Submission by ZWAI to the European Commission on Waste from Electrical and Electronic Equipment — Evaluating the EU Rules

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Zero Waste Alliance Ireland is a member of

EEB European Environmental Bureau and IEN Irish Environmental Network

An Tinteán Nua, Ballymanus, Castlepollard, County Westmeath, Ireland
An Tinteán Nua, Baile Mhánais, Baile na gCros, Co. an Iarmhí, Éire, N91 PP76.
Telephone +353 44 966 2222 Mobile +353 86 381 9811 Email admin@zwai.ie

ZERO WASTE ALLIANCE IRELAND

Towards Sustainable Resource Management

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ZERO WASTE ALLIANCE IRELAND

Towards Sustainable Resource Management

SUBMISSION BY ZWAI TO THE EUROPEAN COMMISSION ON WASTE FROM ELECTRICAL AND ELECTRONIC EQUIPMENT — EVALUATING THE EU RULES

1. INTRODUCTION

Electrical and electronic devices have become the fastest-growing category of waste within the European Union (EU). This type of waste, commonly referred to as E-waste, frequently contains hazardous materials that can contaminate the soil, pollute groundwater, and are hazardous to the health of consumers and recyclers. In response to these problems, the EU introduced Directive 2002/96/EC, also known as the Waste Electrical and Electronic Equipment (WEEE) directive, in 2003.[1] The primary aim of this directive is to prevent or reduce the generation of electronic waste and promote the recovery, reuse, and recycling of electronic products. However, according to estimates from the EU Commission's Directorate General Environment, only approximately one-third of electronic waste in the EU is currently being recycled.

A revised WEEE Directive[2] entered into force on 13 August 2012, and one of the improvements introduced by this Directive was the harmonisation of national registration and reporting requirements; so that Member States' registers for producers of Electrical and Electronic Equipment (EEE) had to be integrated more closely.

The revised WEEE Directive gave EU Member States the tools to fight illegal export of waste more effectively, as the Commission had noted that illegal shipments of WEEE, disguised as legal shipments of used equipment, in order to circumvent EU waste treatment rules, had become a serious problem. The new Directive forced exporters to test and provide documents on the nature of their shipments.

[1] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

[2] Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE).

The WEEE Directive mandates that Member States gather annual data, including well-supported estimates. This information should be based on the quantities and types of Electrical and Electronic Equipment (EEE) introduced into their markets, EEE collected through all avenues, EEE prepared for reuse, EEE recycled and reclaimed within the Member State's borders, as well as separately collected WEEE which is exported, with a focus on weight as the measuring parameter.

After the European Union (EU) adopted Directive 2012/19, commonly known as the WEEE Directive, each Member State incorporated it into their respective national laws. While all Member States are obligated to achieve the objectives outlined in the Directive, they possess some flexibility in how they choose to implement it within their national legislation.

In 2017, the Commission reviewed the scope of the 2012 WEEE Directive, and concluded that no further changes to it were justified. One of the reasons given was that any changes would be disruptive at a time when Member States are still in a period of transition, adjusting to the new definitions and scope of the revised WEEE Directive.[3]

The Commission's 2017 review also indicated that some Member States were finding it difficult to reach the 2019 collection targets, and the review suggested postponing the 2019 deadline to give Member States more time to reach the collection target, without prejudice to existing derogations, and/or decreasing the collection target of 85 % of WEEE generated without changing the deadline.

Finally, the Commission's review concluded that it is not appropriate to set individual collection targets in the WEEE Directive at that time.

It is a key element of our submission that those 2017 conclusions, now some six years old, have been overtaken by changes in the types and amounts of electrical and electronic equipment (EEE), that these changes are accelerating, and that **significant changes in the WEEE Directive (amounting to an entirely new Directive) are urgently needed**. Furthermore, significant changes in the WEEE Directive are needed, in order to take account of recent EU environmental policies in the areas of waste reduction, re-using EEE, repairing EEE, recycling of materials and the implementation of the circular economy.

[3] Report from the Commission to the European Parliament and the Council on the review of the scope of Directive 2012/19/EU on waste electrical and electronic equipment (the new WEEE Directive) and on the re-examination of the deadlines for reaching the collection targets referred to in Article 7(1) of the new WEEE Directive and on the possibility of setting individual collection targets for one or more categories of electrical and electronic equipment in Annex III to the Directive. Brussels, 18.4.2017 COM(2017) 171 final.

