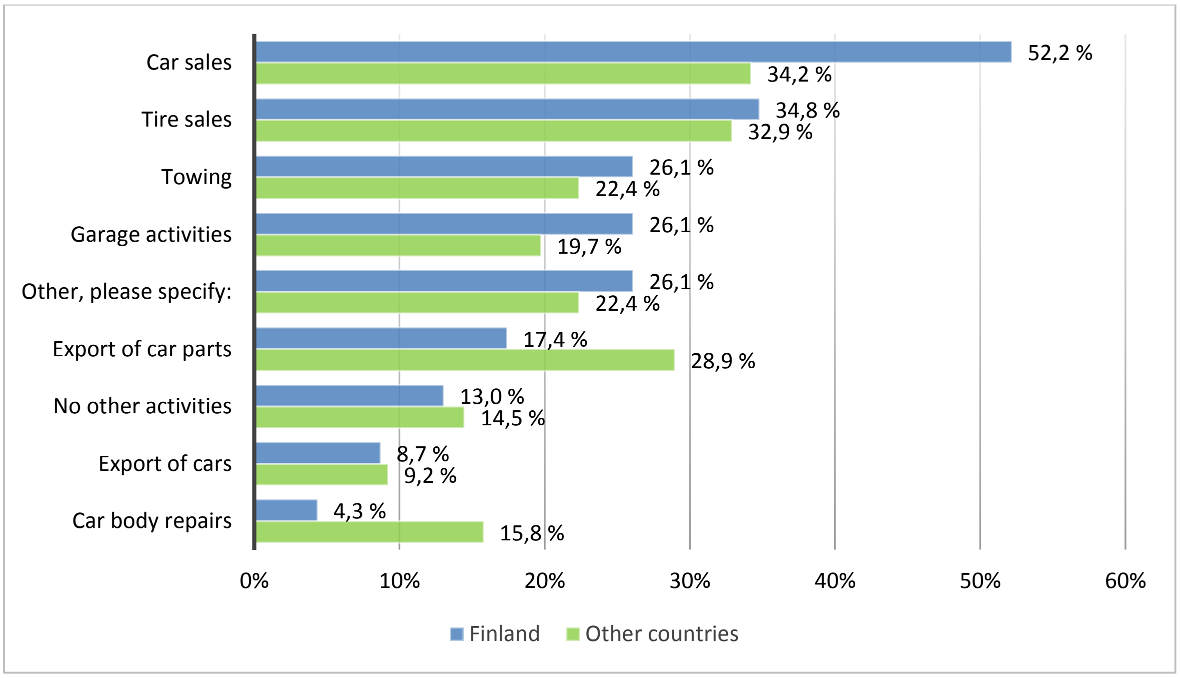

Figure 9. Other activities in Finland (N = 23) and other countries (N = 76)

There has been some specialization in the dismantling field. There are dismantlers that have specialized on a specific brand or in a certain type of vehicles. The extent of specialization was enquired in question 5. 50% of the Finnish dismantlers have not specialized but accept and dismantle all vehicles as we can see from figure 10. 37.5% have specialized on one type of vehicles such as passenger cars or vans. Respondents from other countries have not specialized nearly as much as the Finnish. In addition to Finland only Denmark and Netherlands had specialized on one brand and in The Netherlands 6.7% of the respondents had specialized on one brand group. The respondents from Ireland, Norway, Poland, Sweden and Switzerland had not specialized at all but accepted all vehicles.

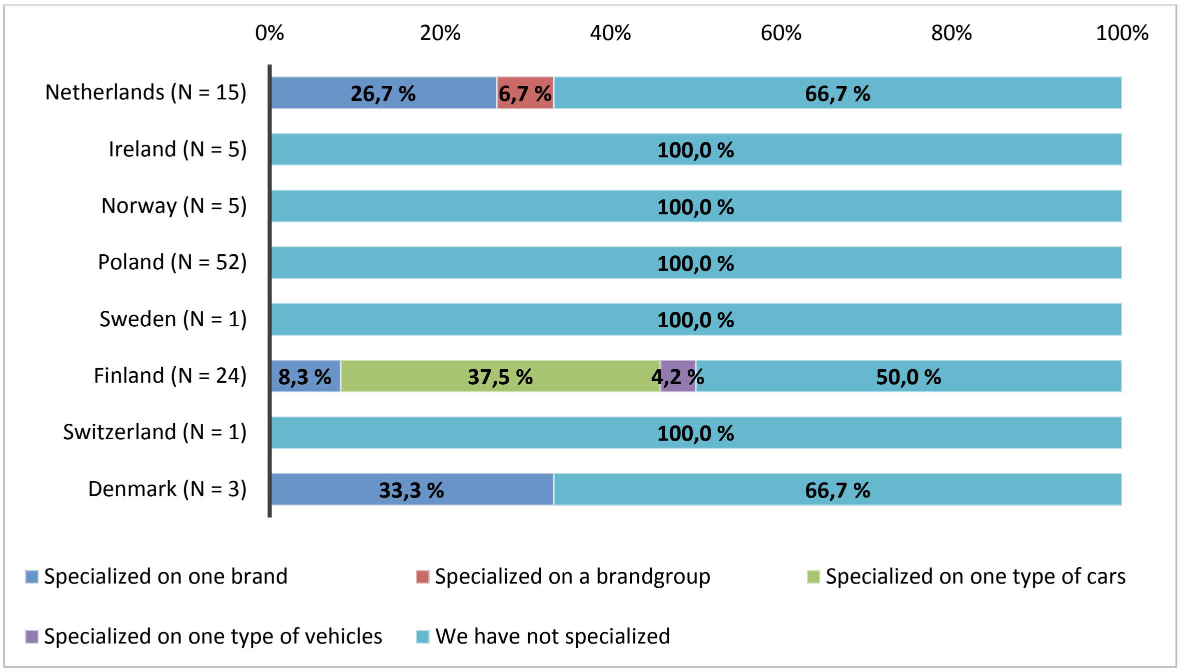

Figure 10. Specialization by country. N = 106

6.2 Dismantling activities

It is the last owners' obligation to deliver the vehicle for dismantling. The legislation in Finland does not define if collecting vehicles should be free of charge. The costs for collecting ELVs is defined by the collectors. The author of this thesis did not have information on practice of the other countries. The Finnish dismantlers collect mainly ELVs without charge, 82.6% of the respondents collect ELVs for free. The long distances in Finland are likely to impact possible costs, if the vehicle is far away from the collector, the costs of collection might override the profits. In Finland 8.7% of the respondents only receive ELVs. As we can tell from figure 11 is collecting for a fee more common in other countries than in Finland. The majority of other respondents only collect for a fee. The differences might also be influenced by a possible scrapping incentive. In Denmark the car owners pay for example an annual 101 DKK = 13.53 EUR fee in addition to the insurance premium. When a vehicle is taken to an ATF for scrapping the last owner gets a 1 500 DKK = 201 EUR incentive. (Madsen, B. 9 May 2015)

