Study on items shipped for reuse and Extended Producer Responsibility fees

A case for extending EU EPR fees to cover end-of-life activities of products shipped outside the EU

Circular Innovation Lab
for the
European Environmental Bureau

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EEB European Environmental Bureau

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TABLE OF CONTENTS

Executive summary

National and international circular economy policies have grown in popularity across the globe since the first such national policy was published by Japan in 2003. New methods are being created to pursue the goal of sustainable consumption and production with key circular principles: reduce, repair, refurbish, recycle. As part of this policy shift, Extended Producer Responsibility (EPR) schemes have become central to national plans since their introduction in the late 1990s. EPR aims to carry end-of-life costs back to the producer, to incentivise circular design and finance the establishment of waste management infrastructures. They have been implemented across the European Union and are increasingly extending to South-East Asia and Africa. As individual countries take steps towards a more circular economy, the international community must ensure such shift is reflected globally and is not fragmented. Circular economies often rely on imported materials and products, making international trade an essential component of the transition to more circular national economies. This is the case for the import and export of products for reuse and refurbishment.

However, in the current state of play, importing countries often receive 'used products' that are in fact no longer functional, or simply waste, thus not immediately reusable. Although the 1992 Basel Convention strives to prevent the trade of hazardous waste, there is still much to do to enforce appropriate export labelling, better distinguishing between products exported for reuse and waste streams, and ensuring a suitable end-of-life management. At the core of this study is the fact that, currently, EPR fees do not follow the products shipped for reuse to importing countries. This situation keeps the EPR fees within exporting countries, depriving receiving countries of the financial coverage for end-of-life treatments.

This study, therefore, attempts to estimate the total EPR fees that are retained in exporting countries' Producer Responsibility Organisations (PROs) and therefore not made available in importing countries to ensure the proper end-of-life treatment of the shipped products (once these become waste). This study, therefore, wishes to inform the case for new global EPR policies.

In the writing of this study, qualitative research was conducted on existing literature from the Organisation for Economic Co-operation and Development (OECD), United Nations (UN) agencies, and other organisations. Primary and secondary data sources were used to calculate trade flows in Electric and Electronic Equipment (EEE) and vehicles from Eurostat, OECD, Chatham House, the World Bank, UN Comtrade, and the International Trade Centre (INTRACEN). Interviews were held with market leaders in Ghana and Nigeria to develop case studies in Chapter 5. Data availability for estimates on trade flows of waste, used goods, and EPR fees is very limited. As the Harmonised Commodity Description and Coding System, used at World Trade Organisation level, does not differentiate between recycled materials and used goods, it is impossible to separate data streams. Therefore, this study has relied on data collected from intercepted shipments and studies conducted by other researchers and the UN.

Currently, the European Union has well-established EPR policies. Five EU policies include EPR: the Waste Framework Directive (WFD), the Waste Electrical and Electronic Equipment (WEEE) Directive, the Packaging and Packaging Waste Directive (PPWD), the End-of-Life Vehicle (ELV) Directive, and the Batteries and Accumulators Directive (BAD).

The WFD succeeded in increasing collection and recycling rates of Municipal Solid Waste (MSW), but there is still little evidence or incentive for circular practices. Under the WEEE Directive, EPR is used to financially support electronic waste management, complementing eco-design requirements for Energy related products set under the Ecodesign policy. The ELV Directive covers, so far, the end-of-life of vehicles, aiming to recycle and recover most materials. However, the EPR scheme in the ELV directive is not fully formed: some materials (such as plastics, critical raw materials, and glass) are not targeted, and the costs for dismantling and recycling are not properly addressed. Despite some level of EPR schemes harmonisation across the EU, none of these policies allow fee transfers across borders outside of the Union.

Moreover, even within the EU, approaches are heterogenous and sometimes incompatible. Despite its mention in waste legislation at the EU level, there is no obligation to include such eco-modulation policies in national law. In France, for instance, EPR schemes are more robust than in other Member States, including eco-modulation which bases fees on the extent of eco-design features within the product, but this is still an exception.

This study focuses on the electronics and automotive sectors, and the related EPR fees between the EU and African countries, as a significant proportion of international trade in waste materials and used goods exists between these regions. The EU, for example, is responsible for one-third of all Used Electric and Electronic Equipment (UEEE) exports to Africa (Hemkhaus et al., 2020).

The majority of EEE products consumed in Africa are imported. Therefore, there are significant challenges in the implementation and enforcement of EPR schemes in Africa, as these do not currently cover goods that are not produced domestically. To account for this, countries such as the Ivory Coast, Cameroon and Ghana often emphasise policies targeting consumers, and not the role of importing or manufacturing organisations, while Nigeria is working to incentivise waste collection, specifically for EEE, through Producer Responsibility Organisations (PROs) and Minimal Collection Incentives.

In terms of end-of-life vehicle (ELV) management, African economies exhibit limited infrastructure. Between 80-90% of vehicle consumption growth in the next decade is predicted to come from used vehicle imports (UN 2020). Therefore, it is important to develop robust international flows of EPR fees to finance recycling infrastructure capacity for ELVs.

Currently, only 21 out of 54 African countries have implemented imported vehicle age restrictions, while a UN study found that only one country (Mauritius) has "very good" import policies for used vehicles (UN 2020). The need for stronger import policies is clear. For instance, more than 80% of used vehicles exported from the Netherlands (a key exporting port) to Africa were below Euro 4/IV emission standards.

Currently, only 17 out of 54 African countries have EPR policies in place, many of which do not cover imported (second hand) products. Without flows of EPR fees between exporting EU countries and importing African countries, African economies face huge pressure to handle all imported used goods that demand refurbishment and/or waste management. Within African economies, there are limited financial leverages to recycle or refurbish used goods, and informal landfilling and incineration are common.

To remediate to this situation where waste management duties are de facto delegated to already struggling economies as they import used goods and materials from the EU, without ensuring the related financial means to support end-of-life activities, this report recommends to investigate how EPR fees paid in EU could follow the products when they are legally shipped to trading partners outside the Union.

EEE trade between the EU and Africa has the potential to bring new technology, business growth, and greater access to low-cost second-hand goods to African economies. Nevertheless, trade in EEE suffers many challenges such as mislabelling, forged documents, a lack of resources at the African customs, and a lack of enforcement of import policies. The Basel Convention does not cover used products, leaving loopholes in the international restrictions to waste trade. With these issues combined, despite bans on WEEE, the Global North is still able to send near-end-of-life products to African countries, which are often partially – and illegally – made up of waste. For example, the Hinckley recycling group in Nigeria claims that about 70% of all Used Electrical and Electronic Equipment (UEEE) imported is in fact Waste Electrical and Electronic Equipment (WEEE), while around 20% of all imports are not recorded because of poor border control in the country. Furthermore, LCD-TVs and flat panel monitors account for 18% of the UEEE imports in the country but 55% of these imports are not functional. Thus, robust EPR flows between exporting and importing countries are key to tackling mislabelling and the trade of faulty goods.

Estimates on EEE trade show that between 1.8 and 8.8 million tonnes are exported to emerging economies, meaning up to 4.3 megatonnes of EEE are exported to Africa annually.

We estimate that African economies miss out on an estimated 340-380 million in EPR fees associated with EEE trade each year, based on averaged data from Ireland, France, Germany, and Denmark.

In addition, used cars trade could also bring significant benefits to African economies. However, a substantial portion of the used vehicles that are currently traded do not meet basic environmental requirements in the EU. This entails health risks in importing countries due to air pollution and technical failures. Besides, the traceability of discarded vehicles is too often problematic. As many EU countries transfer used vehicles to the Netherlands for shipping, there is a significant lack of data on original exporting countries. Currently, Germany is identified as the leading European exporter of used vehicles. In 2019, leading African importers, Nigeria and Libya, imported 171,248 and 148,668 used vehicles respectively.

According to current estimates, 3.4 to 4.7 million ELVs could be exported illegally each year (Kitazume et al., 2020), on top of 1.8 million confirmed exports, 40-60% of which originates in the EU. Thus, the total of exported vehicles could range between 6.4 million and 8.9 million. With a conservative estimated average ELV EPR fee of 46 EUR, total EPR fees that do not follow vehicles to Africa would then range between 294.6 million EUR and 409.4 million EUR. It should be noted that vehicles EPR schemes in the EU do not currently cover vehicles heavier than 3.5 tonnes.

This study is complemented by two case studies by Footprint Africa on African importers. The case studies provide a more detailed analysis of the African experience of used EEE and used vehicles trade, and demonstrate the opportunities and risks under the current situation.

The first focuses on Lapaz, a suburb of Accra, Ghana, which is a major hub for imported second-hand goods including clothing, EEE, and furniture. Goods passing through Lapaz strengthen the local economy with entrepreneurship and employment for dealers, importers, the Ghana Ports Authority, third party agents, and scrap dealers. Imported UEEE is much cheaper than new models, allowing greater access to EEE. Some used electronics from the EU are also considered of higher quality than new ones available on the market. However, interviews with local importers reveal that up to 30% of imported goods are not fully functional and require repair. Goods that cannot be repaired still find a purpose and are sold to scrap dealers who retrieve useful materials, but may not fully ensure a decent treatment of residues.

The second case study focuses on the imported used car industry in Nigeria, which is the most significant destination for imported used cars in Africa. The EU is responsible for a significant number of imported cars, over 170.000 in 2019 according to the UNEP. The value chain of imported cars consists of several steps and involves various stakeholder groups. Collective effort and commitment are therefore required from all stakeholders involved to make sure a sound environmental management takes place when dealing with waste materials from vehicles. This effort should be financed the same way it is done in the EU – via EPR schemes. However, the case study shows that no EPR fund is transferred from the exporting countries to Nigeria.

Following the analysis above, this publication provides policy recommendations in three directions: EPR schemes in general, EEE sector, and vehicle sector. With regards to EPR schemes, there remains significant differences between policies across the EU. A lack of harmonisation creates issues in terms of data-reporting and cross-border transfers. Therefore, this study makes the case for increasing coherence among EPR schemes across the EU.

Several studies have recommended increased Extended Producer Responsibility (EPR) fees and implementation of eco-modulation. However, these recommendations have not been implemented. For example, eco-modulation criteria are not clearly defined in EU laws, and when existing remain very low, consequently, they do not necessarily perform to transform the market. Also, if fees remain too low, they cannot be relied on to cover the costs of a sound end-of-life for each product. Therefore, this study recommends eco-modulation fees for goods with high value retention potential, such as vehicles and batteries, as well as the introduction of Ultimate Producer Responsibility (UPR) schemes. In that perspective, it suggests connecting international EPR systems through Producer Responsibility Organisation (PROs) to facilitate transfers of fees alongside transfers of products.

For EEE streams, greater testing and reporting at the export stage is required, alongside an increased number of surveillance activities at testing stations to ensure goods are clearly identified as UEEE or WEEE. To support this, definitions in the WEEE Directive should be strengthened, including a set of minimum functionality requirements. Greater border controls and monitoring is crucial to prevent the illegal trade of WEEE. With greater controls and tracing, these recommendations will enable the transfer of EPR fees via UPR schemes.

Currently, trade in vehicles is not sufficiently monitored. Due to the difficulty of extracting components and materials from end-of-life vehicles, potential reuse and recycling opportunities are often overlooked. Furthermore, the standing ELV Directive does not include the introduction of similar EPR schemes as in the EEE or battery sectors.

For future revisions of the ELV Directive, this study recommends the introduction of fees to be associated to each vehicle, built into a type of digital product passport. A revised directive should include mandatory EPR schemes alongside binding monitoring and reporting guidelines, thus ensuring the traceability of vehicles from the placement on the market until the final dismantling and disposal.

A clear allocation of responsibilities is required to guarantee that producers bear the costs of sound treatment and disposal, and not only let the treatment facilities optimize end-of-life costs. The introduction of Digital Product Passports is recommended to support product tracking, including the related EPR fees.

Finally, it is crucial that the ELV Directive covers all vehicles as far as possible, and therefore include guidance for vehicles heavier than 3.5 tonnes, motorbikes and trucks.

Overall, this would ensure greater transfers of EPR fees to cover management costs, not just for the vehicles that are already covered under EU EPR schemes, but for all ELVs traded between the EU and Africa.

LIST OF ABBREVIATIONS

ARN	Auto Recycling Nederland
ASR	Automobile Shredder Residue
ATF	Authorised Treatment Facility
CE	Circular Economy
CoD	Certificates of Destruction
CO2	Carbon Dioxide
CRT	Cathode-Ray Tube
DPP	Digital Product Passport
EC	European Communities
ECOWAS	Economic Community of West African States
EEE	Electrical and Electronic Equipment
ELV	End-of-Life Vehicle
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
ESM	Environmental Sound Management
EU	European Union
EUR	Euro
EV	Electric Vehicle
GACERE	Global Alliance on Circular Economy and Resource Efficiency
GHS	Ghanaian cedi
(H)CFC	Hydrochlorofluorocarbons
HS	Harmonised Commodity Description and Coding System
ICT	Information and Communication Technology
INTRACEN	International Trade Centre
IT	Information Technology
ITU	International Telecommunications Union
LCD	Liquid Crystal Display
MCI	Minimal Collection Incentive
MS	Member States
N	Naira
NCS	Nigerian Customs Service
NESREA	National Environmental Standards and Regulations Enforcement
OECD	Organisation for Economic Co-operation and Development
PiP	Person in the Port
PRO	Producer Responsibility Organisation
SUV	Sport Utility Vehicle
TV	Television
UEEE	Used Electrical and Electronic Equipment
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
USD	United States Dollar
VIN	Vehicle Identification Number
WCEF	World Circular Economy Forum
WEEE	Waste from Electrical and Electronic Equipment
WFD	Waste Framework Directive
WTO	World Trade Organisation
ZICTA	Information and Communications Technology Authority
ZRA	Zambia Revenue Authority

Introduction

The measures taken by governments worldwide to transition towards a circular economy are still largely limited to their national borders (regional borders in case of EU). However, international cooperation is increasingly essential in this field. The circular economy operates on the principle of reducing waste and maximizing the lifespan of goods through practices such as reduction, reuse, repair, refurbishment, and recycling. By focusing on upstream design interventions, the goal is to extend the material lifecycle of products, promoting sustainable and efficient resource use while minimising waste.

Consequently, it is pertinent to ensure a strong connection between circular economy policies and trade policies for the transition to be successful. The need for coherent circular economy policies between exporting and importing countries is essential because EU policies and practices can affect waste management policies, as well as the reuse and recycling techniques, of importing countries (Rademaekers et al., 2020). Furthermore, the EU transition towards circular resource use creates both negative and positive spillover trade effects for exporting and importing countries.

In Europe, the circular economy and trade policy framework is steered by the European Commission in the form of global circular economy partnerships, notably the GACERE initiative (UNEP, 2021). These initiatives could foster monitoring progress and incorporating circular economy objectives in Free Trade Agreements. As a specific trade feature, trade in used goods provides Europe with access to global markets, the opportunity to achieve potential targets for reuse, and the ability to extend product life, thus saving on resource use.

The European market for second-hand and used goods is limited, therefore many of these goods are shipped outside the EU. In doing so, importing countries, usually emerging economies, benefit from increased access to products at a lower cost. However, the importing countries receiving goods for reuse may not be fully equipped and financed for a proper handling of the end-of-life stage. Notably, they often receive used products that are either non-functional or should be classified as waste. In these situations, trade in used goods for reuse could lead to significant social and environmental negative externalities that may even outweigh the benefits.

Following a public outcry in the 1980s caused by the dumping of toxic waste in Africa and other emerging economies, the Basel Convention was adopted in 1989 and entered into force in 1992 to control transboundary movements of hazardous wastes and their disposal. Despite this progress, several studies have shown that the problem is far from being solved. Findings reveal, for instance, that one-fifth of all shipments that left Europe between 2008 and 2010 contained waste, in violation of national waste regulations and export bans (Baird et al., 2014).

To address waste management issues, over the past few decades the European Commission has enacted several policy measures that aim at driving a sound waste management. One prominent policy tool is the Extended Producer Responsibility (EPR) scheme, which shifts the financial responsibility of waste management from the public sector and taxpayers to the producers. One aspect of EPR schemes includes the levy of fees from the suppliers of products. These fees are then used to collect, treat and dispose of discarded goods according to EU regulations. EPR is a well-established policy approach in the EU, but there are currently several issues and loopholes connected to it.

One of the biggest problems, when used goods are exported, is that the EPR fees collected in exporting EU countries do not follow the products to the importing countries. This means that, once the product leaves the country where it was first placed on the market, the utility of the EPR fee is undermined: the fees do not actually support an environmentally sound management of the exported products in the country of destination, while the traceability is hindered.

The aim of this study is to gain a preliminary understanding of the volumes of products shipped for reuse beyond the EU, and to estimate the sum of EPR fees that remain with exporting European Producer Responsibility Organisation (PROs) for vehicles and EEE streams that are exported, but not followed by collected EPR fees. The study investigates exports from EU Member States to African countries, focusing on electronics and vehicles, touching upon batteries and textiles. It also uses available information to extrapolate future trends and trade flows caused by policy changes.

The study starts with a short literature review on EPR and EU policies, followed by an analysis of the current situation of shipments for reuse from Europe to Africa. It also estimates the accumulated EPR fees associated with specific product streams, and conducts a comparative analysis of various developments and initiatives in African countries. Finally, it presents concrete policy recommendations for future revisions of European policies and legislations to ensure the effective use of EPR as a mechanism when used goods are exported beyond the EU.