2. Zero Waste Alliance Ireland (ZWAI)

At this point we consider that it is appropriate to mention briefly the background to our submission, especially the policies and strategy of ZWAI.

2.1 Origin and Early Activities of ZWAI

Zero Waste Alliance Ireland (ZWAI), established in 1999, and registered as a company limited by guarantee in 2004, is a Non-Government Environmental Organisation (eNGO) and a registered charity. ZWAI has prepared and submitted to the European Commission, the Irish Government and to Irish State Agencies many policy documents on waste management, and continues to lobby the Irish Government and the European Commission on the issue of using resources more sustainably, on using resources sustainably, on promoting re-use, repair and recycling, and on development and implementation of the Circular Economy.

One of our basic guiding principles is that human societies must behave like natural ecosystems, living within the sustainable flow of energy from the sun and plants, producing no materials or objects which cannot be recycled back into the earth's systems, or reused or recycled into our technical systems, and should be guided by economic systems and practices which are in harmony with personal and ecological values.

Our principal objectives are:

i) sharing information, ideas and contacts,

ii) finding and recommending environmentally sustainable and practical solutions for domestic, municipal, industrial and agricultural waste management, and for more efficient and ecologically appropriate uses of natural resources such as scarce minerals, water and soil;

iii) lobbying Government and local authorities to implement environmentally sustainable waste management practices, including clean production, elimination of toxic substances from products, re-use, repairing, recycling, segregation of discarded materials at source, and other environmentally and socially beneficial practices;

iv) lobbying Government to follow the best international practice and EU recommendations by introducing fiscal and economic measures designed to penalise the manufacturers of products which cannot be re-used, recycled or composted at the end of their useful lives, and to financially support companies making products which can be re-used, repaired, recycled or are made from recycled materials;

v) raising public awareness about the long-term damaging human and animal health and economic consequences of landfilling and of the destruction of potentially recyclable or re-usable materials by incineration; and,

vi) investigating, raising public awareness and lobbying Irish Government departments and agencies about our country's failure to take adequate care of vulnerable and essential natural resources, including clean water and air, biodiversity, and soil;

vii) advocating changes in domestic and EU legislation to provide for more ecologically appropriate, environmentally sustainable and efficient uses of natural resources; and,

viii) maintaining contact and exchanging information with similar NGOs and national networks in other countries, and with international zero waste organisations.

2.2 Our Basic Principles

Human communities must behave like natural ones, living comfortably within the natural flow of energy from the sun and plants, producing no wastes which cannot be recycled back into the earth's systems, and guided by new economic values which are in harmony with personal and ecological values.

In nature, the waste products of every living organism serve as raw materials to be transformed by other living creatures, or benefit the planet in other ways. Instead of organising systems that efficiently dispose of or recycle our waste, we need to design systems of production that have little or no waste to begin with.

There are no technical barriers to achieving a "zero waste society", only our habits, our greed as a society, and the current economic structures and policies which have led to the present environmental, social and economic difficulties.

"*Zero Waste"* is a realistic whole-system approach to addressing the problem of society's unsustainable resource flows – it encompasses waste elimination at source through product design and producer responsibility, together with waste reduction strategies further down the supply chain, such as cleaner production, product repairing, dismantling, recycling, re-use and composting.

ZWAI strongly believes that Ireland and other Member States, and the EU as a whole, should have a policy of not sending to other countries our discarded materials for further treatment or recycling, particularly to developing countries where local populations are being exposed to dioxins and other very toxic POPs. Relying on other countries' infrastructure to achieve our "recycling" targets is not acceptable from a global ecological and societal perspective.

2.3 What We are Doing

Our principal objective is to ensure that government agencies, local authorities and other organisations will develop and implement environmentally sustainable resources and waste management policies, especially resource efficiency, waste reduction and elimination, the promotion of re-use, repair and recycling, and the development and implementation of the Circular Economy.

As an environmental NGO, and a not-for-profit company with charitable status since 2005, ZWAI also campaigns for the implementation of the UN Sustainable Development Goals, including (but not limited to) Goal 12, Responsible Consumption and Production; Goal 6, Clean Water and Sanitation (having particular regard to the need to avoid wasting water); and Goal 15, to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and to halt and reverse land degradation and halt biodiversity loss.