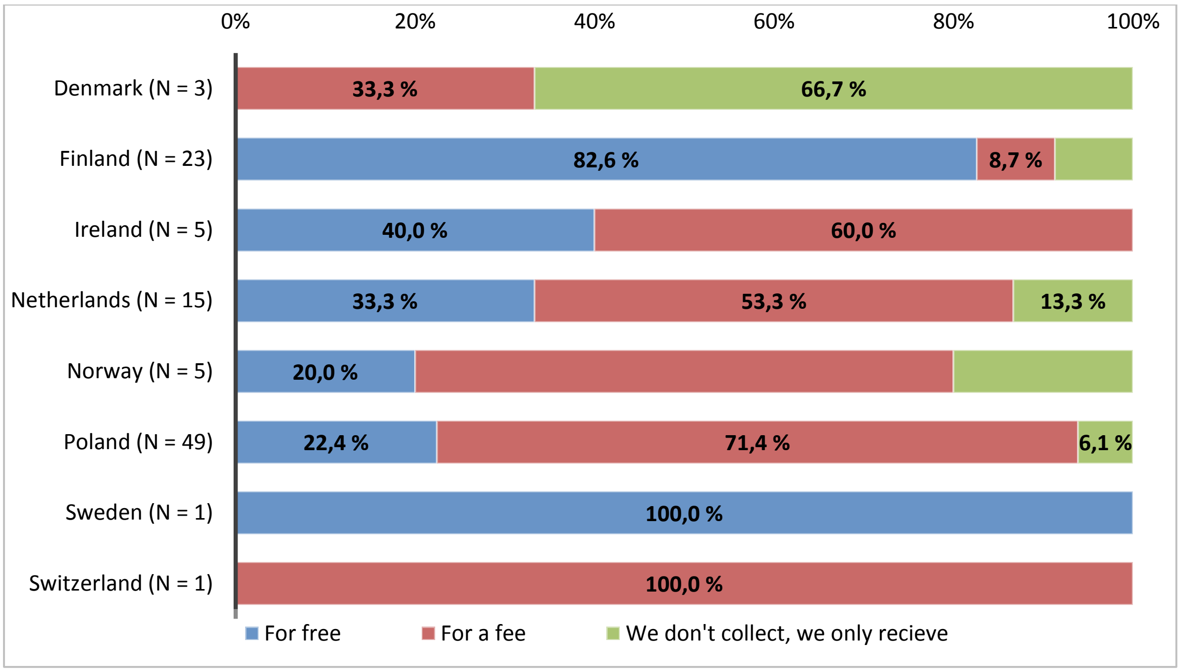

Figure 11. Collection of ELVs. N = 102

As concluded in chapter 3.1 there are many other collector points in Finland that aren't dismantlers. From other collector points ELVs are merely pretreated regarding fluids, batteries and catalysts. Reuse, as required by law, can only be achieved dismantling and re-selling parts. In Finland only 2 of the respondents, 8%, receive ELVs from other collector points. The majority, 92%, of the respondents do not receive ELVs from other collector points.

The author of this thesis did not know the praxis of other countries, if other than dismantlers allowed to issue CODs. This was enquired in question 7. As we can see in figure 12 only dismantlers are allowed to issue CODs in Denmark, Ireland, Norway, Netherlands and Sweden. In Switzerland issuing CODs is according to the respondent free for all. In Poland the responses were divided, according to 81.4% of the respondents only dismantlers are allowed to issue CODs. According to 18.6% of the respondents in addition to dismantlers also collector points (punkty zbierania) and tire services (serwis opon) are allowed to issue CODs. From the responses can be concluded that some of the dismantlers consider collector points as dismantlers but the majority does not. According to Honda (2015) in Poland ELVs can be taken only to dismantlers or collector points. Dismantling is allowed only at authorized dismantling stations.

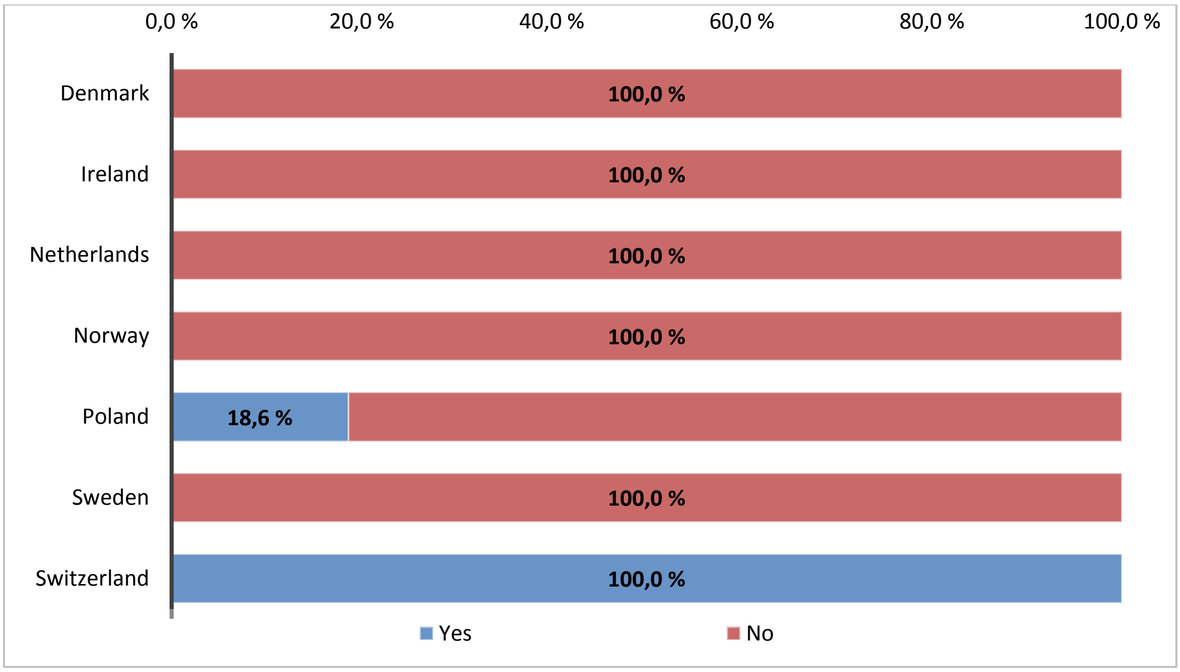

Figure 12. Issuing CODs. N = 69

The extent of the dismantling activities was enquired in question 8. The number of dismantled vehicles was enquired in the question. The respondents were asked to give the answer to nearest hundred. One of the Finnish respondents had obviously misinterpreted the question and responded with 1 dismantled vehicle. This answer has been deleted as faulty. The Finnish respondents have dismantled in average 267 vehicles in 2014. 13% of the respondents had dismantled 700 vehicles in 2014. 34.8% of the respondents had dismantled 200 vehicles, which is according to average. In reference to other countries the amount of dismantled cars in Finland are quite small as we can see in figure 13. The largest number of dismantled cars was in Norway, where 6,600 vehicles has been dismantled in 2014. In Poland the annual amount vary between 100 and 5,500 vehicles. The average amount of all respondents is 932 vehicles which is more than three times the amount compared to Finland. The median of the enquiry is 500 vehicles. As the difference between the median and the average is significant it can be concluded that the median corresponds better to the respondents’ average annual amount.

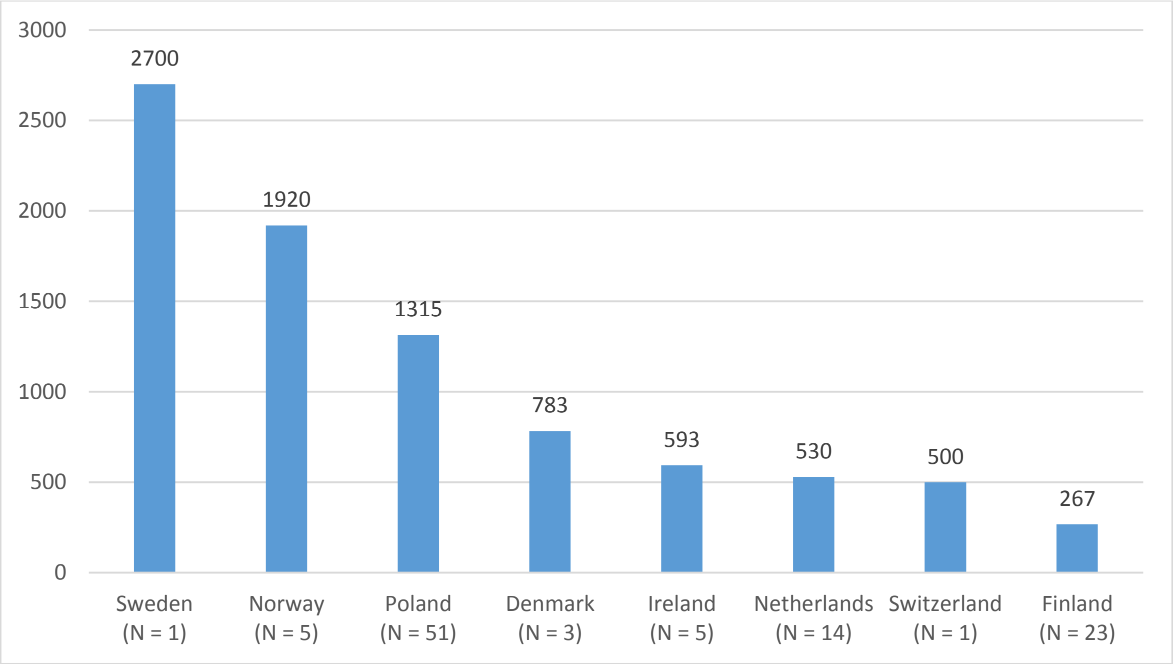

Figure 13. Average amount of dismantled vehicles in 2014. N = 103

The dismantlers' estimate of the dismantled vehicles age was enquired in question 9. According to Tilastokeskus (2015) has the average age of deregistered vehicles in Finland been 20.3 years in 2014.The average age has been similar since 2011. In Finland up to 26.1% of the respondents do not dismantle under 5 year old vehicles at all. 16-20 year old vehicles are dismantled by all of the Finnish respondents. From the responses can be concluded that in Finland vehicles 11-20 years of age are mainly dismantled which corresponds with the statistics from Tilastokeskus. When examining the results of all countries in figure 14 it can be concluded that the age category 11-15 years is the most dominant. Only 11% of the respondents do not dismantle vehicles in this age category at all. It would seem that the average age of vehicles is lower in other countries than Finland as almost 50% of the respondents do not dismantle vehicles over 21 years of age at all.