1.1 Methodology

The methodological approach of this study covers both the qualitative and quantitative aspects. It draws on existing literature from the Organisation for Economic Co-operation and Development (OECD), UN agencies, the European Commission and national PROs, as well as previous scientific research on the topic. Additionally, consultations and bilateral meetings were conducted at the World Circular Economic Forum event (WCEF) in December 2022 in Kigali with key stakeholders. An interview conducted at the forum with Israel Olagunju from the Nigerian Hinckley e-waste recycling plant gave knowledgeable insights into the situational picture where lack of data was a challenge.

The collection of data comes from primary and secondary data sources to estimate the annual quantities of EEE, batteries, vehicles, and textiles exported for reuse beyond Europe, including mapping of the exporting and importing countries. The databases used included Eurostat, OECD, Access2Markets, Chatham House, The World Bank, UN Comtrade and The International Trade Centre (INTRACEN).

In the mapping of the available information, product streams of EEE and vehicles are targeted in more detail, as these two streams are highly relevant in the current market scenario and are affected by the changing landscape of EU legislation. With EEE now placing a greater emphasis on circularity,

hazardous waste generation, health impact, and the dependence on critical raw materials, and with vehicles transitioning from combustion engines to electric, there are valuable insights to be gained from these streams that will remain essential going forward.

In the following chapter, the study delves deeper into the specific EU policies and regulations setting up Extended Producers Responsibility regimes.

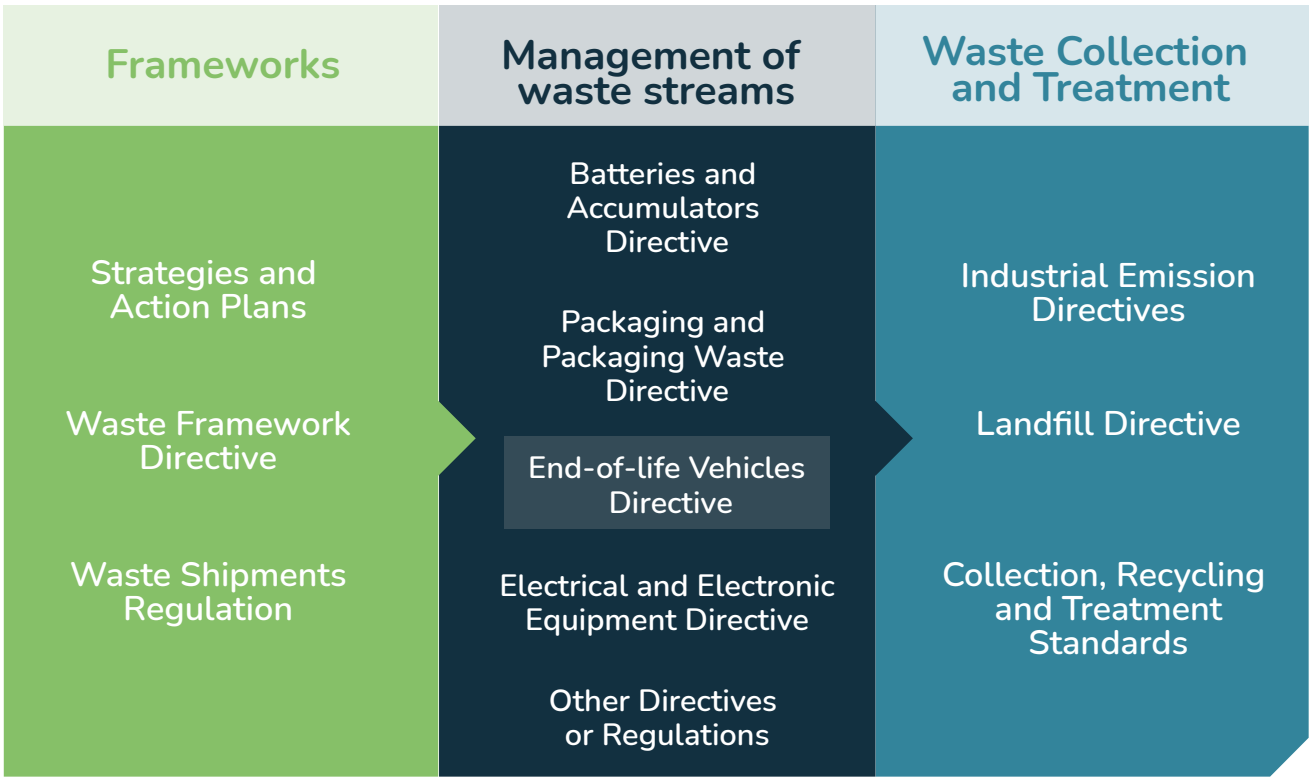
Chapter 2

Analysis of EU Policies on Extended Producer Responsibility (ELV, WFD & WEEE)

Extended Producer Responsibility (EPR) is defined as “an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle” (OECD, 2016[1]). EPR schemes reallocate the responsibility for waste management costs to producers instead of the conventional approach where governments, municipalities or taxpayers have to bear products waste management costs (Monier et al., 2014). Therefore, EPR is supposed to incentivise producers to manufacture more environmentally friendly products where waste is limited, and where the end-of-life costs are calculated and covered when products are put on the market.

In the EU, Extended Producer Responsibility first appeared as a policy approach in the late 1990s (Monier et al., 2014). Today the European landscape provides a general legislative framework to adopt EPR in Member States, which is regulated by several directives on waste management and waste streams. EPR is encouraged as an instrument for the implementation of the European Waste Hierarchy (Monier et al., 2014), and it is introduced as a policy approach under the following directives: (1) the Waste Framework Directive (WFD) 2008/98/EU, (2) the Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU, (3) the Packaging and Packaging Waste Directive 94/62/EC, (4) the End-of-Life Vehicle (ELV) Directive 2000/53/EC and (5) the Batteries and Accumulators Directive 2006/66/EC (figure 1).

Figure 1: EPR in the EU - Policies and regulatory frameworks on waste, own production based on Ahlers et al., 2021



Even though EPR schemes are supposed to support the development of circular products, whole lifecycle thinking, and circular economy principles (such as upstream design and reuse) are rarely included in the discussion. This means that, in practice, EPR schemes focus primarily on waste management, recycling and disposal of products. Currently, waste prevention is not prioritised as there is no incentive for producers to differentiate between products manufactured for reuse, recycling, repair and remanufacturing in the EPR system (Sachdeva et al., 2021). While circularity and the practices that promote longer product lifecycles are not yet fully promoted by existing EPR schemes, there have been recent initiatives aimed at encouraging these schemes to focus more on influencing the product design process (e.g., via the eco-modulation of the EPR fees).

To look at the issue of how EPR can promote design and upstream improvements, a study by the European Environmental Bureau and the Ecologic Institute found that EPR fees for producers are still small compared to products' prices. For example, the EPR fee for a 300 EUR laptop would amount to 0.42 EUR. The fee is calculated with the aim to guarantee that enough money is collected to meet the EU collection and recycling targets, but not as a tool to guarantee that each single item will be properly dealt with in its end-of-life stage. An additional EPR eco-modulation scheme, as introduced in France, could be used to incentivise the producers to develop eco-design for their products. Under that eco-modulated system, the fees are based on the product's "level" of eco-design (Micheaux & Aggeri, 2021).

Today in the EU, EPR schemes have been devised for various products such as electronics, batteries, vehicles, plastics, packaging and textiles; however, the implementation has been heterogeneous, notably as the implementation and enforcement of EPR policy is performed at the national level.

Different types of materials and products have unique qualities and properties, which means there is no one-size-fits-all solution. To handle the different actors involved, specific product features, and the methods used to collect and treat waste, a differentiation by material and product is necessary. This means there are varying levels of complexity for each waste stream that require different system adaptations.

When implementing EPR schemes, countries and eventually companies can choose to organise through collective or individual systems. Individual system puts the responsibility of organising collection and treatment on the concerned producer, while in the collective system, the responsibility is based on the collaboration between multiple producers, which results in the creation of a PRO to which the responsibility is delegated (Sachdeva et al., 2021). The European Commission defines a PRO as "a collective entity set up by producers or through legislation, which becomes responsible for meeting the recovery and recycling obligations of the individual producers" (Monier et al., 2014, p.7). This means that PROs are responsible for ensuring that producers follow legislative requirements.

The implementation challenges of EPR schemes can be attributed to the lack of harmonised rules on the matter, which creates considerable differences between EPR standards taken by producers in different countries. According to Monier et al. (2014), Pouikli (2020) and Ahlers et al. (2021), the implementation of EPR schemes across EU Member States can be improved through: (a) increased consistency in EPR schemes in the Member States; (b) the distribution of knowledge on best-practices (c) the integration of eco-modulation fees into the different EPR schemes; (d) the integration of control mechanisms and (e) the promotion of the reuse schemes when there are ecologically and economically feasible options that ensure smooth and efficient functioning. Additionally, Pouikli (2020) finds that stakeholders involved in the EPR system generally showcase a lack of enforcement and compliance.

Figure 2: Responsibilities of the different actors involved in the EPR scheme, own production

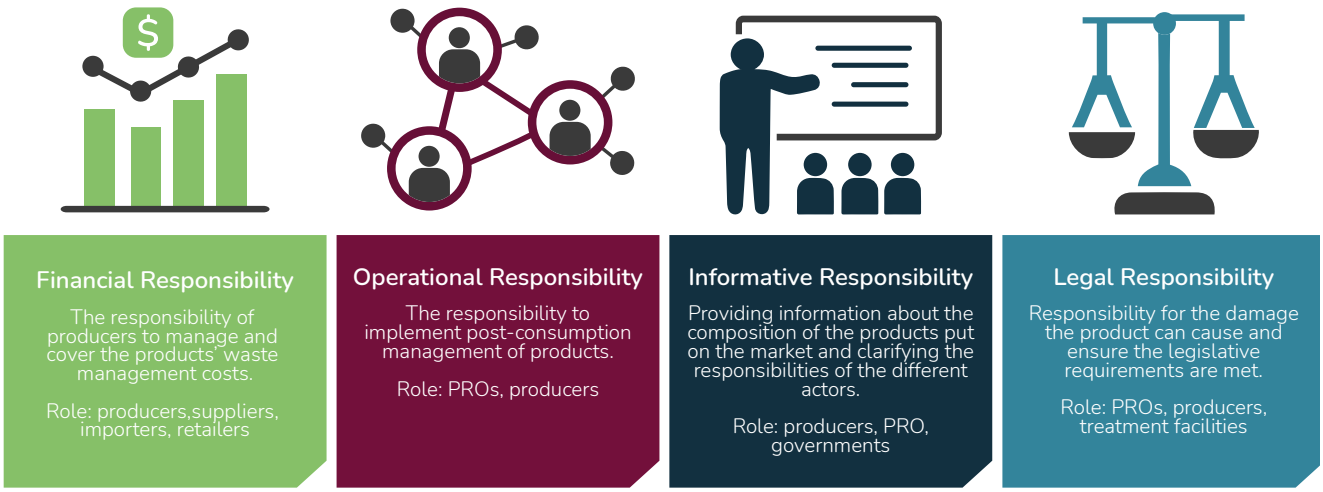


Figure 2 portrays the responsibilities of the different actors involved in EPR schemes. In the EU, EPR schemes aim to ensure that producers and importers are financially responsible and logistically support waste management actors within their national borders. But once the product is exported, producers are no longer held responsible for its waste treatment (Thapa et al., 2022). This implies that, when a product is exported, there is minimal possibility of monitoring its fate once it has crossed

national boundaries, especially if is sent outside the EU. This crucial global challenge of EPR schemes needs to be addressed to allow multiple lifecycles (reuse and second-hand) and transboundary trade of products to be accounted for.

In 2022, research on EPR schemes proposed that these should transition to UPR (Ultimate Producer Responsibility), which would ensure financial transfers between domestic EPR schemes and importing economies. UPR fixes a major shortcoming of EPR by following the exported product from the exporting to the importing country and across multiple lifecycles (Thapa et al., 2022). By including multiple lifecycles for products and more accurately estimating the value of produced goods, the UPR aims to trace and monitor products across borders and along their entire lifecycle.

2.1 Waste Framework Directive (2008/98/EU)

The current WFD encourages Member States to reach certain levels of material collection and recycling rates. However, while Member States are required to meet these objectives, they are free to implement them into their national legislation at their discretion. Therefore, different collection and treatment systems may be adopted by different countries, while the responsibility for such systems is often placed on varying actors across Member States. While the WFD does increase collection and recycling rates by implementing related targets, Compagnoni (2022) questions whether it fosters circular practices due to the lack of incentive for producers to proactively engage in circularity (e.g.., design for the environment, beyond recycling).

The WFD introduces the EPR regime through Article 8, which explains that Member States can take legislative and non-legislative measures to ensure the producers implement EPR to promote reuse, prevention, recycling and recovery of waste (Directive 2008/98/EC). Producers in Member States can choose to take on various financial and organisational responsibilities of product life cycle and waste management, but they must meet the general minimum requirements laid out in Article 8a (DIRECTIVE 2008/98/EC). According to Article 8a, as part of the WFD, all roles and responsibilities of involved actors should be specified.

As stated in Article 8(3), provisions that support the use of EPR require Member States to implement measures that encourage producers to take environmental factors into account during product design. Moreover, the Article states that the Commission will organise the exchange of information between Member States and producers under the EPR scheme to ensure cross-border cooperation and the reinforcement of the internal market (Directive 2008/98/EC). Then through Article 8(4), Member States are obliged to ensure proper product waste management.

2.2 WEEE Directive (2012/19/EC)

The Waste Electrical and Electronic Directive is an EU directive that introduced EPR as a policy tool to counter electronic waste. The main objective of the WEEE Directive is to ensure that the producers of electrical and electronic equipment (EEE) meet collection and treatment targets and support recovery facilities for the waste management of their products. The directive aims to promote the reuse and proper treatment of waste electrical and electronic equipment (WEEE) through design requirements. The design requirements encourage eco design (reuse, dismantling and recovery) throughout the

whole product lifecycle. Moreover, the introduction of the EPR scheme in the directive is to further encourage design and production that fosters reuse, recycling, dismantling, repair and upgrading (DIRECTIVE 2012/19/EC).

In 2008, an impact assessment of EEE collection and treatment targets revealed that 65% of the products placed on the market were treated correctly, which coincides with the quota set in 2012 as the annual target for Member States (DIRECTIVE 2012/19/EC). However, these target rates are based on the average of the EEE products placed on the market in the three previous years, and the targets are not met by all Member States. Besides, a large chunk of WEEE is subject to improper treatment and illegal exports, which can lead to raw material losses, environmental issues and inconsistent data. To limit the illegal exports of used electrical and electronic equipment (UEEE) suspected to be WEEE, the directive recommends setting up minimum requirements for requalifying reusable EEE (Annex VI Directive 2012/19/EC).

2.3 ELV Directive (2000/53/EC)

The End of Life Vehicles (ELV) Directive covers all vehicles and end-of-life vehicles, their components, materials and parts, with a focus on recovery and waste prevention of used vehicles. The directive sets out measures to prevent and restrict waste generated from ELVs and their parts, by ensuring their reuse, recycling and recovery. Furthermore, it aims to enhance the environmental performance of all the entities engaged in the lifecycle of vehicles (Directive 2000/53/EC).

Throughout the Directive, the responsibility of producers and economic operators is shared and, in some cases, it overlaps. According to Articles 2 and 5 of the Directive, Member States should ensure that economic operators set up a system for the collection, treatment and recovery of ELVs. However, according to the 'polluter pays principle', it could be argued that producers are the ones that should bear the ELV delivery costs to treatment facilities, instead of the last owners of the vehicles.

Producers should also ensure that vehicles are designed and manufactured in a way that promotes reuse, recycling and recovery. Information on design and manufacturing requirements, targets and standards set by this Directive should be disclosed by economic operators to consumers and recyclers. Consumers could then make more informed choices, while recyclers would be able to adjust their behaviour thanks to a better understanding of both the fleet of cars on the market and developing car manufacturing trends (Directive 2000/53/EC).

Additionally, Member States should support economic operators to achieve reuse and recovery targets, by promoting the reuse and recovery of vehicle components and incentivising the reuse of materials generated by economic operators. As written in Article 7 of the Directive, the yearly reuse, recycling and recovery targets from 2015 onwards are 95% of average ELV weight (85% for material reuse and recycling). The overlap in responsibilities between producers and economic operators regarding ELV management creates difficulties in determining the division of roles and a lack of clarity.

An evaluation report done by the European Commission (2021a) found that, compared to other waste stream legislations, the EPR scheme in the ELV Directive is not fully established. Thus, the challenge to bring EPR schemes for vehicles on par with those for other products needs to be addressed to establish a complete ELV EPR scheme. Furthermore, a Working Document by the European Commission

(2021c) on the evaluation of the ELV Directive, points out significant shortcomings related to the poor consideration of some materials such as plastics, electronic components and glass. In addition, the costs for dismantling, separation and recycling are currently not covered by the revenues generated for the treatment facilities. Consequently, despite specifically targeting end-of-life vehicles and their treatment, the ELV Directive does not go far enough to effectively impose an environmentally sound treatment, and lacks a system to hold producers responsible to bear the costs. The Working Document (2021c) also finds that the ELV Directive lacks guidelines to establish EPR systems. Nevertheless, the Directive renders collection points for vehicles more efficient and helps reach recovery and recycling targets.