In responding to many public consultations, members of ZWAI have made submissions and given presentations on how Ireland and the European Union should address the problem of plastic waste (March 2019), on single-use plastic packaging by the Irish food industry (November 2019), on transforming the construction industry so that it could become climate-neutral (instead of its present position as a major emitter of greenhouse gases and toxicants), on the general scheme of the Irish Government's Circular Economy Bill (October 2021), on the recovery and reuse of the phosphorus and nitrogen content of wastewater (2019 to 2022), on a proposed revision of the EU Regulation on Shipments of Waste (January 2022), on Ireland's energy security situation (October 2022), on Ireland's Fourth National Biodiversity Action Plan (November 2022), on Ireland's National Bioeconomy Action Plan 2023-2025 (January 2023), on Ireland's draft Waste Management Plan for a Circular Economy (July 2023), and on the problem of disposable vaping devices.[4]

It will be clear that ZWAI is primarily concerned with the very serious issue of discarded substances, materials and goods, whether from domestic, commercial or industrial sources, how these become "waste", and how such "waste" may be prevented by re-design along ecological principles. These same ecological principles can be applied to the many ways in which we abstract and use water as a resource, and to the equivalent volumes of wastewater produced as a consequence of these uses.

ZWAI is represented on the Irish Government's Waste Forum and Water Forum (An Fóram Uisce), is a member of the Irish Environmental Network and the

[4] Submission to the Department of the Environment, Climate and Communications in Response to the Department's Public Consultation on Disposable Vaping Devices; ZWAI, 27 July 2023.

Environmental Pillar, and is funded by the Department of Communications, Climate Action and the Environment through the **Irish Environmental Network**.

In 2019 ZWAI became a full member of the **European Environment Bureau** (EEB); and a member of the **Waste Working Group** of the EEB. Through the EEB, we contribute to the development of European Union policy on waste and the Circular Economy. In November 2021, the EEB established a **Task Force on the Built Environment**; ZWAI is a member of this group, and we contribute to discussions on the sustainability of construction materials, buildings and on the built environment.

3. WEEE in the Context of Renewable Energy End-of-Life Materials

While the WEEE Directive represented a significant step in mitigating the environmental and health challenges posed by electronic waste, it is essential to recognise that neither the first version of Directive, issued in 2002, nor the revised version, which came into force in 2012, took account of the rapid advancements in renewable energy technologies.

Notably absent were provisions for the disposal and management of electronic waste arising from innovations such as solar photovoltaic (PV) systems, wind turbines, and energy storage systems.

The subsequent widespread deployment of these technologies and their expected continued rapid deployment across the EU over the coming years underscores the urgency of addressing these omissions through amendments to the Directive.

3.1. Growth in EU Renewable Energy Technologies

The EU is rapidly accelerating solar PV and wind deployment in response to the energy crisis, with more than 50 GW combined capacity added in 2022 alone, an almost 45% increase compared to 2021.

New policies and targets proposed in the REPowerEU Plan[5] and The Green Deal Industrial Plan[6] are expected to be important drivers of renewable energy

[5] REPowerEU Plan – Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels, 18.5.2022 COM(2022) 230 final.

[6] A Green Deal Industrial Plan for the Net-Zero Age. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels, 1.2.2023 COM(2023) 62 final.

investments in the coming years, as the EU looks to divest from fossil fuels and to increase energy security.

The **REPowerEU Plan** was introduced as a response to Russia's unprovoked and unjustified military aggression against Ukraine, which massively disrupted the world's energy system, causing hardship as a result of high energy prices and heightened energy security concerns, bringing to the fore the EU's over-dependence on gas, oil and coal imports from Russia. High amounts paid for Russia's fossil fuels are also helping Russia sustain its war against Ukraine.

In March 2022, EU leaders agreed in the European Council to phase out Europe's dependency on Russian energy imports as soon as possible; and, drawing on the Commission's communication,[7] they invited the Commission to put forward a detailed REPowerEU plan. One of the plan's objectives is quickly substitute fossil fuels by accelerating Europe's clean energy transition.