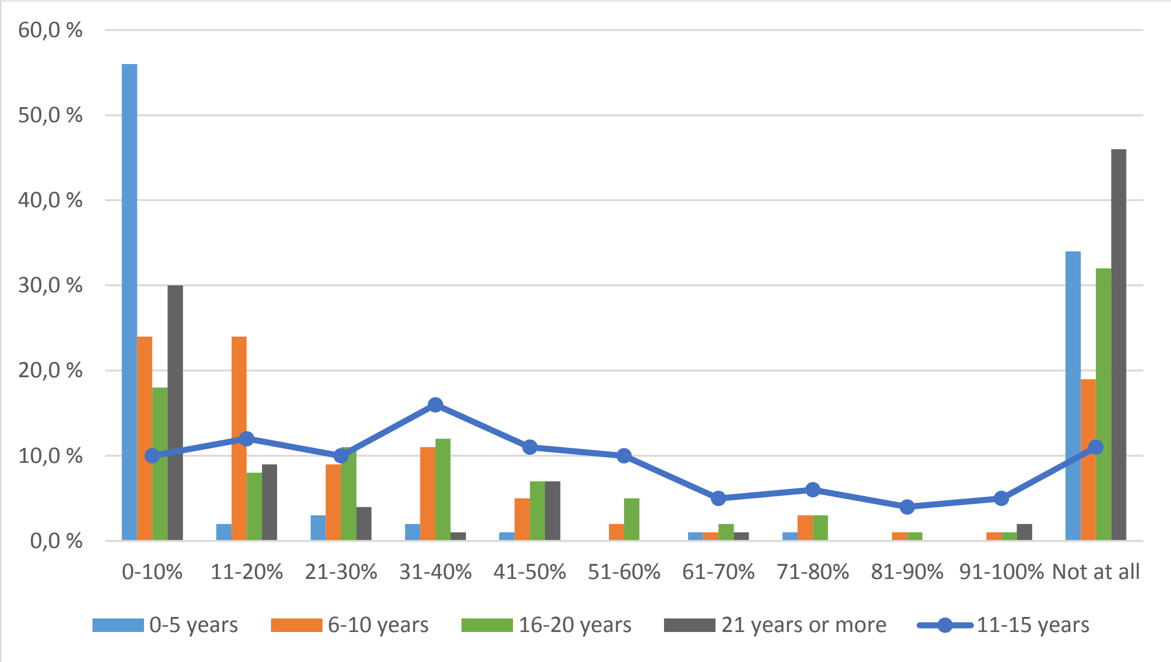

Figure 14. Age distribution of dismantled cars in 2014. N = 100

According to legislation the new vehicles are to be manufactured in such a way, that at least 95% of their average weight has to be made possible to reuse and recovery. The dismantlers were enquired about the reuse, recycling and recovery of the vehicles that were treated at the dismantling facilities in 2014. The respondents were asked to estimate how much of the total weight of the dismantled vehicles were sold as spare parts (reused), sold as reusable material (recycled) or sent to the recycling operators (recycled or recovered). As we can see from table 1, most of the dismantlers does sell spare parts, in which case reuse is made possible. Sales of spare parts does not however appear to be very extensive. 49% of the respondents have sold as spare parts only 0-20% of the total weight. Only 12.4% have sold more than 51% of the average weight as spare parts. One of the respondents have sent over 91% of the material to the shredder. The results of this enquiry cannot be considered reliable. Based on the responses a question arises: have all the respondents understood the difference between selling recyclable material and sending the material to the shredder? The material that is sent to the shredder is at least partly recyclable. There might be differences in opinion regarding the interpretation in this particular question. There is also differences in pre-treating the ELVs between countries. For example in Sweden they dismantle glasses prior sending the carcass to the recycling operator (Allbildelar 8 May 2015) when in Finland they are not dismantled (Laine 15 May 2015).

Table 1. Reuse, recycling and recovery of the average weight. N = 98

	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%	Not at all
	24	24	18	12	3	7	2	3	2	0	3
Sold as spare parts	24,5 %	24,5 %	18,4 %	12,2 %	3,1 %	7,1 %	2,0 %	3,1 %	2,0 %	0,0 %	3,1 %
	27	17	12	8	4	6	3	1	6	1	13
Sold/collected as material	27,6 %	17,3 %	12,2 %	8,2 %	4,1 %	6,1 %	3,1 %	1,0 %	6,1 %	1,0 %	13,3 %
	9	5	11	11	7	10	13	9	9	1	13
Still in the hulks as they go the shredder	9,2 %	5,1 %	11,2 %	11,2 %	7,1 %	10,2 %	13,3 %	9,2 %	9,2 %	1,0 %	13,3 %

6.3 Questions of opinion

Drafting the thesis an assumption awoke that there are certain factors, which affect the profitability of the dismantling business and also how the goals set by legislation are achieved. The accuracy of these assumptions were enquired from dismantlers in questions 11-12.

According to the responses the assumptions of the writer of this thesis are correct. As we can tell from figure 15 of all respondents (N = 109) 45% thought that the consumers' awareness of the right process of ELVs should be increased. More than 50% of the respondents thought that the authorities should make inspections more often and that illegal operators should be punished more severely. There were quite a few respondents that neither agreed nor disagreed to the questions regarding information on suitability of car parts and illegal shipments of ELVs. It might depend upon not fully understanding the question as well as not having an opinion at all. There were differences in granting environmental permits in every respondent country.