Another challenge raised in the report by the United Nations Economic Commission for Europe (UNECE, 2022), is that the ELV Directive does not mention trucks and motorcycles, which account for 25% of all vehicles. Some shortcomings have been observed in the Directive, such as the need for a EU-wide definition of ELV. A common definition would help clarify what classifies as ELV and help improve the monitoring of the vehicles. The report has also highlighted further challenges to achieve better statistics and monitoring; increased enforcement of measures to stop illegal disassembling of vehicles by the dealers and repair shops; and a legally binding policy that showcases the differentiation between ELV and used vehicles.

To revise the ELV Directive and address some of the issues identified, the EU initiated an impact assessment based on a public consultation and feedback from economic operators, vehicle manufacturers, dealers and distributors. During the consultation period from July 2021 to October 2021, subjects of revision of the EU rules for ELVs were analysed concerning reusability, recyclability and recoverability. The European Commission will produce a proposal for the Review of the ELV Directive in 2023.

The feedback from consulted stakeholders suggested adapting the Directive in several ways. First, the assessment indicated that both motorcycles and trucks should be included in the scope of the Directive. Also, stakeholders agreed that vehicle manufacturers should include circular characteristics of products during the design stage. Moreover, the incorporation of recycled plastics during the vehicle manufacturing process should be favoured to complement the already existing recycling targets (European Commission, 2021b).

Concerning illegal exports and vehicle registration guidelines, most stakeholders agreed to charge owners for the de-registration of vehicles, to avoid unreported changes of ownership or exports. This was also confirmed by the general agreement during the public consultation, that better traceability needed to be established. Lastly, the impact assessment includes the need to reduce illegal ELV exports, as well as the proposal to require roadworthiness certificates as a condition for exporting used vehicles.

These major findings from the public consultation are all expected to be addressed in the proposal for the review of the ELV Directive in June 2023.

2.4 Table 1 - Overview of existing EPR schemes in EU Member States, 2022

The following table includes information on the existence and lack thereof of EPR systems for textiles, ELVs, batteries and WEEE product streams. The table presents an overview of the different EPR schemes and policies in place across EU Member States.

Member States	Textiles	ELV	Batteries	WEEE
AT		x	x	x
BE	*	x	x	x
BG		x	x	x
CY		x	x	x
CZ		x	x	x
DK		x	x	x
EE		**	x	x
FI		x	x	x
FR	x	x	x	x
DE			x	x
GR		x	x	x
HU		x	x	x
IE		x	x	x
IT	*	x	x	x
LV		x	x	x
LT		x	x	x
LU		x	x	x
MT		(1)	x	x
NL	*	x	x	x
PT		x	x	x
PL		x	x	x
RO		x	x	x
SE	x	x	x	x
SK		x	x	x
SI		x	x	x
ES	*	x	x	x
HR		x	x	x

* The Netherlands is planning to implement EPR on textiles from 2023, while Belgium, Italy and Spain (Law 7/2022) are in the early stages of implementation

**Estonia has a PRO for ELV, but no EPR

(1) ELV waste is currently subject to EPR in Malta, but this is not implemented yet (ERA, 2021)

Table 1: Overview of existing EPR schemes in the EU in 4 sectors (textiles, ELV, batteries and WEEE), own production

In the EU, EPR schemes for WEEE, batteries and vehicles are mandatory through the Directives on WEEE, Batteries and ELV. According to the European Commission (2014), the producers of these three product streams are accountable for financing the collection, recycling and responsible end-of-life disposal. Even though EPR schemes are mandatory for the treatment of WEEE, batteries and vehicles, the implementation of EPR in some of the Member States is ongoing, as shown in Table 1. Moreover, while all Member States have EPR schemes in place for batteries and WEEE, the implementation of EPR schemes for textiles and ELV differs across the EU.

ELV-related EPR schemes have been established in almost every Member State except Estonia, Germany and Malta. However, all three countries either have or are establishing a system for the management of ELVs. Estonia incorporated a PRO to ensure producers compliance with the regulations, meaning that producers do not use internal forces but rather a nationally operating body that provides the compliance service. In Germany, the ELV legislation differs from other Member States, but it does require owners to transfer vehicles to authorised treatment facilities that then dispose of them via shredding and provide certificates of destruction (CoD) similar to the ones required by the ELV Directive. In Malta, ELVs are currently subject to an EPR scheme, but the final step of implementation is not yet achieved.

Compared to the implementation challenges and individual systems of EPR schemes for ELVs, all Member States have an implemented working EPR scheme for WEEE. France and Romania are two countries that have their own supplementary systems in place. For example, France is the only Member State to use an additional fee modulation method in addition to the developed WEEE EPR system in place. The French Ministry of the Ecologic Transition enforces and monitors the eco-modulation fees, but outsources the management and collection of the fees to three different PROs that focus on household streams. On the other hand, Romania manages EEE streams by only allowing registered producers and importers of EEE to put EEE on the market, providing a certain level of market control and accountability.

Regarding EPR scheme for textiles, only a few Member States put in place or are in the process of implementing EPR schemes for textiles. Currently, Sweden and France are the only ones to have an EPR scheme for textiles, while Belgium, Italy and Spain are in the early stages of implementation. The Netherlands is also due to implement an EPR scheme for textiles in 2023. The number of Member States introducing such schemes into their national policy may soon increase as the European Commission plans to introduce a mandatory textile EPR scheme across the EU through the new revision of the WFD in 2023.

This subchapter gave an overview of EPR policies and schemes across EU Member States on four product streams (textiles, ELV, batteries, and WEEE). However, this study focuses specifically on EEE and vehicles. The decision to focus on these two product streams was based on the potential future trade flow and current policy trends, as well as on data availability.

The following chapters give an additional overview of these two streams and connect them to their respective EPR scheme. In the EU, to ensure the prolonged lifecycle of products such as EEE and vehicles, goods are exported to other countries to be reused. However, the EPR fees paid by producers do not follow the product once it leaves the country of first placement on the market. Thus, to address EPR shortcomings it is crucial to understand the material stream flows of used items that are exported.

It is worthwhile to note that the EU is responsible for one-third of all used EEE (UEEE) exports to Africa (Hemkhaus et al., 2020). This information shows that Africa acts as the main destination for discarded EEE streams generated in the EU. Furthermore, according to the UN, Africa is the main destination of EU used vehicle exports (2020). Africa is therefore the geographical focus of this study, which aims to give a more comprehensive overview of African imports of used material streams from the EU and show the necessity to reassess EPR schemes for the EU-African trade.

The following chapter will focus on EPR policies in Africa on the two targeted product streams (EEE and vehicles), to establish the products waste management challenges and to elaborate on solutions fostering EPR fees to follow exported products.

Chapter 3

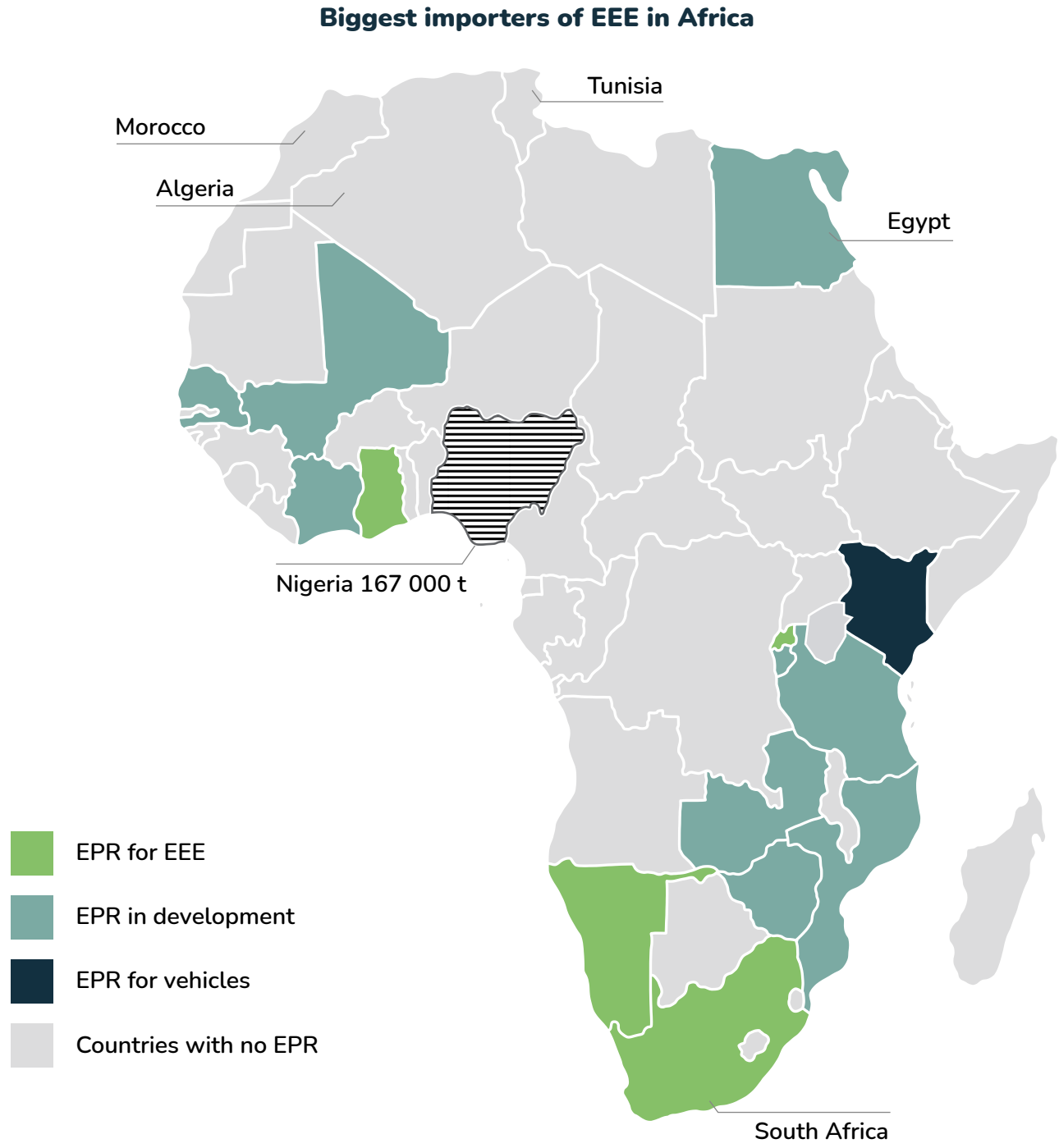
EPR policies in African countries and overview of sectors covered by EPR

The ongoing development of EPR policies globally and the growing legislative responsibility for producers for the safe disposal of their products has led to policy developments in Africa. This chapter will investigate existing and future EPR policies in African countries and lay out their implementation strategies with a focus on EEE and vehicles.

Currently, only 17 out of 54 African countries have EPR policies in place. As mentioned before, the current EPR systems in Africa do not connect to the EPR systems in the EU. Therefore, when products from the EU are exported to Africa, the fees remain with the European PROs. Depending on the existing national legislations and the area of focus, African countries can decide to cover imported goods or solely nationally produced products. Hence, EPR schemes in receiving countries are not guaranteed to apply to imported products from the EU, and a loophole for exports to Africa remains.

Due to the limited financial resources for managing end-of-life products arriving in Africa, the region's public infrastructure faces a tremendous strain that African economies cannot cope with. Given the public sector's weakness to manage this situation, the private sector is often at the initiative to propose potential solutions. However, the lack of financial incentives for the African private sector presents a challenge in addressing this issue. Companies choose therefore the cheapest, non-compliant option of informal landfill and incineration instead of responsible management as the EPR approach intends to. There is also an issue of governance, as reused products fall outside the realm of domestic EPR policies if they only govern the products manufactured within the country's territory. The African countries that do have or are in the process of implementing EPR policies are South Africa, Senegal, Kenya, Zambia, Rwanda, Nigeria, Mali, Uganda, Tanzania, Mozambique, Zimbabwe, Ivory Coast, Ghana, Gambia, Egypt, and Sao Tome and Principe (figure 3).

Figure 3: Countries in Africa that have EPR for EEE and vehicles, in addition to the main importer countries of EEE, own production



3.1 EPR schemes for EEE in Africa

Established EPR schemes in Africa often cover material streams that are easy to treat, such as glass or metal cans. Nevertheless, schemes for more complex products such as EEE are gaining momentum and a growing number of countries have e-waste policies or are in the process of implementing them. To understand the flows of exports of EEE products from the EU to Africa, it is necessary to expose the extent of present policies in African countries. This chapter will first provide a general overview and then offer a description of country-specific efforts.

Among 54 African countries, 13 have national e-waste policies, regulations and legislations. Six countries have EPR or are in the process of implementing and enforcing EPR for EEE, namely Kenya, Nigeria, Rwanda, Ghana, South Africa and Namibia (Schroeder & Tilkanen, 2021). The Nigerian government, in collaboration with the Dutch governmental development cooperation department, is currently registering producers that are obliged by EPR rules akin to the ones in the Netherlands (International Telecommunication Union (ITU), 2022). Similarly, Namibia is implementing EPR schemes by 2023, with the help of ITU and the Dutch government, based on the Dutch national waste directives and EPR systems (ITU, 2022). In Kenya, the EPR system on EEE is still not well organised, but IT companies like Safaricom are assisting the national government with EPR-related waste issues by organising collection points for old phone accessories and handsets (Bimir, 2020).

The challenge of enforcing EPR schemes in Africa arises because most EEE products are not produced in Africa, but are imported as UEEE from elsewhere, commonly from the EU. EPR schemes that only cover domestically produced goods neglect imports that are then not regulated by the policies in place in the importing country. Hence, it is crucial to address this loophole by adopting policies that allow for imported products to be included in the local EPR system (Schroeder & Tilkanen, 2021).

Ivory Coast, Cameroon, Ghana, Madagascar, Nigeria, Rwanda, and South Africa place specific emphasis on the person or persons, rather than on organisations that import, manufacture or otherwise introduce products on the market. By focusing on the person or persons putting the products on the market, it is easier to identify those responsible for the monitoring and disposal of goods. Hence, the term “producers” should not only include actual producers of goods, but also local importers and distributors of electronics.

In South Africa, several legislations and policies aiming to improve waste treatment practices and facilities have been introduced, while various EPR systems and supporting PROs have been established. However, many of these were introduced voluntarily by the industry or private partnerships, meaning that the public sector involvement is limited, and cross-sector coordination and organisation is inexistent. In 2021, mandatory compliance for EPR schemes was introduced for producers and importers of EEE, but this did not stop the occurrence of free riders.

Additionally, the informal sector remains crucial for recycling practices and targets, and continues to dominate waste treatment in South Africa (Godfrey & Oelofse, 2017). However, the informal sector still heavily relies on unsafe manual recycling and material segregation, leading to harmful practices for the labour force that is exposed to extremely dangerous substances. For example, Gupt & Sahay (2015) point out that private collectors often collect waste from households and dumpsites and sell it to be repaired or manually dismantled and treated in unqualified factories.

Since the informal sector operates outside regulations, such treatment practices continue, and informal actors can reduce costs through sub-standard processing. Unfortunately, it is difficult to regulate a market that does not abide by existing legislation, and the ongoing practice of cheap waste treatment by unsound informal actors may reduce the effectiveness of the policies despite side benefits for the concerned informal actors. Moreover, the formal sector cannot compete with the relatively low treatment costs of the informal sector. Thus, as the informal sector displaces streams away from formal recycling stations, the latter are forced to operate below their capacity to recycle. As stated by Gupt & Sahay (2015), the failure to consider the coexistence with the informal sector hinders the

effective implementation of EPR schemes and similar waste treatment policies aiming to achieve sound treatment of discarded goods.

Due to landfill airspace shortages and diminishing space for the local inhabitants, the government's position to move away from landfills and towards the reuse of materials has been made clear through several policy strategies and white papers. In relation to these strategies, some municipalities have increased their gate fees for landfill sites from 10-15 EUR to 25-40 EUR per tonne (Godfrey & Oelofse, 2017). Nevertheless, landfilling remains a relevant waste disposal option since it is financially more feasible compared to other, environmentally sound, treatment options.

Like South Africa, Nigeria has also introduced regulations to address waste management and product circularity for EEE products. The Nigerian authorities produced the "Guide for Importers of Used Electrical and Electronic Equipment" to increase the monitoring of imported goods and clarify responsibilities regarding disposal and treatment, while also avoiding mistakenly imported waste products. Additionally, the National Environmental Standards and Regulations Enforcement Agency (NESREA) is a key actor in establishing the EPR scheme for EEE in Nigeria (Woggsborg & Schröder, 2018), tasked with controlling and monitoring of policies and sound practices.

The Nigerian system is based on incentivizing waste collection, specifically e-waste, as well as non-valuable or less profitable materials, through the formation of a PRO. The PRO is responsible for subsidising the reported materials to be recycled, and is funded by a Minimal Collection Incentive (MCI). Manufacturers, importers, assemblers, producers and distributors of EEE must pay a fee to the PRO that manages e-waste and ensures a shared responsibility and funding for the treatment. Producers and importers also help cover the costs of managing products once they are discarded. Their responsibilities include everything from the collection to the final disposal. They also include public information and awareness campaigns, and training programmes financed by the fees paid by the industry. However, despite these efforts and these comparatively advanced policies, Nigeria remains one of the largest importers in Africa.