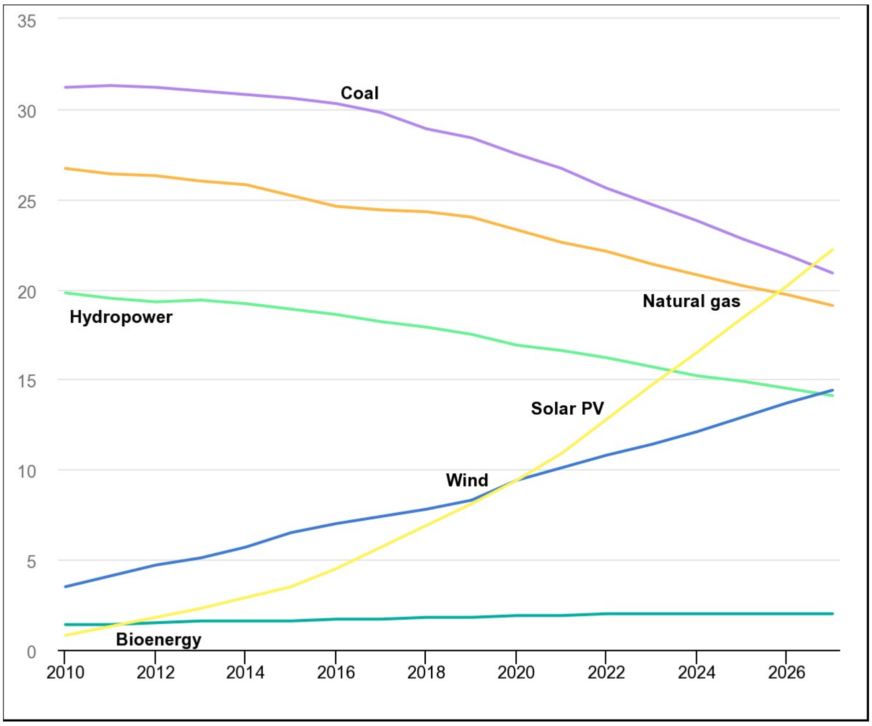

Figure 3.1 Share of cumulative power capacity by technology, 2010-2027. Source: IEA, 2022

The changes in the world energy picture (which includes Europe) are shown in figure 3.1 above.

[7] Communication on REPowerEU: Joint European Action for more affordable, secure and sustainable energy, COM(2022) 108 final, (8.3.2022).

3.2 Rapid growth in Solar PV

3.2.1 From 2010 to 2020

The cost of solar power has decreased by 82% over the 2010-2020 decade, making it the most competitive source of electricity in many parts of the EU.

In 2010, the installed solar photovoltaic (PV) capacity in the European Union (EU) was approximately 40 gigawatts (GW), representing just 0.8% of cumulative power capacity.

During the 2010s, the EU witnessed rapid growth in solar PV installations. Several countries introduced supportive feed-in tariffs and incentives, driving a surge in solar PV deployment. Germany, Italy, and Spain continued to lead in solar capacity, with the addition of numerous smaller installations in other EU member states.

By the end of 2020, the EU had over 130 GW of installed solar PV capacity, making it one of the world's largest solar markets, representing 9.4% of cumulative power capacity. Falling solar panel prices, improved technology, and favourable policies drove this growth.

3.2.2 From 2020 to 2030

In 2022, the EU installed over 40 GW of solar – twice as much as 2020 and the same as the total capacity in 2010.

As part of the REPowerEU plan, the Commission adopted in May 2022 an EU solar energy strategy, which identifies remaining barriers and challenges in the solar energy sector and outlines initiatives to overcome them and accelerate the deployment of solar technologies. It aims to bring over 320 GW of solar photovoltaic online by 2025, and almost 600 GW by 2030.

Alongside the plan, the Commission also presented a set of initiatives on permitting renewable energy projects, which are reflected in the political agreement to revise the Renewable Energy Directive (2009/28/EC). These new legal provisions will accelerate solar energy deployment in the EU even further.

3.3. Growth in Wind Power

3.3.1 From 2010 to 2020

In 2010, the installed wind power capacity in the EU was approximately 84 gigawatts (GW), representing just 3.5% of cumulative power capacity.

From 2010 to 2020, wind power capacity in the EU experienced substantial growth, driven by a combination of supportive policies, technological advancements, and increased investment in renewable energy.

By the end of 2020, the EU had over 220 GW of installed wind power capacity, representing 9.4% of cumulative power capacity. In 2020, wind power met 16% of Europe's electricity demand, up from 5.3% in 2010.