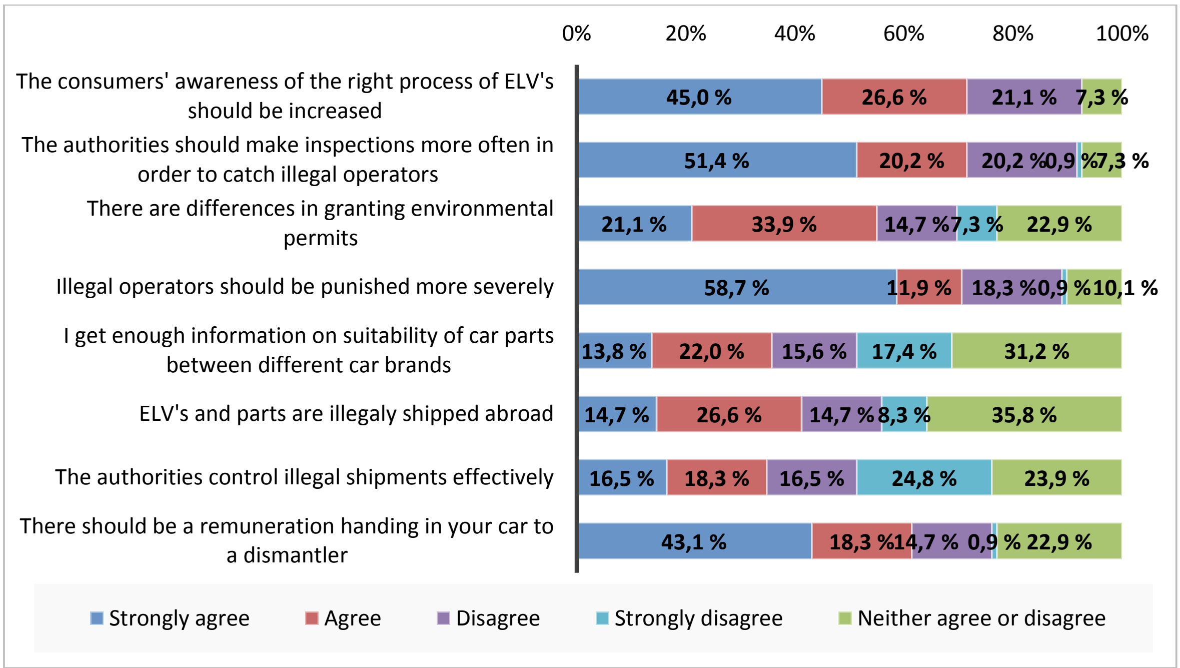

Figure 15. Questions of opinion. N = 109

Temporary deregistration was another factor that came up drafting the thesis. It seemed that in Finland temporary deregistration is hindering achieving the goals set by legislation. In question 12 the dismantlers were enquired if they consider temporary deregistration an issue. The responses affirm the assumptions. As we can see from figure 16 the Finnish respondents thought that temporary deregistration should be time limited as 41% of the respondents agreed strongly to the statement. They also agreed that temporary deregistration enables shipments abroad when a total of 75% agreed to the statement. Whether temporary deregistration should be time limited and if there should be an annual fee or not were the questions with most dispersion. It can be concluded from the responses that temporary deregistration is not as big of an issue in other countries. The alternative 'neither agree nor disagree' got most responses in all questions. The practice of temporary deregistration vary from country to country so the responses are not directly comparable.

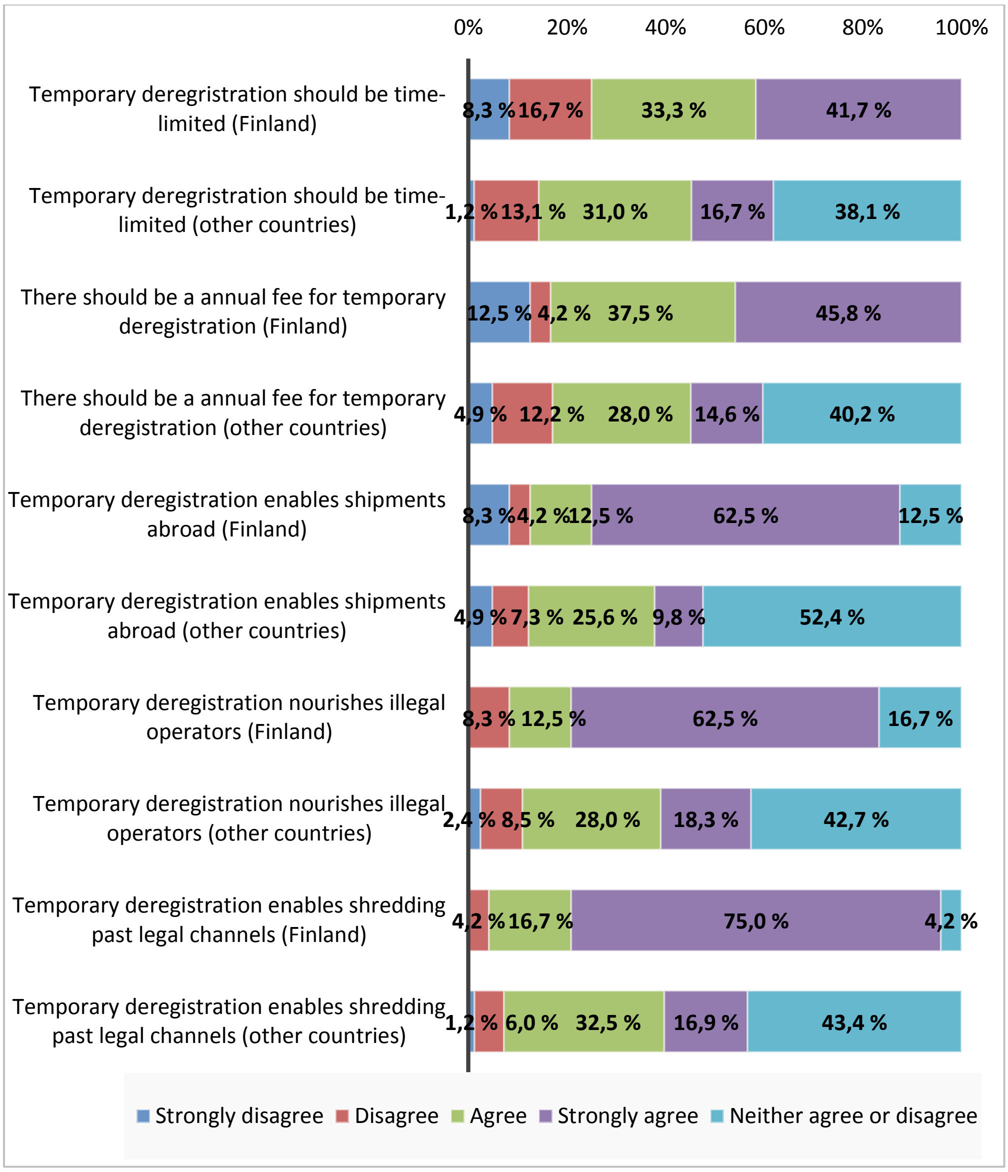

Figure 16. Opinions about temporary deregistration. N = 106

6.4 The 95% goal set by legislation

This thesis aims to determine if the 95% goal is achieved. Drafting the thesis a few such measures that might assure achieving the goal has come to mind. The dismantlers were enquired statement to these measures. As preface to question 13 the terms reuse, recycling and recovery were explained. As we can tell from figure 17 both Finnish and other respondents thought that directing ELVs mainly to dismantlers would be the best way to achieve the 95% goal. Over 90% of the Finnish respondents and over 75% of the other respondents thought this was the best measure achieving the 95% goal. As we can see from the responses to this enquiry temporary deregistration is not as big of an issue in other countries as it is in Finland. Other measures that were stated were: economic incentives to owners, additional fee (scrapping bonus) and concentrating selling used parts. One of the respondents thought that the 95% goal will never be reached and maintained.

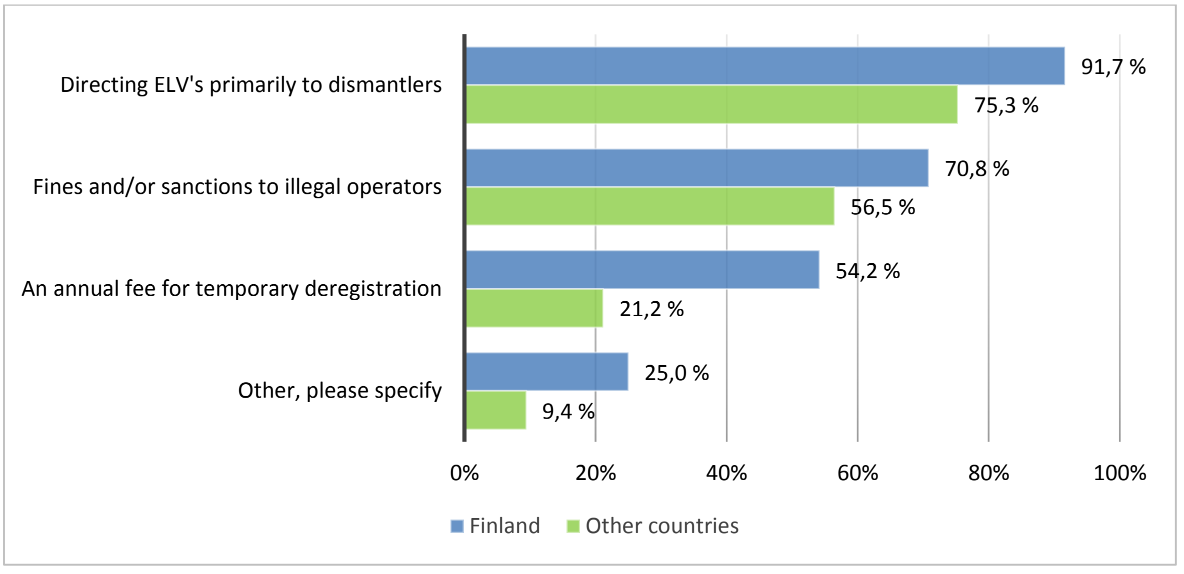

Figure 17. Measures that contribute achieving the 95% goal in Finland (N = 24) and in other countries (N = 85)

The new Government Decree on End-of-Life Vehicles and restraining the use of dangerous substances in vehicles came into effect on 12 February 2015. The dismantlers were enquired how they think the national implementation helps achieving the 95% goal. 66.7% of the Finnish respondents thought that the national implementation helped to some extent or helped significantly achieving the 95% goal. It can be concluded that the renewal of the legislation has served its purpose. Respondents from other countries did not think that the national implementation helped quite as much, more that 30% thought that the national implementation helped and only 12.1% of the respondents thought that it helped significantly. More than a fifth of the respondents could not say.