According to Thapa et al. (2022), Nigeria is facing several issues in its efforts to operate a successful waste management system, such as weak waste management practices, a lack of monitoring and enforcement, corruption, and a lack of awareness and infrastructure. Also, according to Woggsborg and Schröder (2018), subsidies are still required to make the recycling of streams such as e-waste profitable, while the highly developed informal sector remains important.

The lack of control over the supply of goods coming via import and the failure to monitor imports are the major concern for African countries (Thapa et al., 2022). Hence, Ghana introduced an eco-levy on the import of used and end-of-life EEE led by the Customs Division of the Ghana Revenue Authority. However, clarification on how the customs division is organised and how well it manages to monitor imports and enforce the levy is needed. Due to a lack of staff, understanding and training of custom agents, supervision and control prove difficult, and the extent of the enforcement is not reported.

Similarly, in Zambia, authorities are working on improving the control of imports. The Information and Communications Technologies Authority (ZICTA) helps prevent the importation of counterfeit equipment and enforces responsible importation of technology equipment. To do this, they check products to make sure they meet a minimum set of regulatory, safety, and technical requirements

and then provide type approval for equipment. They work with the Zambia Revenue Authority (ZRA) to guarantee that imported goods meet the required standards. Furthermore, all licensed dealers of technological products are required to submit annual statistics on equipment imported the previous year, allowing the monitoring of equipment placed on the market while also allowing to estimate the incoming amount of e-waste likely to be generated.

Focusing on the other end of the chain, the government of Rwanda invested in large-scale collection, recycling and treatment schemes for e-waste. Furthermore, it entered a public-private partnership with the dismantling and recycling company Enviroserve. While this partnership does not operate the same way the PROs do, it offers the potential to scale up and serve Rwanda´s neighbouring countries. Since PROs are based on the fees paid by national members and producers, cross-border functioning is comparatively more difficult than the model in Rwanda.

3.2 EPR for vehicles in Africa

The need for vehicles is exponentially growing in Africa (Ayetor et al., 2022), with the number of vehicles set to quadruple by 2050. 80-90% of growth should come from used vehicle import (UN, 2020) which is supported by the Ellen MacArthur Foundation's report on Automotives that states that only 1% of global new vehicle sales happen in Africa (Odumuyiwa et al., 2021). Trade in used vehicles is undoubtedly aiding local business growth and more accessible mobility (UN, 2020). However, the problem with the import of used vehicles is that most of them are close to the end of their life cycle, thus creating waste, health and environmental issues for importing countries. In Africa, there are 246,000 annual fatalities caused by poor-quality used vehicles. Some countries report that the average age of used vehicles when imported is 16-20 years old (UN, 2020).

Out of 54 African countries, 21 (Kenya, Libya, Uganda, Ghana, Nigeria, Chad, Seychelles, Mauritius, Gabon, Senegal, Tunisia, Ivory Coast, Guinea, Namibia, Cameroon, Mauritania, Eritrea, Equatorial Guinea, Liberia, Niger and Swaziland) have implemented imported vehicle age restrictions as a response to their rising waste problems (Barrie et al., 2022; Ayetor et al., 2021). This contributed to a relative reduction of the GHGs emissions for some of these countries, and benefited local manufacturing.

However, there is no general age import restriction ban in Africa, and the existing national bans vary for vehicles older than 3 and up to 15 years old (UN, 2020). In addition, only five countries (Sudan, Algeria, Morocco, Egypt and South Africa) have a complete ban on the import of used vehicles. However, the UN (2020) reports that a complete ban on the import of used vehicles is not desirable, because it reduces access to recent vehicle technology embedded in used vehicles. In addition, the import and age restriction bans on used vehicles have unfortunately not stopped the illegal imports of vehicles entering these countries (Ayetor et al., 2021).

The trade of used vehicles from Europe to Africa is large, and it is only expected to increase in the next decades. Therefore, there is a need for importing countries to regulate used vehicle imports. Yet, a UN study (2020) covering 146 countries in the world found that 81 have "weak" or "very weak" policies on used vehicles import, and only one-third (47 countries) have "good" or "very good" policies in place. In Africa, 60% of annual vehicle registrations regard used vehicles, but only nine countries have "good" or "very good" import policies on used vehicles. The "very good" policy categorisation only applies

to Mauritius, while the policies of Chad, Ivory Coast, Gabon, Lesotho, Mauritania, Morocco, Rwanda and Tunisia result as “good”. Furthermore, the policies of 36 African countries (Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Comoros, Congo, DRC, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Libya, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Sao Tome and Principe, Sierra Leone, South Sudan, Somalia, Tanzania, Togo, Uganda, Zambia, Zimbabwe and French Guiana) are classified “very weak” because they either lack used vehicle emissions standards, age limits for used vehicles older than 9 years, or have no age limits on used vehicle imports (figure 4).

Figure 4: The categorisation of countries that either have very good, good or very weak policies on used vehicle imports according to the UN (2020) research, own production

In January 2021, 15 countries of the Economic Community of West African States (ECOWAS) that were part of the UN study (2020) implemented an emission standard similar to Euro 4/IV through national Vehicle Directives. However, research in 2019 demonstrated that more than 80% of used vehicles exported from the Netherlands to Africa were below Euro 4/IV emission standards, and did not have valid road certification during shipment testing from the Human Environment and Transport Inspectorate of the Dutch ministry (UNECE, 2022).

Even though vehicle age bans and regulations on the import of used vehicles exist, EPR schemes for imported vehicles are not yet established in Africa. Due to relatively far-reaching and broad regulations such as import bans and age restrictions on the import of used vehicles, governments do not consider EPR schemes for used vehicles necessary.

However, a few African countries such as Kenya, South Africa and Nigeria have voluntary EPR schemes for glass, used tyres, motors and oils. Most of these EPR schemes cover parts of vehicles but not vehicles altogether. Hence, EPR for ELVs are not yet established in Africa, but regulations and efforts setting up the possible successful introduction of such policies are increasingly popular across the continent. Overall, the newly implemented policies and efforts by industry and governments to manage imports more efficiently and avoid unsound treatment practices are increasingly elaborate.

In Africa, Kenya and Nigeria are the only countries that are engaged in efforts to set up EPR policies especially for vehicles. In Kenya, EPR for motor vehicles and cars was introduced through the Sustainable Waste Management Act (2021) as a key tool for managing waste issues in the country. However, the enforcement of these policies has been challenging. The policies in place and the capacity to support the implementation are not developed enough to allow for successful EPR schemes across different material streams, especially regarding ELVs and vehicle imports. Similarly, the Nigerian government introduced the EPR scheme for motor vehicles into their national environmental regulation in 2014, but has not managed to enforce it yet (Ajani & Kunlere, 2019).

The systems currently in place and their underdevelopment allow for loopholes and shortcomings that can be exploited. Therefore, imports from the EU still overwhelm African economies that are not yet prepared to deal with products generated locally, let alone with the masses coming from the EU (Ayetor et al., 2021). Nevertheless, with more extensive financial resources to fund collection and recycling infrastructures, such burdens could be addressed, and the situation improved.

The next chapter will therefore analyse the extent to which policy shortcomings allow for product displacement, and what this means for importing countries. Moreover, it will lay out how loopholes allow for ongoing practices to avoid EPR fees and export products and materials from the EU. Practices within exporting countries that create a supply of shipped products and neglect sound treatment complying with EU regulation are also presented.

Chapter 4

Overview of trade outflows of goods shipped for reuse from the EU to Africa

This chapter examines the existing EU-African trade and waste policies in action, including trade flow data and potential future trends for textiles, batteries, electronics and vehicles. It starts with a brief overview of battery and textile streams and past trends leading to policy changes, followed by a focused analysis of the two main streams, vehicles and EEE (figure 5). It then highlights the impact of trade policies for used goods in these two product streams for the importing countries if EPR schemes are not properly implemented; further explains EU Directives and international laws, bans and regulations, to give an overview of the current situation related to the two streams; and concludes by elaborating on the challenges and opportunities of trade in EEE and vehicles between Europe and Africa.

The availability of data is a major concern in the efforts to successfully monitor trade flows between the EU and Africa. Since the Harmonized Commodity Description and Coding System (HS), which captures product streams and classifies products to clarify import duties, does not distinguish between recycled and used goods, it is not possible to estimate the amounts of used products shipped based on trade documentation. Therefore, the reported numbers are based on intercepted shipments where data could be collected, whereas most shipments are not intercepted and uncontrolled. Hence, the reported data and underlying information for the analysed trade flows only represent a fraction of the total amounts generated and shipped, and the real numbers are most likely higher. Nevertheless, the reported data provides insightful information and allows for a relative understanding of the trade flows between the EU and Africa.

Data on used batteries and their exports are not collected and reported, thus there are none available for EU or Africa. Nevertheless, according to the Chatham House Circular Economy Earth trade database, in 2020, the EU-27 exported 256 tonnes of waste and scraps of primary and spent primary cells, batteries and electric accumulators worth USD 3 million to Africa. Germany, Spain and Austria were the top exporting European countries of used batteries while exports from France have been declining by 75% from 2015 (145 tonnes) to 2020 (<1 tonne). The largest exporter is Germany, exporting around 118 tonnes (USD 1.4 million), while Spain exported 99 tonnes (USD 1.3 million) of used batteries to Africa in 2020.

In addition to Germany and Spain, Austria and Poland were among the top exporters of used batteries to Africa. Austria exported 15 tonnes (USD 168,000) and Poland exported 2 tonnes (USD 28,000). South Africa functions as the largest importer, importing 234 tonnes of used batteries, at a value of

USD 2.9 million. Chatham House data shows that South Africa was the fastest-growing importing country for used batteries in Africa in 2020 and has witnessed a steep increase of imported used batteries by 609% from 2015 to 2020.

As for textiles, the World Trade Organisation (WTO) identified the EU as the main importer of new clothes worldwide. Being the biggest consumer market for clothes, the EU imports most textiles but also exports large amounts of used goods. Like for batteries, over the past 15 years exports of textiles from the EU to Africa have increased overall, but trends have proven to be volatile. Data from Chatham House also suggest that different regions in Africa import different amounts of textiles from the EU. Shipments to Northern and Western Africa keep increasing, which may harm local producers as it increases competition with local industry while unsold, unused materials are eventually disposed improperly. In Europe, the demand for clothing has increased as fast fashion has become more popular and EU consumers are using clothes for half as long as before (Remy et al., 2016). At the same time, the quality of textiles has decreased due to the increased inclusion of polymers, and the recycling of these textiles has become even more difficult. In response, in 2016, African countries started taxing as well as rejecting used and worn garments from the EU (Remy et al., 2016).

The biggest importing region for used textiles is North Africa, where 362,000 tonnes were shipped from the EU, Spain being the main exporter. Tunisia imported the most second-hand textiles (102,000 tonnes of garments in 2020). Western Africa also imported large amounts of second-hand textiles in 2020 (248,000 tonnes). In this area, Togo was the import leader (49,200 tonnes), while the major exporters were Poland and Italy. For both Northern and Western Africa overall imports of second-hand textiles have kept increasing over the past years. In Central Africa, instead, imports of used textiles remained relatively constant over the past years; in 2020 123,000 tonnes were imported, mostly to Cameroon (70,200 tonnes). Once more, Spain acted as the largest exporter of products. Finally, both Southern Africa (importing 57,600 tonnes) and East Africa, (importing 37,100 tonnes) have seen declining imports of second-hand textiles from the EU. The national main destinations for used goods in 2020 were South Africa, having imported 11,000 tonnes in 2020, and Kenya, with 12,800 tonnes. For both regions, the Netherlands was the largest exporter. Overall, worn clothing and used rags remained the dominant import streams in Africa, but a recent increase in vegetable fibre textiles imports to Africa has been identified.

4.1 Electrical and Electronic Equipment (EEE)

4.1.1 Systemic Background

Trade in used electronics, which cannot but eventually become waste, is one of the main reasons for the growing waste issue in Africa, as well as the connected environmental and health issues (Bernard, 2015). Electronic waste always falls under the categorisation of waste containing hazardous materials that harm both the environment and human health (Chin & Yong, 2019). International laws do not currently permit the export of hazardous waste outside national borders, unless a set of conditions are met, and subject to notification.

Under the Basel Convention, hazardous waste can only be exported if it meets the following three

conditions: (1) the exporting country can ship hazardous waste if it does not have the proper capacity and facility to dispose of waste in an environmentally friendly way; (2) waste needs to be collected for recycling and recovery purposes; (3) the waste is not categorised under the criteria made by the Parties in the Convention. If the waste shipped does not meet all these requirements, the shipment is considered illegal.

However, an issue with the Basel Convention is that it does not cover used products as they do not fall under the waste regime. Therefore, international trade loopholes persist, and goods can still be classified as used products, humanitarian aid or charity, private goods, for personal use and miscellaneous, to be legally shipped.

The failure of the Basel Convention to address and limit transboundary hazardous waste flows also led African countries to join the Bamako Convention in 1998 (Maes & Preston-Whyte, 2022). On the EU side, the WFD included elements that were designed to improve material treatment practices and introduce a certain level of circularity.

Yet, despite the WFD's attempt to introduce a standardised system for waste management across the EU, no such system is yet in place. Therefore, significant variations in waste reporting and categorisation persist, and it is challenging to get a comprehensive understanding of EEE material and waste streams in the EU. Moving forward, solutions such as the digital product passport (DPP), that follows the product throughout its entire lifecycle, or eco-modulation of fees could address these shortcomings and complement EPR systems, as discussed in Chapter 6 of this study.

Furthermore, the definitions of electronic waste are ambiguous and allow for different interpretations across the EU, making the differentiation between E-waste, used EEE and EEE rather complicated (Habib et al. (2022). McMahon et al. (2021) explain the distinct differentiations stating that UEEE is used but still working, and EEE products can be either reused, repaired or modified. WEEE, on the other hand, is EEE that is disposed of by the owner as waste, foregoing the options of reuse, refurbishment or recycling. However, research finds that WEEE is not always "waste" as such, but often describes an item that has been disposed of by the original owner for various reasons. For instance, the consumer might have switched to a different model, or the product was discarded while still being functional. Hence, it is important to understand that these different categorisations are often intertwined, meaning that UEEE can be WEEE while discarded EEE (WEEE) can be UEEE that is not adequately disposed of, and most of the time it is difficult to establish a distinction between the two.

Global trade in EEE is accounted for in the Harmonized Commodity Description and Coding System (HS). While a recent addition of HS codes has been introduced to differentiate between UEEE and WEEE, the use of these new codes is not yet common practice, and countries have not started reporting data on them yet. Hence, shipments of EEE streams often include a mixture of different flows of WEEE, recycled EEE and UEEE. Besides the difficulties to distinguish between UEEE and WEEE, Habib et al. (2022) point out that shipments of these products often lack documentation, and fraudulent practices such as forged certificates, falsified functionality tests, and incomplete documents are common.

4.1.2 Monitoring and Control

The supervision and control of the shipments are left to port and customs authorities, but due to missing documentation or misleadingly falsified and incomplete papers, it is often difficult for the agents to grasp the state of the contents in the containers (Brink et al., 2021). Moreover, it is permissible to ship UEEE, under the Basel Convention, if it is intended for reuse or shipped under the pretext of donation, personal use or recycling purposes. Border control and customs agencies are understaffed at ports and control stations, and have no chance of monitoring the vast amounts of incoming shipments (Daum et al., 2017). Besides, they are often pressured to release goods or face the unfortunate trade-off between compromising possible local economic benefits by sending the shipments back, or accepting containers filled with products of questionable quality, with the risk that a lot of it might be waste.

This creates an opportunity to send near-end-of-life products to emerging economies due to their less stringent regulations, and avoid the high treatment costs and recycling standards within the EU (Perkins et al., 2014). Ultimately, as the EU currently has the most developed waste treatment guidelines, efforts and prices to treat and process EEE equipment rise as the standards rise, rendering recycling stations and treatment facilities economically expensive to run. Therefore, it can be financially advantageous to ship UEEE to countries operating outside these legislations or under a lower or no legal framework at all. EU outflows are often driven by the desire to avoid relatively strict treatment regulations, extensive disassembling processes and high treatment prices, and they are shipped under the pretext of humanitarian aid or reuse opportunities. Hence, in 2020, the whole EU operated as a net exporter of e-waste, sending out 1.8 megatonnes of e-waste while only importing 1.2 megatonnes (Baldé et al., 2022). As per Interreg Europe, a key EU instrument to support cooperation across borders through project funding, the potential revenues lost from the mistreatment of EEE in the EU amounted to 2.15 - 3.67 billion EUR in 2020 alone.

Additionally, UEEE shipments to Africa are common due to the schemes in place to send the appliances via importers in Africa (Baldé et al., 2022). As all EEE products incorporate various precious or rare-earth metals such as gold or silver, which are often found, for example, in printed circuit boards, importers in Africa can harvest these and sell them for a profit. Thapa et al. (2022) found that the informal sector in Nigeria is very well organised, and operators are aware of the valuable materials within EEE. Also, the trade of UEEE from Europe to Africa is an important connection that brings new technology, boosts local business growth, and provides enough low-cost second-hand goods to meet the local demands (Bimir, 2020). For a lot of people and institutions such as schools, these shipments provide a way to obtain IT materials, such as screens, TVs and mobile phones, at a low-cost price, while they would not be able to afford new ones.

EU countries export products that can be reused so they classify these products as UEEE. As previously stated, shipments of UEEE are not always assessed in the European ports to ensure the products are functional and not labelled incorrectly. This leaves the opportunity to illegally ship WEEE under the categorisation of UEEE. Once shipments of discarded EEE sent as UEEE arrive in the importing African country and the products are processed, goods often turn out to be waste because the products are either not functioning or are too damaged. According to an interview conducted with an electronics recycler who works with the Hinckley recycling group in Nigeria, about 70% of all UEEE imported is indeed e-waste, and around 20% of all imports are not recorded because of poor border control in Nigeria.

4.1.3 Trade and material flows

In the EU, waste policy requires that the discarded EEE streams are accounted for and reported, but only once they are collected as WEEE or, in rare cases, UEEE. Therefore, tracking UEEE flows goes hand in hand with tracking e-waste flows. Additionally, materials of discarded EEE flows are often found within undocumented UEEE flows, so it is worth looking into these three main identified complementary flows. Additionally, as shown by figure 5, during collection WEEE can get interconnected and merged with UEEE and EEE.

Figure 5: Undocumented WEEE, own production

Looking at the trade flows in more detail, according to Unitar's Global Transboundary E-waste Flows Monitor by Baldé et al. (2022), the EU generated 12 megatonnes of e-waste in 2019, which amounts to a world-leading 16.2 kg per inhabitant, and an increase of 0.6 kg per inhabitant from 2014 to 2019. Of this e-waste, 42% was documented as being collected adequately, leaving 58% as complementary flows, meaning that they are unreported. The uncollected and hence unreported discarded EEE is hoarded, treated illegally, scavenged or processed by unofficial channels and entirely unaccounted for from a waste disposal and material circularity point of view. Some of the collected amounts are also unreported, according to Simon (2018), because smaller waste management businesses do not need to report if the amount of hazardous waste transported from the facility does not exceed 2 tonnes per year. Thus, in addition to the 58% of unreported discarded EEE and UEEE streams, at that point mixed together, the collected UEEE that is not accounted for potentially explains a large part of the unaccounted exports. Unreported product streams could end up as UEEE exports that also contain illegal WEEE and evade monitoring and control.

Most UEEE streams are later found in Western and Northern Africa, where they are then transported across the continent. However, due to their illegal nature and the practice of mixing broken equipment with functional equipment, UEEE streams are difficult to estimate. Nevertheless, the study by Unitar's

Global Transboundary E-waste Flows Monitor by Baldé et al. (2022) estimates a total of 2.8-3.7kg per inhabitant of discarded EEE generated within the EU to be transported in this manner and to further elude EU EEE reporting. Habib et al. (2022) estimate that roughly 20% of generated WEEE is exported illegally, amounting to around two megatonnes. Screens and IT equipment are the most common products to be shipped abroad while steel-dominated appliances, large equipment and temperature exchange appliances are mostly handled through scavenging. However, data gaps remain the main barrier to adequately quantify complementary flows. In 2018, more than 50% of e-waste generated in the EU was not documented in the WEEE collection system (Habib et al., 2022).

The complex and overlapping definition of UEEE and WEEE streams creates an additional challenge in determining the data flow of information from Europe to Africa. However, Hemkhaus et al. (2020) find that Germany, the Netherlands, Spain, France and Italy were responsible for three-quarters of EU-African used EEE trade in the timespan of 2015-2020. Yet, shipments from the EU to Africa mostly occur from ports in Germany, the Netherlands, Spain, Belgium and Ireland. Therefore, it becomes clear that the origin of the shipments to Africa does not necessarily coincide with the origin of generated UEEE streams within the EU. For example, Luxembourg does not treat its UEEE and WEEE streams itself, but transports them to neighbouring countries, whereas Ireland, according to Eurostat data, ships roughly one-third of discarded EEE to other EU countries. It is therefore important to note that EEE transport within the EU contributes to the high number of shipments from the major ports in the above-mentioned countries. This further complicates monitoring and controlling, as large amounts of shipments are leaving the same ports while originating from different countries within the EU. Due to the growing number of actors involved while transporting EEE within the EU, it becomes challenging to rely on documentation and transport certifications. Meanwhile the responsibilities expected under EU law remain unclear. Once the products arrive in the major EU shipping ports, it is often already too late to reject specific products or send them back.

From 2015 to 2018 the EU was responsible for one-third of the EEE products exported to Africa. The majority of EU EEE is shipped to South Africa and Nigeria, followed by Tunisia, Egypt, Morocco and Algeria (Hemkhaus et al., 2020). Even though South Africa and Nigeria are the biggest importers of EEE streams to Africa, numbers show that the EU exports the greatest amount of EEE to Northern Africa. In detail, 49% of shipments went to North Africa, 21% went to West Africa and 17% to Southern Africa (Hemkhaus et al., 2020). Nevertheless, the most active ports in Africa for trade, according to Maes and Preston-Whyte (2022), are Durban in South Africa, Bizerte in Tunisia and Lagos in Nigeria. East and Central Africa, on the other hand, only account for 13% of the EU-African trade, largely due to a lack of access, long shipping routes or transport distances from the major ports. However, the highly developed informal waste sector in Africa is responsible for cross-border trade and transport, ultimately spreading EU shipments all over the continent (Bimir, 2020).

According to Forti et al. (2018), South Africa and Nigeria are considered the largest importers of EEE. But data for EEE put on the market and e-waste generated are, like in other African countries, not available in Nigeria and South Africa (Lydall et al., 2017). This shows that monitoring and control of imports and trade are underdeveloped even in the largest importing countries. A report by Basel Action Network (2019) investigated exports from Austria, Belgium, Denmark, Germany, Hungary, Ireland, Italy, Poland, Spain, and the United Kingdom over the timespan of April 15th, 2017, to September 2nd, 2017. Excluding major exporters France and the Netherlands, they estimate that the 10 countries export over 350,000 tonnes of WEEE categorised as UEEE to emerging economies per

year, mostly to Africa. The report also identified Nigeria as the country importing the most UEEE, but extrapolated that a total amount of over 167,000 tonnes yearly is indeed e-waste and not UEEE.

Similarly, a study by the United Nations University titled "Assessing Import of Used Electrical and Electronic Equipment into Nigeria" analysed UEEE imports from the EU with the help of data provided by the Nigerian government. The study, under the Person in the Port (PiP) project, investigated imports into Nigeria from January 2015 to December 2016, monitoring its two largest ports, both in Lagos state. Between 60,000 and 71,000 tonnes of UEEE were imported into Nigeria per year. It was reported that around 77% of the assessed UEEE imported was sent from the EU (54,670 tonnes). 20% of it came from Germany (10,934 tonnes), followed by 9.4% from Belgium (5,138.98 tonnes), 8.2% from Spain (4,482.94 tonnes) and 6.2% from Ireland (3,389.54 tonnes) (Hinckley recycling, n.d.). The level of functionality of the imported UEEE varied depending on the type of electronic equipment, while 19% of it have been found to be non-functional altogether. This means that more than 15,000 tonnes of UEEE imported through Lagos ports were actually e-waste and were either falsely declared or entirely undeclared in import documents. In addition to the UEEE shipments, Adesokan et al. (2016) found that another 1.2 million tonnes of assorted e-waste are yearly sent to Nigeria and another 40,000 tonnes of near-end-of-life EEE products arrive monthly, the majority coming from the EU.

Based on the data provided and the PiP project, it is possible to estimate UEEE exports from the EU to some countries in Africa, as well as the overall exports from the EU. In 2019, 12 megatonnes of discarded EEE products were generated within the EU, 42% (or 5 megatonnes) of which were collected and reported. As stated by Baldé et al. (2022) a total of 1.8 megatonnes of discarded UEEE were exported from the EU in 2018, although not all were sent to Africa. As mentioned above, up to 71,000 tonnes of UEEE are shipped to Lagos each year. While another study claims that 1.2 million tonnes of discarded EEE goods are imported to Nigeria, 77% are estimated to be exported by the EU, meaning approximately 924,000 tonnes of EU products are sent to Nigeria yearly. Being the largest importer of EU shipments, this is in accordance with the number of total exports estimated by research. However, the issue of the categorisation of shipped products and their functionality remains, leading to a challenging estimate of UEEE quantity being shipped.

As per a study by the United Nations University in 2017, the PiP project in Nigeria revealed that most of UEEE shipments from the EU to Nigeria were LCD-TVs that contained mercury, air conditioners containing hydrochlorofluorocarbons (H)CFCs, and refrigerators, falling into the WFD categories of large household appliances and consumer equipment. By weight, the report shows that LCD-TVs and flat panel monitors accounted for 18% of the imports, but 55% of them were non-functioning and therefore essentially waste. Interestingly, the second largest import category was Cathode-ray tube (CRT)-TVs and CRT-monitors (14%), which are formally banned for importation in Nigeria. This partially underscores the finding from Thapa et al. (2022) that the Nigerian government does not view e-waste imports as a major concern, since they do not actively prevent these illegal imports. Similarly, Okorhi et al. (2019) found that over 100,000 used computers arrive monthly in the port of Lagos. Thus, screens and monitors, while circumventing import bans, prove to be the dominating export goods in Nigeria.

UEEE imports prove too much to handle for local waste management facilities that already do not manage to treat waste generated locally. The highly complex treatment processes that are a standard requirement in the EU to dismantle and recycle e-waste are not widespread in Africa. This leads

to shipments being disposed of in ways that do not align with the standards set for EU exporting countries, as the discarded products are landfilled, illegally dumped, or burnt in Africa.

The informal sector is dominating the handling of UEEE imports and waste management (Thapa et al., 2022). Nigeria, Kenya and South Africa have an extensively developed informal sector that recycles and sorts up to 90% of all discarded (U)EEE. Maphosa and Maphosa (2020) state that in South Africa 64,000 tonnes of e-waste were generated in the country but only 11% were treated by the formal sector. This is in accordance with findings from Daum et al. (2017) that reveal that in Ghana only 1% of the imported UEEE is treated formally. Furthermore, Israel Olagunju from Hinckley recycling in Nigeria explains that only 1% of all UEEE imported gets recycled or refurbished, while 99% of it ends up in landfills due to a lack of infrastructure and recycling facilities in the country.

4.1.4 EPR Fees and Flows

Most European EPR schemes on EEE were adopted in 2002 after the first WEEE Directive was introduced in the same year. The loose regulations on EPR implementation generate considerable diversity between countries in the EU, especially because different EPR standards and requirements vary between countries where the products are placed on the market. The heterogeneity of fees is also reflected in the fact that each country in Europe has its own registration number to be a part of a particular EPR scheme for a specific sector. This lack of harmonisation can also create a significant advantage for producers in countries where EPR schemes do not impose high levels of responsibility regarding product design and waste management costs (Kettunen et al., 2019). Since the EPR schemes currently do not properly account for transboundary trade, there is very limited opportunity to track products that cross national borders.

This study attempts to estimate the amount of EPR fees that do not follow the products once they leave the country of origin. To be able to calculate this, research on the European PROs and EPR fees was carried out. According to Monier et al. (2014), data on EPR fees paid by EEE producers, together with the costs and revenues of collection and treatment, is not easily available. The reason the PROs for WEEE do not share their economic information is because of a highly competitive market in Europe. Hence, estimating the amount of EPR fees that do not follow the products when they are shipped for reuse is dependent on the disclosed data and prices from EU PROs.

Fees differ across countries as in some countries they depend on the market share of the producers, or on the actual item and their reuse and recycling potential. Since the fees are then often dependent on the producer, the product and the product design, and different in each country, an overall approximation for EU-wide EPR fee totals is questionable. France is one of the only countries in Europe that uses eco-modulation fees (Sachdeva et al., 2021) for EPR schemes, which means producers in a collective system are charged on the basis of product design (Laubinger et al., 2021). Take-e-way, a company that brings solutions for EPR schemes in WEEE, states that each country has its own EPR systems, and in Germany the fee is based on the market share of the inner German market (take-e-way, n.d.). A Danish PRO explains that the price for the producers is based on the weight sold in the previous year, but a minimum fee is 250 DKK per year (33.62 EUR) (DPA, n.d.).

In Germany, EPR for WEEE has been in place since 2005 (Monier et al., 2014). In 2008, the total number of exports of UEEE from Germany was estimated to be between 93,000 and 216,000 tonnes

(Sander & Schilling, 2010). Most of the exports of UEEE were shipped to Nigeria and Ghana. However, since Germany calculates EPR fees based on the market share of the producer domestically, the fees differ largely within a sector and across the companies. Thus, even for specific countries it is speculative to estimate total EPR fees, due to the broad estimate of exports paired with differing fees for producers, products and recycling potential. The fees collected from a major manufacturer of refrigerators will be different from those levied from a comparatively small producer, while the fees for screens are different altogether. Hence, a container full of discarded EEE will contain products fetching very different EPR fees from a range of producers subject to varying price schemes.

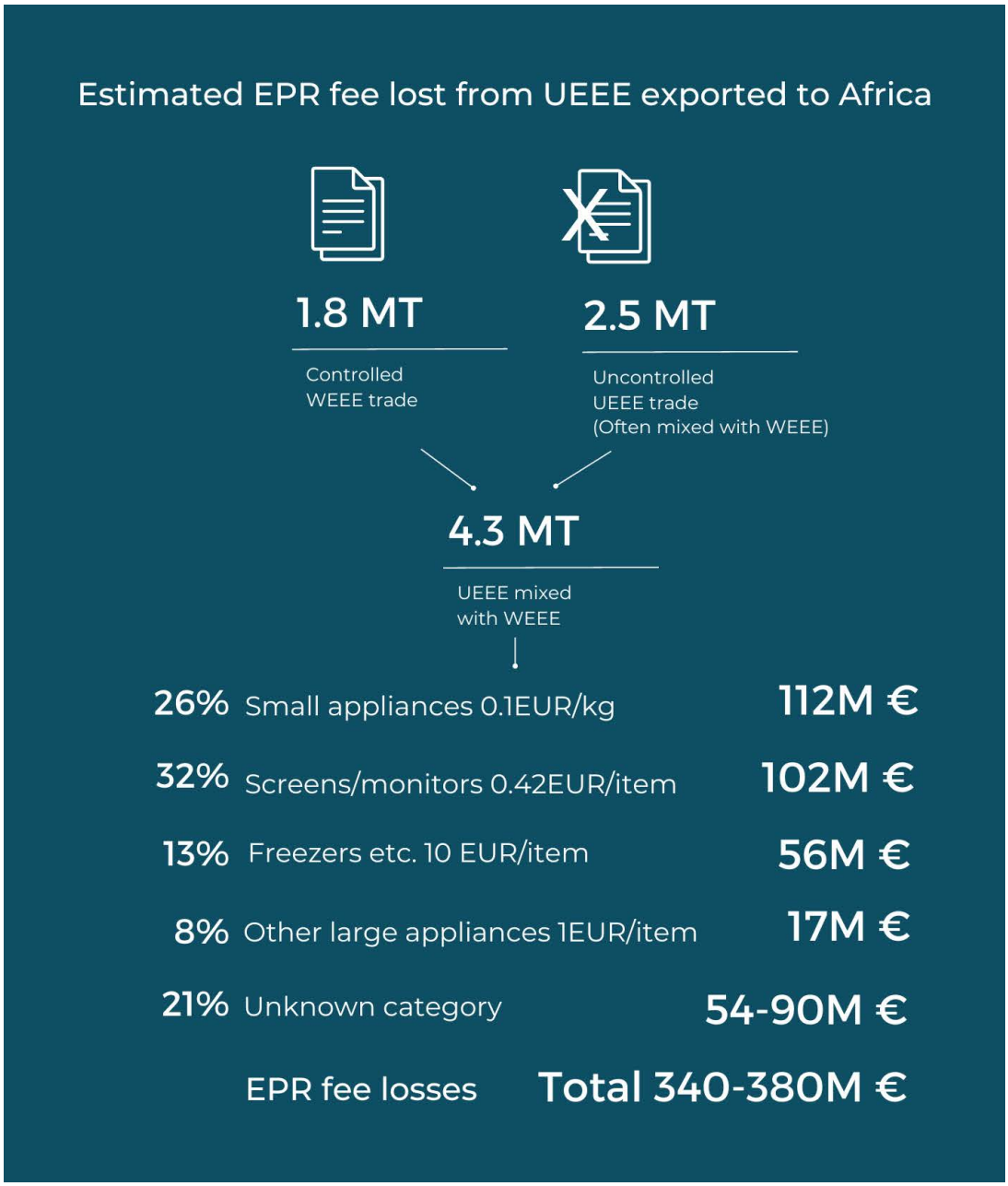
Estimating the amount of EPR fees where the levied fees did not follow the products up to the final treatment facility proves to be even more complex. Due to the difficulty of tracing UEEE transports within the EU and the number of actors involved in the handling and transporting of the products, it is currently not possible to identify product origin. Hence, identifying the ones responsible for the management of the discarded products is impracticable, and the exact origin of the streams as well as the market shares by the provider and legal responsibilities are often unclear. The monitoring and control of UEEE within the EU must be improved to guarantee a representative and detailed overview of the origin and status of the products. Due to the lack of knowledge regarding the origin of the products, the status of functionality and the nature of the products, an overall estimation of foregone EPR fees is dubious.