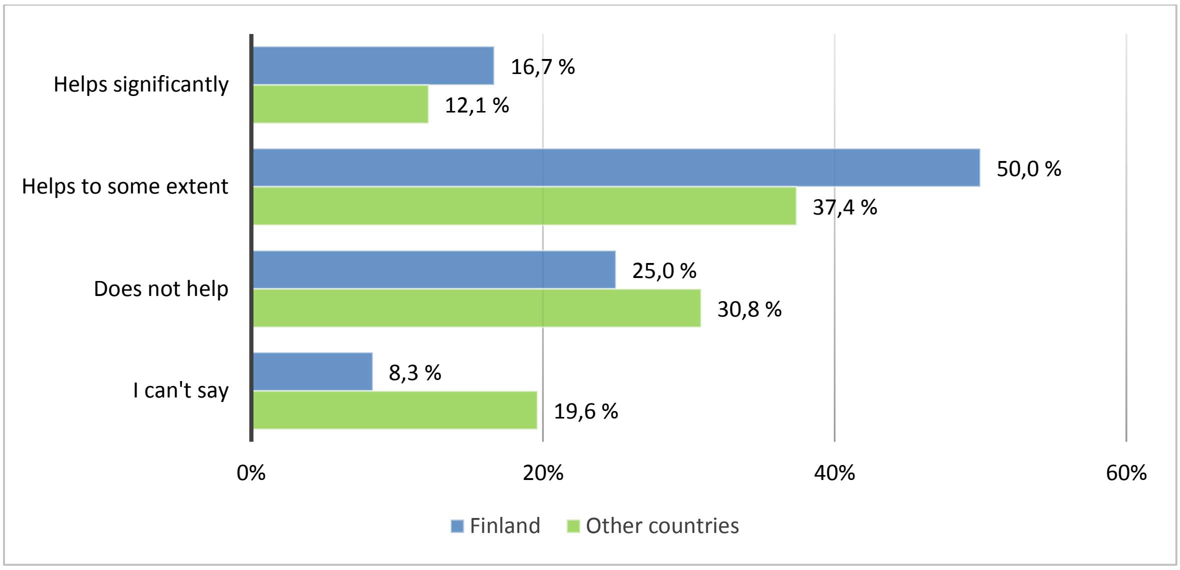

Figure 18. National implementation in Finland (N = 24) and in other countries (N = 74)

6.5 IDIS

The IDIS system is developed by the automotive industry to assist operators, including dismantlers, dealing with vehicles. If the respondent did not use IDIS or were not familiar with the system there were no refining questions. As we can tell from figure 19 IDIS is not widely used. From all respondents (n = 109) only 9.2% were using IDIS. 61.5% were not using IDIS and 29.4% were not familiar with the system.

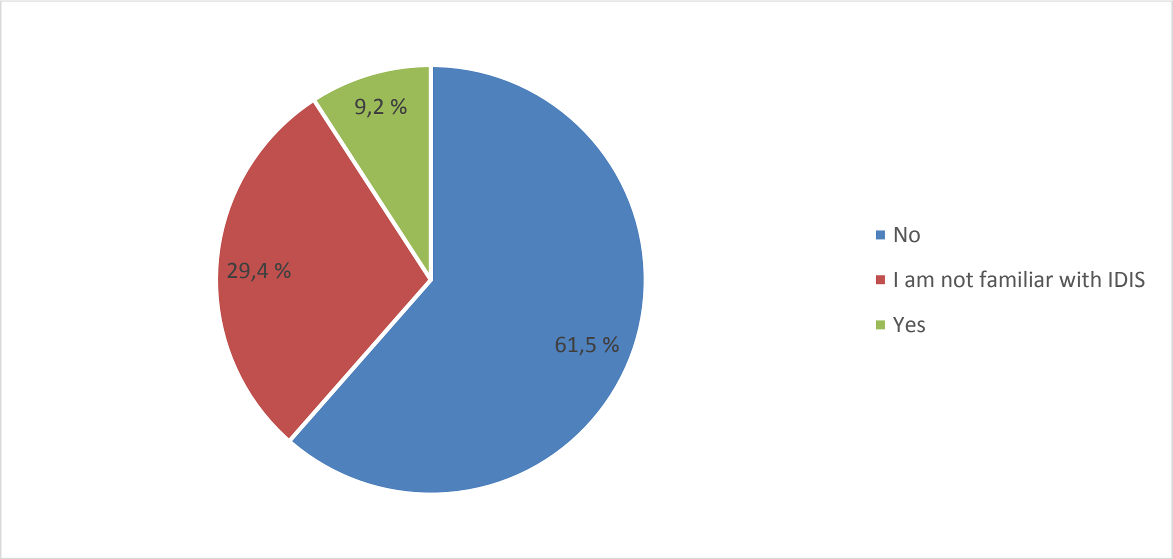

Figure 19. Use of IDIS. N = 109

The respondents were enquired in question 15 if they find the information they need from IDIS and in questions 16 they were enquired if the system should contain more detailed information on vehicles. Of the respondents (n = 10) 40% did not find the data they needed and all respondents to question 16 (n = 3) thought that IDIS should contain more detailed information.

6.6 Circular economy

The dismantlers were enquired in questions 18-19 about circular economy and its principles. Circular economy was familiar to 72% of the respondents as we can see in figure 20. Circular economy was least known in Poland, where 29.6% of the respondents were not familiar with circular economy and its principles.

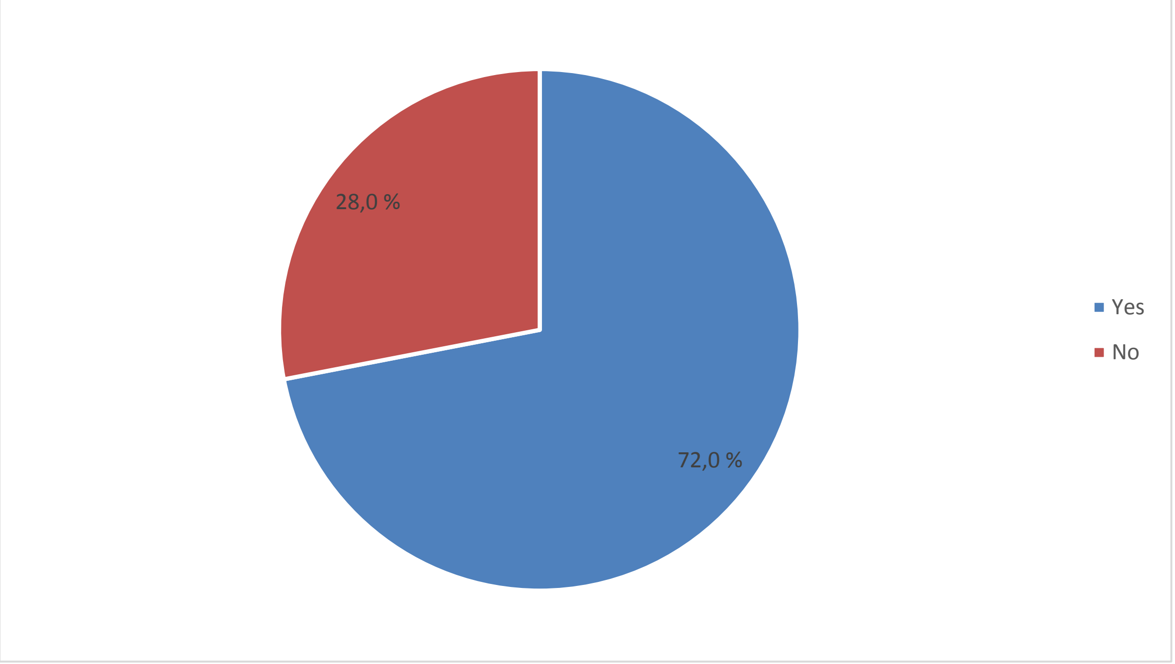

Figure 20. Familiarity of circular economy and its principles. N = 107

In question 19 the dismantlers were enquired which principle they consider the most important principle of circular economy. The respondents were able to choose only one option. As we can tell from figure 21 the Finnish respondents considered reuse as the most important principle. 37.5% of the respondents chose this option. 33.7% of the respondents from other countries chose this as the most important principle. Respondents from other countries thought that recycling was the most important principle when 42.2% of the respondents chose this option. The Finnish respondents chose this as second most important principle as 33.3% of the respondents chose recycling as most important principle.