However, available data from Ireland, France, Germany and Denmark provided some rough basis to estimate an approximation of fees payable. Since other countries and PROs do not disclose the fees and data is not available, it is not possible to precisely generate an EU wide estimate for fees per product or material.

Public data available and research undertaken by other researchers provide an overview of trade volumes. Therefore, in the following paragraphs, the authors of this study attempt to estimate the amount of exported UEEE to generate a representative estimate of the flows and associated EPR fees. According to Baldé et al. (2022), 1.8 megatonnes of discarded EEE equipment are exported, while an additional 20% of discarded goods that were formerly put on the market are shipped without any record of it. Moreover, another 7 megatonnes of the total 12 megatonnes discarded EEE generated in the EU is not collected and not accounted for. These numbers show that shipped volumes could potentially range from 1.8 megatonnes to 8.8 megatonnes of discarded EEE exported to emerging economies .

Based on reports, 77% of EU WEEE exports are sent to Africa, amounting to a maximum 6.77 megatonnes of total WEEE . A 35% (or the equivalent of 5 megatonnes) of all generated WEEE in the EU that is collected and monitored is reportedly exported. For the estimation of uncollected and unreported WEEE expected to be around 7 megatonnes, the same export rate was used. Hence, another 2.5 megatonnes are shipped to Africa via unreported channels . Overall, that would mean that up to 4.3 megatonnes of discarded EEE are exported to Africa yearly (figure 6).

Figure 6: An estimation of EPR fee lost from the UEEE exports from the EU to Africa, own production



The lowest reported EPR fee for the treatment of discarded products is for mobile phones, at 0.02 cents per unit. To provide a conservative estimate based on the lowest EPR fees for EU generated discarded EEE that do not follow the products, we extrapolate the amount retained by European PROs by applying the fee for telephones to the estimated total weight (4.3 megatonnes) of exports to Africa. Thus, considering an average weight of 0.2 kg per mobile phone and a 0.02 EUR fee, the total EPR fees that do not follow the 4.3 megatonnes of exported items would amount to 430,000,000 EUR . However, research provides a certain insight into the exported products. Small IT appliances are estimated to constitute a 26% of UEEE exports from the EU to Africa (Habib et al., 2022). Applying

the 0.1 EUR/kg fee to the 26% (1.12 megatonnes) of small IT appliances, the fee for these exports would amount to 112,000,000 EUR.

Furthermore, research suggests that 32% of all exports (4.3 megatonnes) are screens and monitors, which would therefore amount to 1.45 megatonnes. If 1.45 megatonnes are approximately 250 million units of screens at 6 kg each and by using the 0.42 EUR fee reported for treatment of discarded laptops in the EU, the foregone fees would amount to 102,000,000 EUR. Large household appliances and temperature exchange equipment are another significant trade stream that is estimated to amount to 21% of all UEEE exports from the EU to Africa (Habib et al. 2022). 13% are estimated to be freezers, refrigerators and other temperature exchange equipment whereas the remaining 8% are large household equipment appliances such as washing machines, vacuum cleaners and dishwashers. Fees for larger appliances are significantly higher, with fees for refrigerators and freezers being 10 EUR per unit under the Belgian PRO Recupel and 1 EUR per unit for washing machines and similar (Laubinger et al., 2021). Large household appliances can vary significantly in weight. As the largest portion of large EEE exports are freezers and refrigerators, the authors have taken the average weight of a refrigerator (estimated to be 113kg) as the standard weight. For prudence, and to include the trade of lighter appliances such as vacuum cleaners, they have taken 100 kg as the average weight per unit of large household appliances. Thus, extrapolating the fees for 13% of the 4.3 megatonnes exported at 10 EUR per unit at 100kg each, the total amount is equivalent to 55,900,000 EUR. The remaining 8% are assumed to have an average weight of 20 kg that is accumulated with 1 EUR per unit. The estimated amount for these 8% would amount to another 17,200,000 EUR of fees that do not follow the exported products. In conclusion, the 21% of large appliance exports amount to a total of 73,100,000 million EUR that is retained by the European PROs.

Adding up the estimations for IT equipment, screens and monitors and large household appliances, 79% of total weight of exports at their respective reported fees can be extrapolated. The estimations suggest that for the three major export categories at a total weight of 3.4 megatonnes, the fees that do not follow the products amount to 287,100,000 EUR. Depending on the kind of goods exported for the remaining 21% of total weight, the additional amount of EPR fees collected in the EU range from 54,000,000 to 90,000,000 EUR. Overall, total fees that do not follow the 4.3 megatonnes of EU generated WEEE that are exported amount to 340,000,000 - 380,000,000 EUR. This would align with the study by Woggsborg and Schröder (2018) that reported that the producers from 25 EU countries in 2015 paid a total of 1.3 billion EUR in fees for product streams under EPR schemes, including EEE. The lost fees are collected and retained by European PROs, and the fees fail to follow the products and prevent proper end-of-life management.

Additionally, free riding is a problematic concept for producers, since fees are calculated according to the weight that was added to the market in previous years and allows some producers to avoid fee payment. The system can thus become under-financed, especially if the sales grow exponentially in a year. Online sales are another common issue in terms of free riding, because this type of EEE sale is not connected to the existing EPR schemes in Europe. Research done by the OECD explains that 5-10% of the EEE market is not registered under the EPR scheme and that not all free riding is intentional, as it can be caused by a lack of knowledge (WCEF, 2022).

Besides the unintentional non-compliance, the lack of legal enforcement and follow-through as well as the relatively negligible financial repercussions for not abiding by EU policies do not force actors

to comply. Micheaux and Aggeri (2021) state that the small fine producers need to pay in case of noncompliance does not create incentives for further developing eco-innovation.

However, European PRO Take-e-way (n.d.) states that consequences for incorrect WEEE registration are:

(1) prohibition of sales, (2) warning and fines (max. fine of 100,000 Euros), (3) confiscation of current sales profits, and (4) detention if there is a refusal to pay the fine. The identification of the free riders is usually done by the country's Environmental Protection Agency (EPA), and producers may be fined or sanctioned, but exact numbers are hard to consolidate. Monier et al. in 2014 found that, EEE producers' non-compliance can be sentenced up to two years in prison and fined up to 1,300 EUR in Denmark, and 10 years in prison and/or up to 15 million EUR in Ireland.

Therefore, it becomes clear that systemic shortcomings allow for non-compliance and do not incentivise actors to actively pursue environmentally sound practices. Additionally, the lack of reporting on product streams and products monitoring leads to a large fraction of EEE being unaccounted for. For products that are collected and reported, the issue of distinction between discarded EEE adds another layer of complexity. As UEEE and WEEE are often hard to differentiate due to vague distinctions in EU waste policies. Lastly, EPR systems themselves incorporate the shortcoming that nationally collected EPR fees from producers do not follow the products when they are shipped abroad. European PROs may exert their responsibility by exporting collected EU waste abroad and claim a proper waste treatment. PROs may also retain the money collected for ensuring environmentally sound treatment whereas the used goods, often mixed with WEEE, are exported to developing economies. Hence, importing countries that are treating and disposing of UEEE first placed on the market in the EU do not have access to the resources set for proper management of the imported used goods when they reach their waste stage. Since the financial support generated from EPR schemes in the EU often does not follow the products all the way to where they are treated as waste, the receiving countries are missing financial support to establish sound treatment facilities.

4.2 Vehicles

4.2.1 Systemic Background

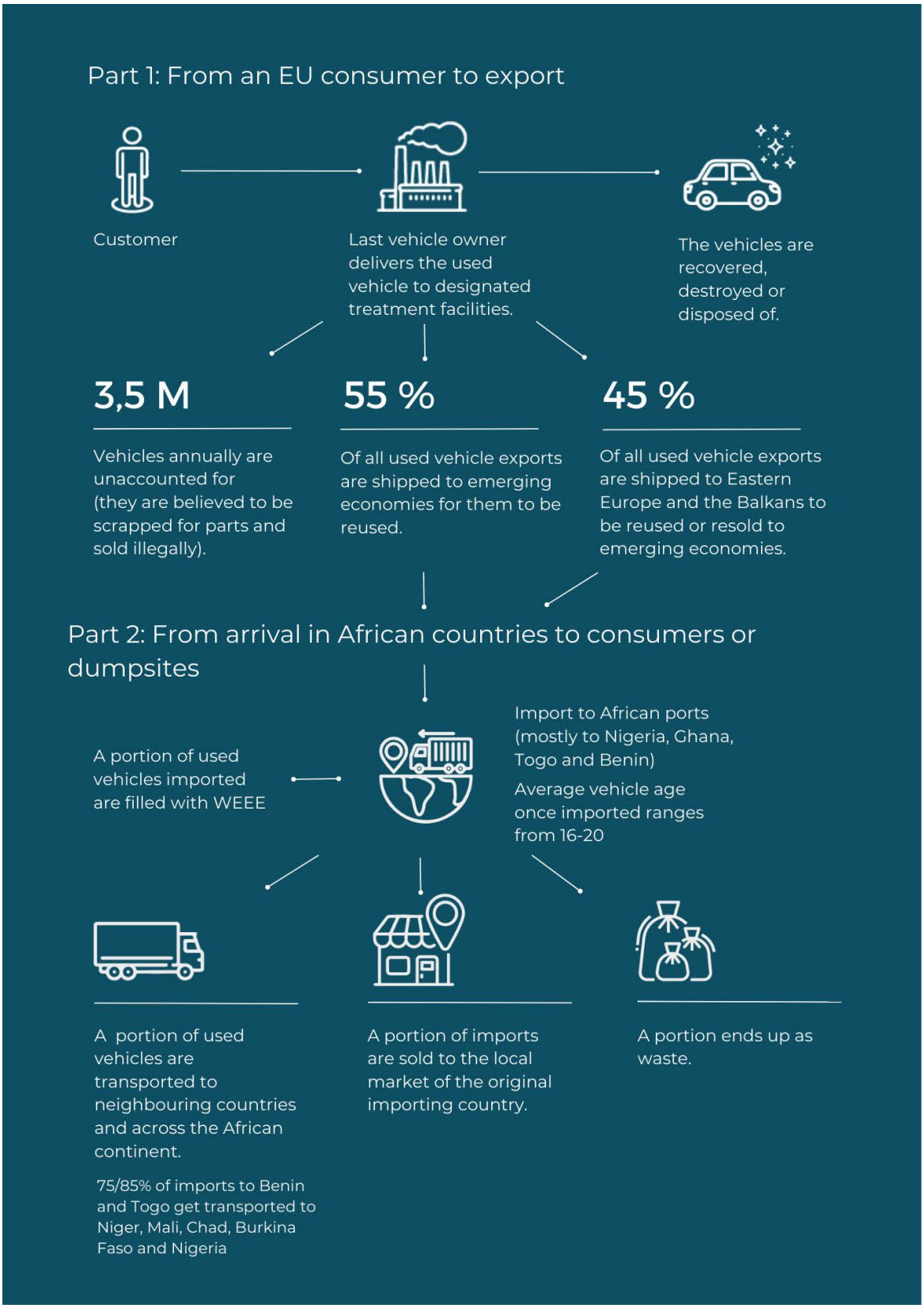
Due to a lack of policy measures, the global trade of used vehicles currently involves the export and import of unsafe, polluting, and aged vehicles between countries. There are no global agreements on the flow of used vehicles, which means that the health and environmental issues that come with it remain unaddressed (UNECE, n.d.). Moreover, a significant portion of used vehicles tradedbetween countries does not meet the basic environmental requirements set in the EU and represents a health hazard in terms of air pollution for citizens of importing countries, as well as a significant source of additional climate-wrecking emissions (UN, 2020).

In the EU, emission standards for vehicles have been adopted since 2009 as Regulations, to make sure these are directly enforced in Member States (EU: Light-Duty: Emissions, n.d.). These standards guarantee that vehicles emit fewer pollutants while their lifecycle is possibly prolonged (European Commission - Press Release, 2022). More importantly, as part of these standards, vehicles that do

not comply with current emission standards (Euro 6/VI as of 2015) are not allowed to be imported into the EU (UNECE, n.d.). The European Commission (2022) claims that transport pollution caused 70,000 premature deaths in the EU in 2018, and they proposed a new emission standard (Euro 7/VII) in October 2022. As per the European Commission, the new standard will promote more zero-emission vehicles for 2035, and the newly introduced ban on internal combustion engines by 2035 supports this. Hence, efforts for new vehicles to stay clean longer, introducing better control, regulation and tightening of car emissions, and better support for the transition towards electric vehicles are showcased in regulatory actions (European Commission - Press Release, 2022). The new strict standards for vehicles in the EU are based on strong and scientific reasoning. They are as much needed for the health of EU citizens as they are helping to meet emission targets. However, used vehicles that do not meet EU standards are shipped elsewhere, mostly to Africa. The main reason is that global trade in used vehicles is often more financially convenient than scrapping the vehicles in the exporting countries as per a report by the UN (2020). Even though in certain EU countries it is required by law to have a proof that old vehicles are transported to disposal facilities, it is not mandatory to have a proof of destruction, which represents a major loophole. The ELV Directive recommends that Member States introduce a certification of destruction but does not make it mandatory (DIRECTIVE 2000/53/EC). This creates a loophole for the illegal shipment of damaged and non-functioning vehicles, which means there is an unknown number of used vehicles shipped from country to country.

According to various research, the number of deregistered vehicles that are unaccounted for every year is between 3 and 4 million in the EU (Mehlhart et al., 2017; Scherger, 2021). These vehicles are believed to be either illegally scrapped for parts or exported to countries outside of the EU (Scherger, 2021 as written in Mehlhart et al., 2017). Moreover, some of these vehicles are tampered with in the exporting countries, by removing parts like filters, catalysts and sensors due to a massive global market for used spare parts (UN, 2020). Figure 7 below depicts the flows and routes for vehicles and spare parts, explaining how vehicles from the EU market are treated, transported and disposed of.

Figure 7: Trade flow of used vehicles from Europe to Africa, own production



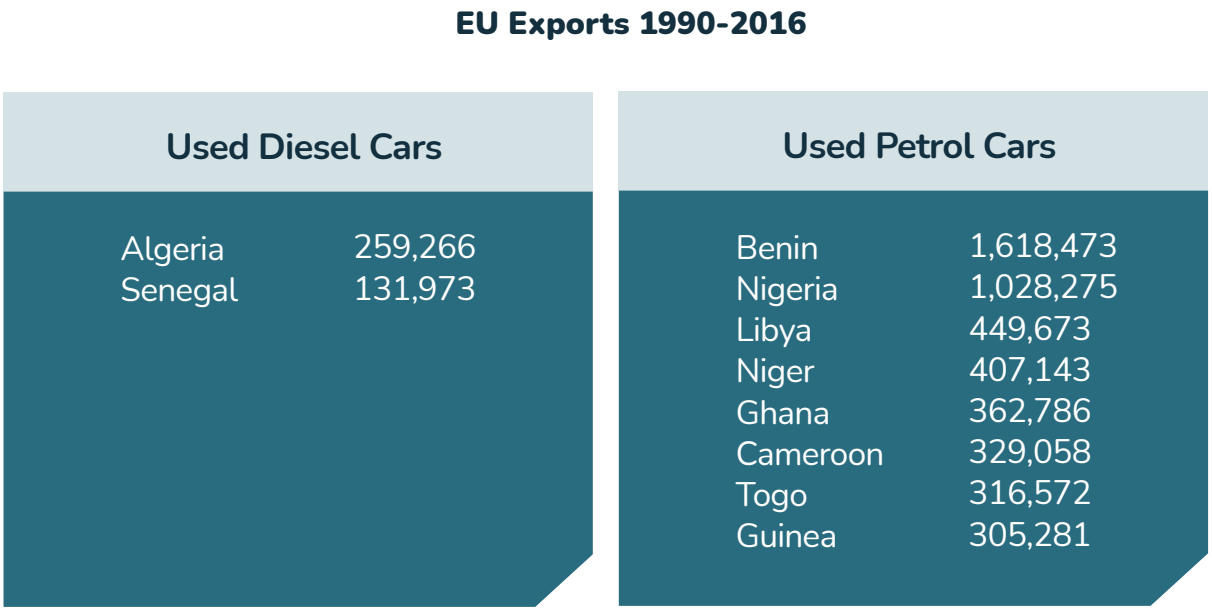
4.2.2 Monitoring and Control

Another challenge in getting data from exporting countries is that most used vehicles are shipped from main ports in Europe, such as the port of Rotterdam. This means that the numbers will show the Netherlands as one of the biggest exporting countries in Europe. However, a big portion of used vehicles is transferred to the Netherlands from other European countries to be shipped outside of Europe. Also, Member States do not always report intra-European trade, which causes a data gap regarding original exporting countries. Furthermore, the trade in used vehicles can be closely connected with the trade in UEEE and WEEE. Research done in Ireland shows that, out of 170 used vehicles exported, 105 contained illegal shipments of UEEE and WEEE (McMahon et al., 2021).

4.2.3 Trade Flows

The EU is one of the three largest exporters of used vehicles, together with Japan and the US. Most of the EU external export of used vehicles is directed towards Northern and Western Africa, but it is important to also mention that around 55% of the total EU used vehicles are traded within European countries, mostly to Eastern Europe and the Balkans (UN, 2020). Data from Eurostat Comext show that, from 1990 to 2016, the EU exported 131,973 used vehicles to Senegal, making it the main destination in Africa for used diesel vehicles. During the same period, the main EU export destinations of used petrol vehicles were Benin (1,618,473), Nigeria (1,028,275), Libya (449,673), Niger (407,143) and Ghana (362,786) (del Rosal, 2022) (figure 8). According to the UN report on a Global Overview of Used Light Duty Vehicles in 2020, the EU, Japan and the US exported around 14 million used vehicles between 2015 and 2018 (UN, 2020). 7.5 million were exported by the EU, which accounts for 54% of all exports between 2015 and 2018. African countries imported around 40% of the 14 million used vehicles exported in that period (UN, 2020).

Figure 8: Main destinations for EU used vehicle exports, own production based on UN (2020) numbers from 1990-2016



Main destinations for EU used car exports, 1990-2016 (number of cars)
Source: Comext

In 2019, according to the Eurostat Comext Database, the EU exported a total of 1,164,147 used vehicles to countries within and outside of Europe (Scherger, 2021). That same year, USD 6.7 billion worth of used vehicles were exported to Africa from the EU. Germany was the leading exporting European country, with USD 2 billion in total exports, which generated up to 550,000 used vehicles (Boateng & Klopp, 2022). Germany was followed by Spain, Belgium and France as the top exporting countries in Europe in 2019 (Ayetor et al., 2021). Comext trade data show a small decrease in the number of exports from 2019 to 2020, as the EU exported respectively 962 and 768 used vehicles (Scherger, 2021).

Africa's import numbers in 2019 show that Nigeria imported a total of 171,248 used vehicles, worth USD 2.7 billion, and Libya imported 148,668 used vehicles, worth USD 855 million, from Europe, Asia and America, making them the leading importing countries in Africa. They are followed by Kenya, Ethiopia and Ghana (figure 8). Kenya has the largest fleet of used vehicles, which accounts for more than 90% of all the vehicles in the country. It is important to note that 75-85% of used vehicles imported by Benin and Togo get shipped to other African countries such as Niger, Mali, Chad, Burkina Faso and Nigeria, which means the numbers in figure 9 are not completely representative of the whole picture (UN, 2020; Scherger, 2021).

Figure 9: Number of used vehicles imported by African countries in 2019, own production based on UNECE (2022)

Imported vehicles in 2019 (units)	
Nigeria	171,248
Libya	148,668
Kenya	89,616
Ethiopia	81,259
Ghana	76,011
Tanzania	61,167
Senegal	43,867
Benin	41,831
Guinea	39,291
Cameroon	31,337
Ivory Coast	28,653
DRC	24,207
Mozambique	19,426
Zambia	17,084
Mauritius	15,744

Main importing Destinations in Africa
Source: UNECE, 2022

During the period between 2017 and 2020, the EU, Japan and South Korea exported 760,139 used hybrids and electric vehicles (UNECE, 2022). 66% of these vehicles were exported to low-and middle-income countries, and more than half of those were exported to Africa (UNECE, 2022). It is expected that the consumption of oil-consuming vehicles in the EU will slow down, while the consumption and production of electric vehicles will rise (Lee et al., 2012), following the ban on new internal combustion engine vehicles approved for 2035. The ban was approved as part of Europe's plan to transition towards carbon neutrality for 2050. The European Commission and Parliament agreed that European vehicle manufacturers need to completely cut CO2 emissions by 2035 (European Parliament, 2022). This could lead to the rest of the world following the 2035 deadline with a five to ten-year delay (Fulton et al., 2019). The increased bans on diesel vehicles, stricter annual inspections of vehicles and the creation of low-emission zones in the EU are driving the global trade for used vehicles (UN, 2020).

While the EU has banned the sale of internal combustion engine vehicles from 2035, Cape Verde is currently one of the only African countries that have plans to move from internal combustion engine vehicles to electric vehicles by 2050 (Ayetor et al., 2022). Rwanda recently announced its plans to have 20% of buses, 30% of motorcycles and 8% of vehicles electric by 2030, to decrease air pollution (UN, 2022). Mauritius, instead, has a three-year age restriction ban on used vehicles, and has implemented fiscal incentives for low and no-emission vehicles. These incentives have increased the country's import of used hybrid and electric vehicles from 43 vehicles in 2009 to 14,754 in 2020 (UN, 2020). EV sales are estimated to grow until 2050, with no signs of vehicle production or sales slowing down (Fulton et al., 2019).

4.2.4 EPR Fees

Besides the issues connected to the lack of testing conducted on relevant emission standards and certification before export in the European ports, the EU ELV Directive does not target vehicles heavier than 3.5 tonnes. These end-of-life heavy vehicles are then not covered by the EU-wide Directive and do not fall under any EPR scheme. According to data from the European Commission from 2016, this excludes approximately 45 million vehicles, including trucks, trailers, road tractors, buses and motorcycles.

Looking at the governance on the exporting side more carefully, the ELV Directive acts as the main recycling and vehicle disposal regulatory tool in the European Union, but it does not incorporate EPR schemes as other waste policies. Besides, the ELV Directive covers end-of-life vehicles but does not provide treatment guidelines for vehicles that are not considered roadworthy. Hence, vehicles that are near end-of-life or that do not satisfy the European emission standards can be exported to other countries where regulations allow for the vehicles to be driven, thus avoiding the disposal and treatment guidelines imposed by the ELV Directive in the EU.

The lack of EU harmonised rules fostering and driving EPR systems in the vehicle sector means that there is no EU-wide system in place. This hampers the tracking of vehicles and allows for national EPR systems to differ greatly, when they exist at all. Yu et al. (2019) reported that, generally, 75-80% of ELV's weight is recycled and reused, whereas the remaining 20-25% is either landfilled, incinerated, or shredded to Automobile Shredder Residue (ASR) as a complementary practice of treatment and disposal processes for vehicles. Nevertheless, a study by Yu et al. (2019), identifies three different types of EPR systems in place in the EU.

In the first system, countries without local vehicle producers are reliant on vehicle importers to supply the market with new vehicles, and EPR on vehicle manufacturers cannot be levied. Hence, countries such as the Netherlands and Belgium introduced fees on vehicle importers to cover the recycling and treatment costs for ELVs. In the Netherlands, the ELV recycling association Auto Recycling Nederland (ARN) was founded in 1995 to manage the treatment and disposal of vehicles. They are contracted to over 300 vehicle dismantling and ASR processor companies that are responsible for up to 90% of all ELVs in the Netherlands. The Netherlands has thereby implemented a registration system that strictly follows the whereabouts of vehicles. This indicates the need for authorities to complement the Directive with national associations that then manage cooperation and monitoring across vehicle treatment facilities within the country. The lack thereof can lead to uncoordinated and inefficient practices, while fostering exports and the avoidance of sound treatment.

The second system covers countries, like Germany, that host major vehicle manufacturers but also have a different system in place to cover the recycling and treatment costs. As the local manufacturers are responsible for a large number of vehicles on the market, the costs for recycling and treatment are covered by them. Germany treats and disposes of its vehicle fleet domestically through recycling facilities and incinerators. This practice enables the country to report 100% recovery rates for its reported ELVs, as incineration is considered a method of recovery and meets the criteria for sound treatment according to the guidelines of the Directive (DIRECTIVE 2000/53/EC). Having enough capacity to handle the nationally generated ELVs, Germany can treat and process all ELVs captured in the system, as long as they are reported in the first place. However, as Germany lacks a monitoring system and vehicles are unreported once unregistered, the system has a loophole that, according to Yu et al. (2019), allows for the exports of second-hand vehicles to Eastern Europe. These exports tend to be undertaken between unauthorized dealers and recycling operators with inappropriate treatment practices. Furthermore, they often end up vanishing and bypassing sound treatment processes as they are later exported to third countries after slipping through the monitoring of vehicles put on the market.

Lastly, Yu et al. (2019) identify a third system for the countries that host vehicle manufacturers but also largely rely on imports to meet their demand for vehicles, and that cannot treat and process the ELVs generated within their country like Germany does. Here Yu et al. (2019) identify Italy as an example, as the country does manufacture its own vehicles but cannot treat and recycle vehicles once they are discarded. Reaching a recycling rate of almost 85%, Italy disposes of the remaining 15% of ELV weight in the form of ASR via landfill. However, the authors also identified a difference in shipments of used vehicles, as most used vehicles and second-hand vehicles are shipped to Africa, as it is closer and cheaper. Nevertheless, in Italy the registration of vehicles and reporting of unregistered vehicles remains an issue that allows for second-hand vehicles and ELVs to bypass sound treatment practices and be exported to third countries.

As the monitoring of vehicles put on the market and the lack of ongoing supervision of unregistered vehicles proves to be an issue across the EU, some countries have adopted approaches that act as complementary to the ELV Directive. As mentioned above, the Netherlands introduced a system that follows the whereabouts of vehicles more strictly, by forming an association of treatment facilities and recycling plants. This allows them to monitor vehicles beyond registration if they are treated within the country after being discarded. Moreover, similarly to Ireland, a vehicle is only considered an ELV when it cannot be repaired for market value realistic costs in the country of export. Portugal, on the

other hand, introduced an approach where vehicle taxes are levied from the owner until a certificate of destruction (CoD) is issued by an authorised treatment facility (ATF). However, this system provides loopholes for unmonitored vehicles if the national legislation allows for vehicles to be registered as no longer "on the road" and exempted from the vehicle tax, which is common practice in several EU countries. Similarly, France introduced a new legal approach for damaged vehicles where the vehicle owner did not accept compensation after the vehicle was categorised as terminated due to extended damages. Hence car insurance, a mandatory document for driving a vehicle in the EU, can only be terminated if a CoD, a new insurance contract for the vehicle or proof that the damaged vehicle has been repaired is issued. Another approach, introduced in Denmark, focuses on a financial incentive to encourage the proper treatment of vehicles. They adopted a system that pays out the last owner of a vehicle if they bring their vehicles to an authorized ATF upon discarding their vehicle.

Based on the different EPR fees and vehicle disposal practices in place across the EU, an average approximation is difficult. According to ARN and Monier et al. (2014), the vehicle disposal fees range from 0 EUR in Germany, 3-4 EUR in Austria, 46 EUR in the Netherlands and up to 66 EUR per vehicle in Slovakia. While in Finland the fees range from 3 EUR to 19 EUR per vehicle. In Greece, fees are collected in the form of vehicle taxes for the owners and range from 0 to 1000 EUR. In Ireland, the fees also come in the form of a tax for the vehicle owner and depend on the type of vehicle and horsepower, ranging from 120 EUR to 2350 EUR per vehicle.

To give a practical example, a study conducted in Ireland in 2019 followed the export of 170 used vehicles from Ireland to several African countries (McMahon et al., 2021). Considering the tax reported above, the total EPR fees for the 170 used vehicles exported from Ireland in 2019 would range between 20,400 EUR and 400,000 EUR. As the fees for most vehicles are on the lower end, it is fair to assume a total value closer to 25,000 EUR per year. This is the amount that has stayed with the PROs in Ireland and has not followed the vehicles for end-of-life management in importing countries for the reported exported vehicles. Based on the numbers from Eurostat, a total of 149,445 ELVs were generated in Ireland in 2019 and those 170 used vehicles only represent a fraction of the total of exports for which EPR fees did not follow the vehicles, both used and end-of-life.

Similarly, most fees in the EU are reportedly relatively low and the average fee is similar to the ones paid in the Netherlands, at 46 EUR per vehicle. The Dutch model, which is based on a cost-efficient treatment system, offers a representative and reasonable fee approximation to extrapolate for total EU estimations. Hence, with reports stating that 1,164,147 vehicles were exported from the EU to Africa in 2019, an estimation of 53 million EUR of foregone equivalent EPR fees for vehicles seems appropriate. This means that, for an estimation based solely on the known and reported exports of 1,164,147 vehicles, a minimum of 53 million EUR in fees did not follow the vehicles to their place of disposal in Africa. Additionally, with 4 million vehicles per year that go unreported and missing, uncollected EPR fees for ELV disposal could amount to significantly higher sums. To estimate the total amount of EPR fees that did not follow the vehicles exported from the EU it is, therefore, necessary to consider confirmed exports, as well as the vehicles that evade reporting or avoid monitoring such as unregistered vehicles and ELVs. Based on the numbers of total vehicles registered and unregistered for the recent years where data was available, this study will estimate an approximation of the total vehicles exported. Then, the sum of EPR fees that do not follow the vehicles when exported to Africa will be estimated by using the average fees from Member States for which prices were available.

Data by the European Automobile Manufacturers Association reported that 15,118,269 new vehicles were registered in 2017, while 11.2 million vehicles left the stock in the EU. As stated by UN data, from 2015 to 2018 a total of 7.5 million used vehicles were exported from the EU to Africa, suggesting a yearly average of almost 2 million exported vehicles per year. In 2017, of the 11.2 million vehicles leaving the stock in the EU, 1.8 million used vehicles were estimated to have been exported to Africa. Additionally, 3-4 million vehicles are reported to be deregistered yearly within the EU. Thus, the number of exported vehicles is potentially higher, as deregistered vehicles can evade reporting and inflate the number of exported vehicles for which EPR fees did not follow the product. Data from Eurostat further suggests that, in 2017, 5,300,000 vehicles were reported as ELV within the EU, and the lack of reporting on ELVs once again allows for a significant number of illegal exports. The report "Effectively tackling the issue of millions of vehicles with unknown whereabouts" by the German Federal Environment Agency from 2020 suggests that 3.4 to 4.7 million ELVs are illegally exported per year (Kitazume et al., 2020).

Thus, in addition to the 1.8 million confirmed used vehicle exports, another 3.4 to 4.7 million ELVs could be exported illegally each year. Based on data for ELVs generated from 2016-2020, the 3.4 to 4.7 million ELVs that are estimated to be exported illegally roughly represent 40-60% of generated ELVs in the EU. Assuming a similar percentage of exports for deregistered vehicles, another 1.2 to 2.4 million vehicles could potentially be exported from the deregistered vehicle fleet and further inflate the amounts of vehicle exports from EU to Africa. The total of exported vehicles could then range from 6.4 million to a maximum of 8.9 million. Once again, assuming the average EPR fee for vehicles within the EU to be cost-efficient and similar to the one in the Netherlands at 46 EUR, the total of EPR fees that do not follow vehicles to Africa would then range from 294.6 million EUR to 409.4 million EUR (figure 10).

Figure 10: The estimated total EPR fee loss caused by vehicle exports from EU to Africa, own production

This chapter gave a comprehensive overview on the trade flows, current and future trends, and policies associated with EEE and vehicles. The information showcases the main European exporting countries and African importing countries of UEEE and used vehicles. Moreover, the challenges and policy loopholes connected to these trade flows are explained and examined in detail. Chapter 4 is connected to chapters 2 and 3 through extrapolation of EPR fees that are lost through trade and do not follow the products. The issue of EPR fees not accompanying products from the exporting country to the importing country means that waste management of the products exported for reuse can hardly comply with the requirements established in the EU and be financed by the EPR systems. The next chapter of this study provides policy recommendations in this regard.

Chapter 5

Policy Recommendations for the revisions of the directives on End-of-Life Vehicles (ELV), Waste from Electrical and Electronic Equipment (WEEE), and Waste Framework (WFD)

This chapter attempts to suggest reasonable solutions to improve EPR systems for second-hand products exported beyond the EU. It is divided into three parts. The first part gives policy recommendations on the EPR schemes in the EU and Africa, focusing on how to create an improved collaboration between the PROs in different countries and enhance the functioning of the EPR system. The second and third parts offer recommendations for EPR schemes regarding trade flows of EEE and vehicles and their respective directives.

5.1 The challenge of the current EPR system

The European EPR scheme is recognized to have multiple issues, the most common being the lack of unification, coordination and collaboration between the Member States. Several authors (Monier et al., 2014; Pouikli, 2020; Ahlers et al., 2021) recommend that EPR in Europe should have more unified schemes across Member States, share knowledge on best practices, have better control mechanisms, and more reuse schemes. A flawed domestic EPR system only compounds issues in global transfers of fees. Therefore, to remedy the lost EPR fees estimated in this paper, domestic EPR systems should strive to be as consistent and exhaustive as possible. A lack of eco-modulation, for example, only worsens the costs faced by importing economies and so exacerbates the problem of lost fees across borders.

Existing research also recommends setting more significant fees and integrating eco-modulation criteria. Sachdeva (2021) explains that current fees, with or without eco-modulation, do not represent the real end-of-life management costs for EEE and textiles, and/or do not act as a real driver because the (eco-modulated) fee is small compared to the overall product price. Eco-modulation is promoted as a solution but can only incentivise producers to change their design if developed thoroughly and in a harmonized way at EU level. The eco-modulation fee is recommended for products where high collection and recycling targets are already established, and changes in design can foster additional material saving opportunities.

Moreover, Thapa et al. (2022) explain that EPR schemes do not account for transboundary trade and the multiple-life cycle of products which is why there is a need for the transition towards Ultimate Producer Responsibility (UPR). The UPR system should have high product traceability from exporting

to importing countries and help improve accountability for producers and distributors of products. Achieving multiple life cycles of products is the essence of the UPR system to reflect circularity and sustainability. This means that the UPR also aims to reduce waste generation and maximise material valorisation. Along with UPR, a digital product passport (DPP) is a suggested solution to follow the transboundary trade of products and multiple life cycles. Compared to UPR, the DPP aims to collect and provide information on the goods and their supply chain to ease a shared understanding of products properties and materials for all actors involved. The DPP is informative for the consumer, as it would help them grasp the environmental impact and materials involved in the product, but DPP is also essential for all actors along the (reverse) value chain. Both UPR and DPP could work together and not only enhanced traceability of products, but also ensure the EPR fees remain attached to the product wherever it is shipped.