Assuring access to raw materials was not important to Finnish dismantlers as there were no one who chose this option. Only 2.4% of the respondents from other countries chose this option as the most important.

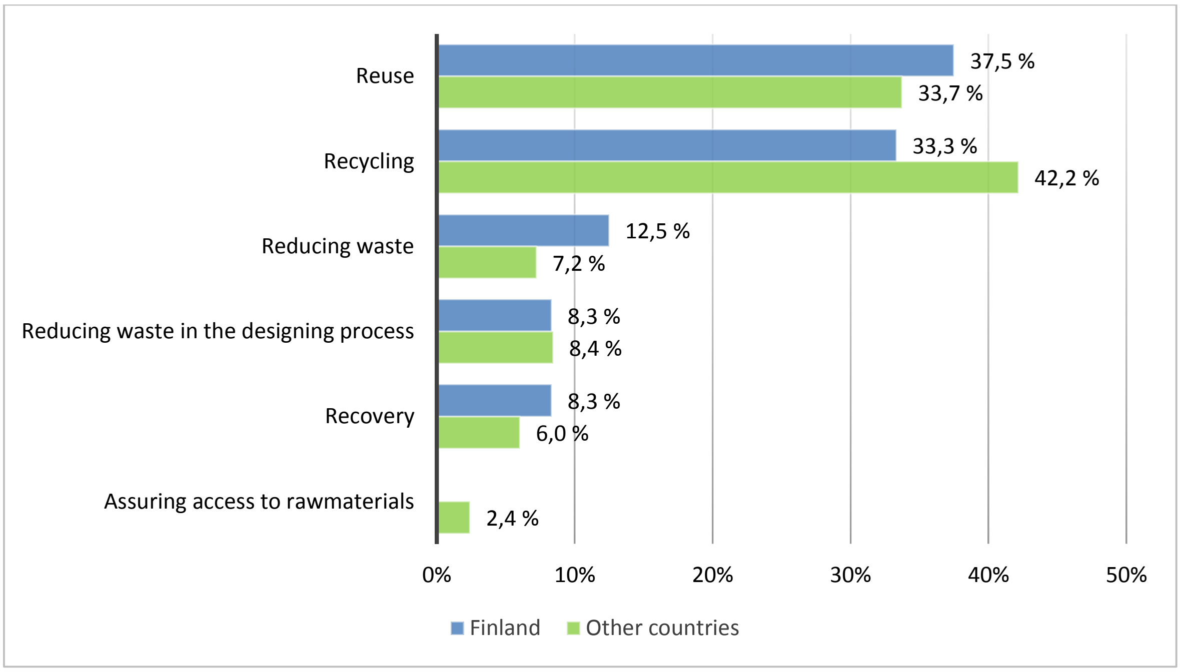

Figure 21. The most important principle of circular economy in Finland (N = 24) and in other countries (N = 83)

The respondents were enquired what they think their business need so they would be able to contribute more to circular economy in question 20. As we can tell from figure 23 thought 50% of the Finnish respondents that there should be more co-operation between OEMs and dismantlers. This option got even more support from other countries as 54.3% of the respondents thought this was needed more to contribute to circular economy. The most needed factor in other countries was more specific data on the car parts and materials used in cars from the OEMs. 66.7% of the respondents from other countries thought this was needed. There were some open answers to the question. An incentive, directing all ELVs firstly to dismantlers, less shadow economy and a recycling fee to cover reuse of goods were needed.

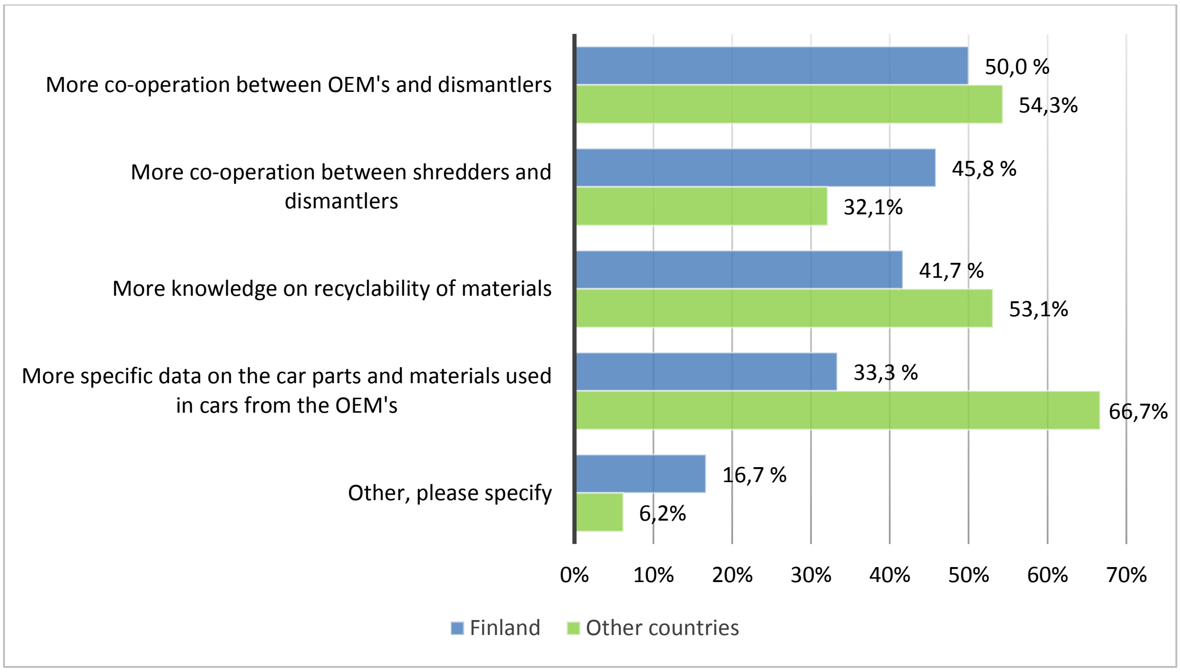

Figure 22. What the dismantlers need to be able to contribute more to circular economy. N = 107

6.7 Closing questions

When visiting Allbildelar at the Nordic Conference it became clear that dismantlers use a lot of different software in their operations. Question 21 enquired to what different purposes dismantlers use software. As we can tell from figure 23 the Finnish dismantlers use software mostly when issuing CoD’s. 91.7% of the Finnish respondents use software to this purpose. Only 68.7% of the other countries respondents use software when issuing CoD’s. There is only a slight difference using software in Finland and in other countries. In other countries software is mainly used for internet sales. 77.1% of the other countries respondents use software for this purpose and in Finland 75% of the respondents use software for internet sales. The biggest difference was in sales. 70.8% of the Finnish respondents use software for this purpose when in other countries it is used only by 44.6% of the respondents. From the results can be concluded that there are some differences between countries but all dismantlers still need many different software for their operations.

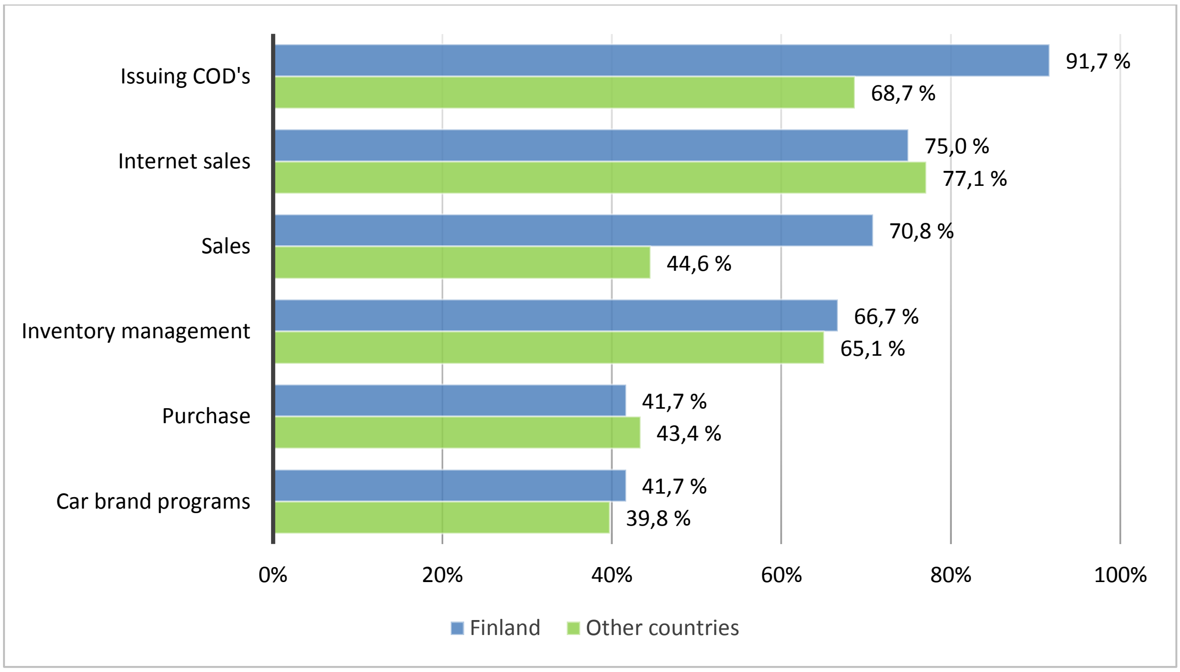

Figure 23. The use of software in Finland (N = 24) and in other countries (N = 83)

The challenges of the dismantling field were enquired in question 22. According to Laine (15 May 2015) are most entrepreneurs of an ageing generation and the dismantling field is not appealing to the younger generation. The profitability and attractiveness of the dismantling field are affected by the continuously tightening legislation, the stiffness of authorities' activities and the lessening effect the grey economy has on profitability. As we can tell from figure 24 the Finnish respondents thought getting newer material was the greatest challenge when 75% of the respondents saw this as the greatest challenge. It seems that getting newer material is not as difficult in other countries when only 54.2% of the respondents saw this as a challenge. Reaching the 95% target was considered in Finland as a challenge by 62.5% of the respondents and in other countries by 57.8% of the respondents. The flow of cars past the official channels was considered as a bigger challenge in other countries with an answering rate of 56.6% when in Finland the corresponding number was only 29.2%. The attraction of the field was not considered as a big of a challenge in other countries as in Finland, only 13.3% of the respondents from other countries saw this as a challenge when in Finland it was considered as a challenge by 29.2%. Other challenges were profitability in general, legislation, differences in rules in different areas create an uneven playing field, development in cars, electronic components and the lack of information from OEM's on parts numbers.

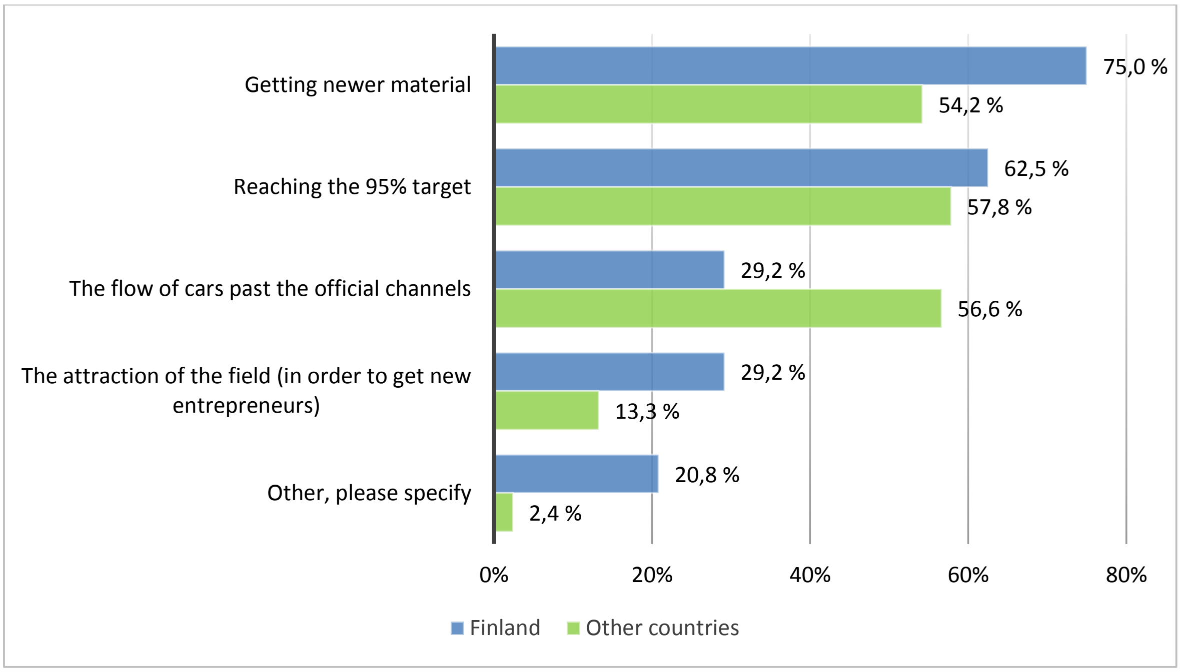

Figure 24. The greatest challenges in the dismantling field in Finland (N = 24) and in other countries (N = 83)

The producers' responsibility is defined in legislation. How it is fulfilled was enquired in question 23. As preface to the question producers' responsibility was explained. As we can tell from figure 25 the respondents thought that the producers' responsibility if fulfilled poorly or very poorly by 66.7% of the Finnish respondents. In other countries the producers' responsibility was considered even more poorly fulfilled when 73% of the other countries respondents thought the producers' responsibility was poorly or very poorly fulfilled. Only 1.2% of the other countries respondents thought the responsibility was very well fulfilled and none of the Finnish respondents thought it was very well fulfilled.

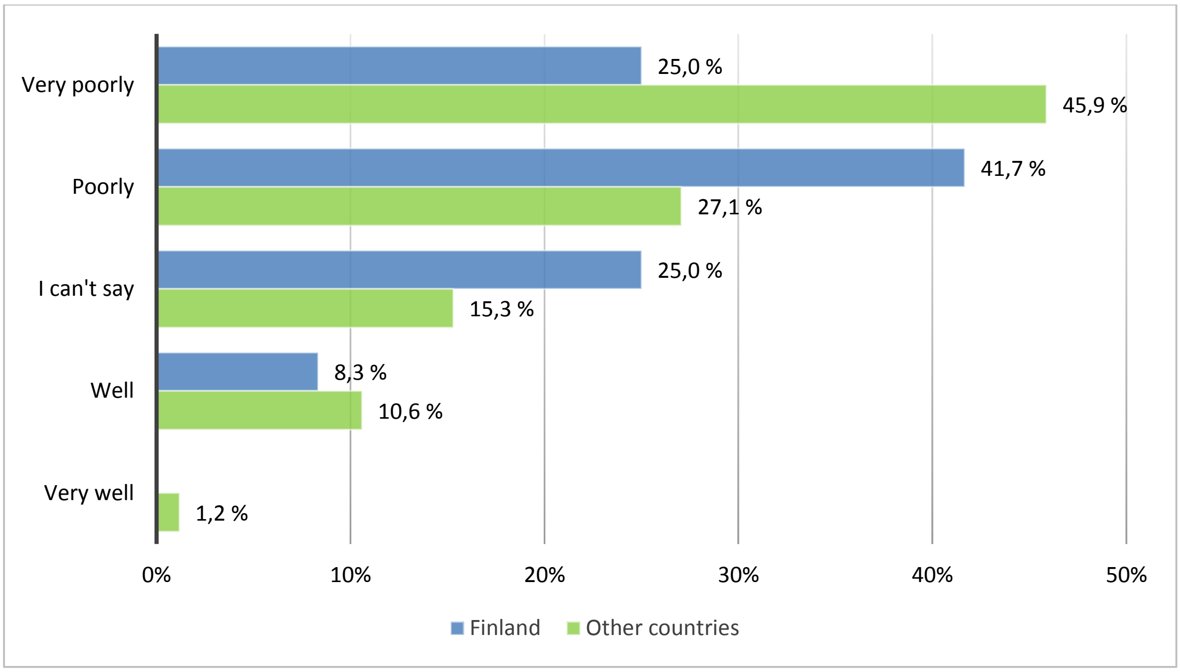

Figure 25. How the producers' responsibility is fulfilled in Finland (N = 24) and in other countries (N = 85)

There were 12 responses to the last question. The question was an open one. The Finnish respondents wanted more visibility for the association and with that to the dismantlers, more benefits for members and better information on the difference between temporary and permanent deregistration. The other countries respondents wondered the OEM's lack of interest in the total value chain, them sharing their technical data would contribute in making the sales of used car parts more structured, predictable and profitable.