To progress the objectives of the UPR, EPR systems should aim to bridge between the exporting and importing countries through PROs. The PROs of exporting and importing countries should collaborate so that the EPR fees are transferred to the importing country PRO that will bear the waste management costs of the products once they reach end-of-life. Where the importing country does not have a PRO system, the collaboration should be done with the recognised/accredited local organisations responsible for waste management of these product streams. Such a global UPR system could help support the local businesses in the importing countries that bear the costs of waste management, and prevent human health and environmental degradation linked to mismanagement of waste. Moreover, supporting policies in importing countries are required to improve the structural organisation of waste management in Africa, taking into due consideration the informal sector which is often involved in reuse and waste management activities in African countries.

European PROs are also encouraged to share their trade flow data to create a more open and collaborative system between the member states. As can be observed throughout the study, there is a lack of information on the amount of used EEE or used vehicles exported. This information could give valuable insights into complete trade flow data and the largest exporting and importing countries. For example, the data would inform authorities about major export routes and allow policy makers to make educated decisions and address systemic shortcomings. It would also be easier to guarantee that the fees follow the products, appropriate infrastructure could be built and EPR fees would indeed finance the sustainable treatment of goods, regardless of the location of disposal.

5.2 EEE

Enforcement of reusability

Data collected throughout this study gives valuable insights into the trade flows of used EEE from Europe to Africa. However, the data is often incomplete and the information on relevant data streams (EEE, UEEE and WEEE) are usually intertwined. Moreover, the verification of EEE functionality and associated certificates, before export, is often not properly done in the European ports. As customs and border controls are overwhelmed by the vast amounts of goods that are to be exported, they can only control and test a fraction of the total amount to ensure their functionality. Therefore, the level of market surveillance activities needs to increase, and custom agents need to receive ongoing training to manage the vast amounts of goods processed in major EU ports and stay up to date with

exporting practices. Also, an improved sorting and testing system is required to reduce the export of non-functional discarded products. Increasing the number of agents at testing stations and improving the supervision of exports will help not only to reduce the export of waste, but also to discourage EU suppliers from carelessly discarding products, as thy will have increased chances to be held accountable once problematic products are revealed in testing stations. This will ensure that the products most in need of EPR fees in importing countries will be retained in exporter countries until they meet sufficient functionality standards.

Moreover, the transports arriving at major European ports from where goods are collected before being shipped to Africa are generated in different EU countries, and their origin is often no longer conveyed. Thus, the responsibility for adequate testing and supervision of the goods destined for export might be diluted along the transport chain and among the various actors involved, even if it is the primary responsibility of exporting companies to check for product functionality and proper reusability. Certificates and relevant paperwork are often incomplete or missing and do not allow to track back neither the original supplier of the product, nor the responsible PRO that collected the correspondent fees. Thus, it is paramount to increase monitoring within the EU to guarantee that the actors who are responsible for the goods are clearly identified, and that dysfunctional products are not exported.

Regarding the functionality of products, the WEEE Directive guidelines still leave room for interpretation and only request a test for basic functionality, without specifying the level or requiring a standard testing procedure. Additionally, the tests are often done by third parties, and the relevant documentation or paperwork might be faulty and incomplete as they are not required to follow specifically set guidelines for functionality testing. Therefore, minimum functionality requirements for products as well as precise testing procedures need to be established to allow for better control of exported products.

Ensuring more precise trade data and optimal use of EPR fees

As for the collaboration between EU and African countries regarding the transfer of fees to accompany exported products, it is highly recommended to improve coordination between EU PROs and the local PROs or local organisations responsible for waste management of EEE in Africa. Increased coordination between the PROs can help solve the challenge of EPR fees and help guarantee they follow products until they are discarded and treated appropriately. This would also allow importing countries to estimate incoming financial flows for waste management. Local authorities could invest these funds in appropriate infrastructure to meet the necessary standards for treating product streams that enter African countries, with the objective of achieving environmental sound management (ESM) standards equivalent to those mandated by the EU, which the paid fees were intended to accomplish.

5.2.1 Policy recommendations for the revision of the EU WEEE Directive

The current WEEE Directive does not clearly identify and categorise what discarded EEE is defined as UEEE. Reusable EEE and WEEE can be mixed up by various actors along the reverse value chain, regardless of the value retention potential of the goods. Hence, users or treatment facilities do not always sort and treat the products appropriately, and forgo extending the life cycle of EEE by

discarding them as waste. Moreover, leakages along the reverse value chain further aggravate the confusion between used EEE and waste. As a lot of discarded EEE is still found in household waste or other unsound disposal channels, clearer traceability features and incentives for the consumer and waste collectors should help reduce improper discarding. By better defining what differentiates waste from a reusable product and by educating value chain actors on the value retention potential of UEEE, functional EEE equipment could be more easily identified and sorted accordingly. Thus, UEEE would be treated separately from WEEE, reducing the overall amounts of discarded products and allowing to extend the life cycle of functional UEEE.

Another major shortcoming of the EU WEEE Directive is the lack of monitoring and reporting within the EU and across Member States. While PROs and treatment facilities report on the amounts collected and the total weight generated, they do not provide in-depth information on the products and material streams, nor on the treatment or shipment of the collected goods. Moreover, reporting and monitoring are often poor when discarded materials are transported across the EU, as collaboration and communication within the EU are still limited. Thus, transported goods from one country to another rarely undergo border controls and are transported until they reach overwhelmed port authorities. This leads to unreported and undocumented streams being transported through the EU before eventually being exported without a clear idea of its provenance or level of functionality. Hence, the reporting on the type of products and materials that are collected and treated remains underdeveloped, and a general unawareness of the major collected and exported goods persists. To improve WEEE treatment, it is crucial to better monitor and understand the material streams, and to allow for the identification of major product streams to address them better and maximise both value retention and life cycles of goods.

To complement the efforts to increase monitoring and reporting, customs and border agents need to be enabled to deal with the incoming transports of materials destined for export. Hence, the training of agents to identify major export streams and common illegal practices, as well as testing adapted to the main material streams, need to be put in place to act on the information obtained from the improved monitoring and reporting. As transparency is further fostered through improved monitoring, material streams will be easier to identify, and the control stations at ports and borders will become

more efficient. Capacity building and awareness campaigns can then follow to further enhance the efficiency of collection, recycling and disposal processes. For example, testing can be done more extensively to avoid export of waste products, while also allowing materials to remain in the loop by treating them within the EU and reusing valuable materials otherwise unsoundly treated abroad.

Thanks to a better organised and supervised system allowing for precise monitoring and reporting of product streams, the EU will also be able to follow what products leave the EU to be reused or recycled abroad. This will allow authorities to identify the suppliers of products and the respective PROs more easily, and to guarantee increased control over the fees collected for waste disposal. While it is currently not common practice to transfer fees from one country to another, it is necessary to ensure that the collected fees are not kept for financial gain or for subsidising other streams domestically, but rather used for their original purpose of sound disposal practices, wherever in the world they will occur. In the long term, it will be necessary to organise PROs in a way that transfers the fees for waste treatment to the countries that will dispose of the product.

5.3 Vehicles

Used vehicles are exported from the EU to emerging economies as well as to the Balkans. However, if compared to other product streams covered by EPR systems, vehicles are not monitored and controlled sufficiently at end of life. Even when the fees stay associated to the vehicle, the proper disposal and treatment of different materials within vehicles, notably if not valuable, is often neglected upon disposal. Due to the complex composition of vehicle manufacturing, the processing and treatment of ELVs is particularly difficult. The potential for reusing and recycling certain materials is often overlooked because the fees charged for using them do not consider the specific characteristics of the materials and vehicle parts. This is evident in the low recycling rates for plastics, as there is not enough emphasis on reusing recycled plastics from vehicles. Therefore, complementary systems are required to incorporate glass, metals, electronics and other product streams of vehicles to improve the collection of fees that finance the sound treatment and disposal of all materials included in vehicles. To allow for better monitoring of vehicles and its parts, a EU-wide implementation of digital product passports (DPP) is necessary. DPPs are designed to track material streams and products and help improve monitoring. DPP should then be allocated to different vehicle parts (batteries, tyres, textiles, electronics) to create higher value retention. The introduction of DPP for individual parts would assist in minimising illegal shipments of vehicle parts. Furthermore, tracking these parts would help end the illegal removal of parts from vehicles brought to collection and treatment facilities in the EU. It is therefore recommended to include DPP within a EU-wide system aiming to tackle the lack of monitoring as well as to eliminate illegal exports after disposal within the EU.

ELVs that have not been discarded and remain at treatment sites can be exported without being tracked and are often illegally shipped to Africa. By increasing traceability of vehicles, their parts and including discarded vehicles in monitoring efforts, it becomes more difficult for vehicles to evade EU jurisdiction and bypass disposal guidelines for a proper treatment. A system like the Dutch one is therefore recommended, where treatment plants collaborate to monitor nationally discarded and disposed ELVs, and safeguard that all ELVs destined for disposal are treated within the country and not ultimately exported to Africa.

Furthermore, the allocation of EPR fees should also be connected to the different parts of vehicles

such as the battery, tyres, textiles and electronics. The fees can then follow the individual parts and further support a disposal system for parts as well as vehicles in the country of final treatment and disposal.

In addition to the DPP for monitoring and individual EPR fee for vehicle parts, vehicle PROs should collaborate similarly to the collaboration system between European and African PROs for EEE. If the exporting and/or importing country do not have a PRO responsible for ELV treatment, this collaboration should be arranged with local organisations, vehicle manufacturers or final treatment facilities. This would ensure that EPR fees follow the vehicles and are released once the latter reach their end-of-life.

5.3.1 Policy recommendation for the new revision of the EU ELV Directive

Research revealed that the ELV Directive does not influence vehicle producers to adopt and enforce the EPR scheme. Firstly, the Directive does not require EPR schemes as such, which means it does not account for the general minimum requirement defined by the WFD. Furthermore, it does not provide any binding guidelines on monitoring and reporting on the treatment and disposal of vehicles. The missing guidelines on vehicle reporting and data collection prevents the efforts towards sound vehicle treatment and disposal by failing to account for vehicles along their entire life cycle.

Currently, in most countries the monitoring of vehicles stops when they are deregistered, evading EU control. Hence, countries have been adopting different approaches to continuously account for vehicles while dissuading against car deregistration to avoid EU jurisdiction. The introduction of fees for owners to deregister a vehicle discourages them from doing and reduces the supply of vehicles provided through unaccounted used vehicle streams. Alternatively, the option to introduce vehicle taxes to be paid by the owner of the vehicle until a proof of destruction or sale contract of the vehicle is put forward is recommendable. A combination of both strategies would further impede illegal and unaccounted exports, while foregoing the major shortcoming that deregistered vehicles do not underlie the vehicle tax - a key issue when working to transfer EPR fees across borders.

Most Member States have established systems to report vehicle transfer to treatment facilities, but do not require proof of destruction. This loophole is responsible for up to 4 million of ELVs that go missing each year in the EU, as reported by Mehlhart et al. (2017) and Scherger (2021). Hence, making CODs mandatory should help reduce unaccounted ELVs that are exported illegally. Therefore, we recommend introducing mandatory EPR schemes in the ELV Directive, adding general minimum requirements and binding guidelines on monitoring and reporting of treatment and disposal of vehicles and adopting mandatory CODs. Potentially, a system like the Danish one, where the final owner of the vehicle receives cash back when disposing the vehicle at treatment sites, could further foster sound disposal and treatment of vehicles. As an additional instrument, the authors recommend introducing a digital product passport (DPP) to track ELVs and to limit the illegal shipments of used vehicles.

Moreover, as the ELV Directive does not put forward the introduction of EPR schemes for vehicles, there is no international common ground to guarantee that producers bear the costs of vehicle treatment and disposal when this happens outside the country where the vehicle is first put on the market. Thus, the costs for ELV disposal often fall on economic operators and treatment agents, leaving them to operate

at a loss, as the revenues do not cover the high disposal costs. The wording of the Directive creates an unclear allocation of responsibilities between producers and economic operators: economic operators are responsible for the collection, treatment, and recovery of ELV, and need to inform the consumers of their choices, while producers are responsible for the design, manufacturing and implementation of measures as required by the Directive. However, the Directive also states that manufacturers should provide treatment facilities for material dismantling. Thus, the new revision of the Directive should incorporate a clearer allocation of responsibilities to improve enforcement amongst producers and economic operators, and aim to guarantee that the costs of treatment and disposal fall on producers, not on treatment facilities.

Additional issues arise due to the unclear distinction in the ELV Directive between end-of-life vehicles and used vehicles, and the lack of mandatory roadworthiness certificates that aim to guarantee standards of functionality for used vehicles. For that reason, ELVs evade EU jurisdiction and are exported to Africa as used vehicles.

Thus, vehicles leaving the European market are often near-end-of-life or end-of-life and would not be road-certified in the EU. However, exports cannot be prevented, since the lack of clear legal definition regarding the classification of used vehicles and ELVs allows the vehicles to be classified as used vehicles. It is then recommended to require a certificate of roadworthiness for used vehicles exported from the EU to emerging economies, as this would help identify ELVs more easily and allow for vehicles without certificate, potentially illegal ELVs, to be returned to the exporter or not to be exported in the first place – thus reducing the immediate need for EPR fee transfer.

Also, the ELV Directive only targets vehicles lighter than 3.5 tonnes, which means that 45 million motorcycles and heavy vehicles such as trucks, trailers, road tractors and buses are left out. The exclusion of heavy vehicles and motorcycles creates a loophole in trade flows and leaves out producers' responsibility for their end-of-life management. The European Commission indicated that in the Directive revision, attention should be paid to the ELVs not already mentioned. Several countries within the EU have been making efforts to address this by introducing fees to unregister vehicles or levying vehicle taxes on vehicles until proof of destruction or sale can be provided. However, those solutions are insufficient, and it requires additional efforts to prevent vehicles from disappearing upon deregistration and evading EU monitoring. On the other hand, the vehicles that are addressed in the ELV Directive do not underlie the same requirements as other product streams, and general minimum requirements for vehicles are, unlike other products, not considered by the Directive at all. Therefore, to have a functioning international EPR scheme it is crucial to include all vehicles while also increasing the level of requirements for sound vehicle treatment and disposal.

Conclusion

Throughout this study, chapters 1 to 4 have given a complete overview of the EPR schemes in the EU and Africa. The study explains that the EU and African EPR schemes are introduced through national policies. In the EU, EPR is introduced through EU directives and individually implemented by Member States, while African countries that have established EPR schemes have done it solely through their national policies. In both cases, the implementation and enforcement of EPR schemes vary between countries, causing several challenges. One of them is that EPR fees do not follow the product once it leaves the country where it was first put on the market for another country where it will be reused and then reach its end-of-life stage. The authors estimate the EPR fees that should follow the exported used products to range between 340,000,000 and 380,000,000 EUR for EEE, and between 294,600,000 and 409,400,000 EUR for ELVs. Therefore, the total estimated EPR fee that disappear between EU exporting and African importing countries in the flow of used electronics and vehicles are estimated to range between 634,600,00 and 789,400,000 EUR annually. However, with a substantial quantity of illegal or unreported shipments in both EEE and ELV exports, this number could be even higher. The lack of data on this sector creates major issues in estimating the disappeared EPR fees, which should be tackled through policy recommendations.

Chapter 5 provides recommendations to address these challenges and on future revisions of the EU Directives on WEEE and ELV. With regards to EPR schemes, there remains significant differentiation between policies across the EU. Therefore, this study recommends increasing the coherence of EPR schemes across the EU. This study also recommends EPR eco-modulation bonus for goods with high value retention potential, and eco-modulation malus for those that do not meet advanced circularity characteristics. As EPR schemes do not allow for cross-border transfers, policymakers should aim to make use of UPR schemes and PROs which could facilitate transfers alongside exports and imports.

For EEE streams, greater testing and reporting at the export stage is required, alongside an increased number of officials at testing stations to ensure that goods are clearly identified as UEEE or WEEE. To support this, the definitions in the WEEE Directive should be strengthened and include a

set of minimum functionality requirements. This study also recommends the inclusion of eco-modulation fees to encourage circular design and practices.

For the New ELV Directive, this study recommends the introduction of vehicle taxes paid by the owner until proof of destruction or sale. A revised directive should include mandatory EPR schemes alongside binding monitoring and reporting guidelines. A clear allocation of responsibilities is required to guarantee the costs of treatment and disposal are paid by producers, not by treatment facilities. The introduction of Digital Product Passports is also recommended to support product tracking. Finally, it is crucial that the ELV Directive covers as many vehicles as possible, and therefore include guidance for vehicles heavier than 3.5 tonnes, motorbikes and trucks.

Future research should aim to expand the analysis of lost EPR fees and evaluate the impact of not transferring these fees from the EU to African countries when the associated products are exported for reuse. Specifically, the potential impact of an influx of an estimated 430,000,000 EUR of EPR fees on African economies should be estimated, taking into consideration the contribution of these financial resources for the development of proper recycling infrastructure for EPR-covered streams, including textiles, and its contribution to long-term sustainability. Policymakers and the private sector should work towards policy solutions. Voluntary EPR schemes with trading partners could represent a first short-term solution to be explored to address this issue.

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