6.8 Summary of the research

There were responses from several countries. There can however be no conclusions made between countries as the number of responses varied greatly. It would have been interesting comparing results more widely. There can be noted similarities between countries even if there are some differences as well. The responses from Finnish dismantlers were enough and they can be considered representative of the dismantlers operating in Finland.

The dismantlers in Finland are mainly small businesses, in average they employ 4 persons. The size of the dismantlers also affect the scale of operations. In Finland the average amount of annually dismantled vehicles is under 300. The single respondents dismantled between 100 and 700 vehicles annually. This is the smallest average of all respondent countries. In Finland all respondents sold car parts to be reused. The amounts varied between 0-10% and 51-60%. It can be concluded that reuse is achieved if ELVs are directed firstly to dismantlers and from there to the shredder.

Nearly all of the Finnish respondents thought that the consumers' awareness of the right process of ELVs should be increased. Increasing awareness could probably affect lessening on the grey economy which disadvantages the dismantling field. The illegal operators are according to the research one of the biggest issue of the field. The professionals of the dismantling field experience that temporary deregistration promote grey economy operations. Most of the respondents thought that temporary deregistration should be time-limited and there should be an annual fee. Getting newer material was experienced as the greatest challenge.

The lack of use of IDIS was surprising. Only less than 10% used the system and nearly 30% were not familiar with the system at all. More detailed information on car parts and materials used in cars were called for so that the principles of circular economy could be pursued. More information on recyclability was also called for. This kind of information should be in IDIS. Reuse and recycling were experienced as the most important principles of circular economy which are also by legislation primary methods. The producers' responsibility was experienced to be fulfilled poorly. Two thirds of the respondents thought that the producers' responsibility was fulfilled poorly or very poorly.

7 Reflection and development proposals

As Ellen MacArthur Foundation (24 July 2013) states, is the automotive industry dependent on raw materials and certain precious metals. Based on the results of the research are parts from ELVs only partly dismantled and materials are not separated from the ELVs treated in Finland. A point of view of the circular economy is, as the European Union (2 July 2014) has stated, that dangerous and difficultly recyclable waste lessen. Circular economy also encourages the consumers to reduce and sort waste. As accessing raw materials are estimated to weaken in only a few years (Waughray 2014) would it be appropriate to start proactively intervening the future issue. In the project Realize (2015) has carried out cars have been dismantled more accurately than nowadays and waste has been sorted. They have experienced that even if the dismantling is more time consuming can the operation still be profitable if rightly planned. Profitability does however demand a need for the dismantled materials. Ellen MacArthur (2014) has noted that circular economy is of interest to leaders, engineers and designers. Schools of thought presented in chapter 2 which have influenced circular economy all strive to develop products reducing waste. It is only a matter of time when the demand of recyclable material override the demand of raw material. From both economic and environmental view now is the time when dismantling ELVs should be developed to the direction of circular economy and ELVs should be dismantled more accurately than today.

The trustworthiness of the statistics of ELVs have awaken suspicion. In Finland has according to Tilastokeskus 61,954 passenger cars and SUV’s been deregistered in 2014. The number of deregistered vehicles have been almost the same since 2011. (Table 2). One faulty answer has been deducted from the responses of the members of SAL. The remaining 23 respondents have dismantled 6,150 vehicles in 2014. If all members of SAL, 61 dismantlers, dismantle all the average amount of vehicles (267) annually is the total amount of dismantled vehicles only 16,287. Even if the calculation is very simplified does a question arise: is the primacy set by legislation achieved in treating ELVs? Not according to the responses from the entrepreneurs in the dismantling field. There are other obscurities as well. According to Eurostat has there been 119,000 ELVs in 2012 when according to Tilastokeskus has there been, all vehicle categories included, only 62,259 vehicles deregistered. The difference is almost double. (Eurostat 2014; Tilastokeskus 2015) The question is what the deviations are due to and whether the statistics are reliable. According to the ex-post evaluation of the ELV Directive (European Commission 18 April 2014) a question of the reliability of reporting has risen. The reporting form is due to be modified but it is still not known if the member states still have an opportunity to report information on ELVs differently.

Table 2. Deregistered passenger cars and SUV's 2011-2014. Tilastokeskus 2015

Rekisteristä poistetut ajoneuvot maakunnittain 2011-2014									
		2014		2013		2012		2011	
		Lukumäärä	Keski-ikä	Lukumäärä	Keski-ikä	Lukumäärä	Keski-ikä	Lukumäärä	Keski-ikä
Manner-Suomi yhteensä	Henkilöautot	57566	20,4	57486	20,3	61088	20,4	61015	20,4
	Pakettiautot	4388	20,1	3922	20,2	3757	20,2	3301	20,6
	Yhteensä	61954	20,3	61408	20,3	64845	20,3	64316	20,5

Autoalan Tiedotuskeskus has published a brochure in 2015 in which they claim that the 95% target defined in the ELV Directive has been achieved in Finland already in 2011. (Autoalan Tiedotuskeskus 2015, 14) According to the respondents to the enquiry and to the interview of SAL's chairman it can be concluded that the declared result can be considered at least questionable. It can also be concluded that the primacy set by legislation, reuse, is not achieved in Finland. There are 279 ATF's in Finland. Most of the dismantlers are members of SAL and there are 61 members. When only dismantlers sell used car parts reuse is made possible in only just over 20% of ATF's. There are many operators in the dismantling field and in interest to all of them is to make profit. Making profit often override other factors such as environmental point of view and the principles of circular economy. Operators give compensation of scrap metal whether parts have been dismantled or not. Dismantlers get their livelihood selling dismantled parts. The other ATF's get their livelihood mainly from scrap metal alone.

Circular economy is a cornerstone of sustainable development. Experts strongly believe that there is place for economic growth in circular economy and that even in Finland hundreds, or if not thousands, of jobs can be created around circular economy. Finland should move over to a similar model as in Denmark, Ireland, Netherlands, Norway and Sweden where only dismantlers are allowed to issue CoD's. This way the goal set by legislation can be achieved and dismantlers can be assured access to adequate material.

Legislation require producers' responsibility handling ELVs. According to the responses of the enquiry it can be concluded that the producers' responsibility is not fulfilled as required and that co-operation should be increased between dismantlers, shredders and OEM's. All operators in the dismantling field should have the same goal: achieving the 95% goal following the principles of circular economy. The IDIS system (IDIS 2015) is meant to support the dismantling field. As we can see from the results of the enquiry the system is used in only a fraction of the dismantlers. The dismantlers that use the system call for more detailed information on vehicles. OEM's should be required more detailed information on availability of parts, can a dismantled part for example be used in another manufacturers vehicle.

Temporary deregistration is considered as an issue in Finland. The owner of a vehicle can remove the vehicle from the registry after which the payment of insurance and vehicle tax is cut off. Temporary deregistration is a one-off settlement after which the vehicle is out of the registry for as long as it has been registered for traffic use again. (Trafi 2015) Based on the results of the enquiry the dismantling field consider that temporary deregistration enables grey economy and prevents fulfilling the Directive. Enabling export of vehicles and their parts is from an environmental point of view very unethical. ”Out of sight, out of mind” –point of view is very short-sighted considering the environmental problems developing countries already face. (Youtube 24 January 2013) The meaning and execution of temporary deregistration should be re-considered in Finland. In my opinion would it be appropriate to take in use a time-limit for deregistration. Deregistration could be prolonged for an additional fee, but there should be a maximum time set. The statistics should be updated and the real fate of the deregistered vehicles should be resolved: how many vehicles are in fact still in Finland and how many have disappeared abroad. In practice this might be difficult to accomplish.

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