3.3.2 From 2020 to 2030

Looking ahead to the next decade (2020-2030), wind power capacity in the EU is expected to continue growing as the region aims to achieve its renewable energy and carbon reduction targets.

As part of the REPowerEU plan, and in line with attempts to reach carbon neutrality by 2050, the EU wants onshore wind to grow to 1,000 GW and offshore wind to grow to 300 GW.

3.4 Growth in Battery Energy Storage

Europe reached 4.5GW of battery storage capacity in 2022 and is expected to install at least another 6GW in 2023. By 2050, Europe is expected to install at least 95GW of grid-scale battery storage systems, with the five most attractive markets for battery storage being Germany, Great Britain, Greece, Ireland and Italy.

3.5. End-Of-Life Materials Generated

The significant growth of the renewable energy sector is undeniably pivotal for the European Union's transition away from fossil fuels and toward a more sustainable and environmentally friendly energy landscape.

However, this unprecedented sectoral expansion brings challenges related to the management of end-of-life materials.

As renewable energy technologies such as solar PV, wind turbines, and energy-storage systems become more integral to the EU's energy mix, the eventual disposal and recycling of electronic and electrical components must be carefully considered.

While renewable energy plays a central role in combating climate change and reducing greenhouse gas emissions, parallel efforts must be made to ensure the responsible handling of end-of-life materials, minimising environmental impacts and maximising resource recovery.

Recognising both the benefits and challenges of renewable energy growth underscores the need for comprehensive waste management strategies and forward-thinking policies supporting the EU's sustainability goals, particularly concerning the WEEE Directive.

3.5.1 Solar PV End-Of-Life Materials

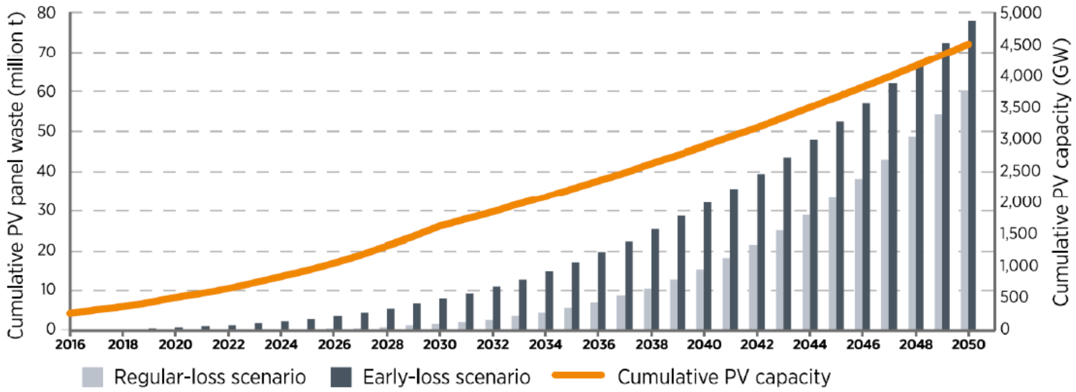

Figure 3.5.1 Estimated cumulative global waste volumes of end-of-life PV modules.

Solar photovoltaic (PV) systems have emerged as a cornerstone of the European Union's clean energy transition. As these systems proliferate, they deliver substantial environmental benefits through emissions reduction and renewable energy generation. However, the rapid expansion of the solar PV sector has also brought attention to a growing challenge: electronic waste.

Solar panels, like all electronic devices, have a finite lifespan, and eventually reach the end of their operational efficiency, widely accepted as 25 years due to industry standard operational-efficiency warranties.

Solar panels typically contain several key materials, including silicon-based solar cells, glass, aluminium frames, and encapsulating materials.

While these materials are chosen for their durability and performance, they do not last indefinitely. Over time, exposure to environmental factors and wear and tear can decrease solar panel efficiency. As a result, solar PV systems are retired, generating electronic waste. Essential materials which should be recycled, and the environmental impact of which must be taken into account, include silicon wafers, valuable resources, and materials containing hazardous substances such as cadmium in specific thin-film solar panels.

Projections of the amount of electronic waste which will be generated by solar PV systems vary depending on factors such as the installation rate, the specific technologies used, and the efficiency of recycling and repurposing efforts.

However, as solar PV installations continue to grow, it is estimated that the volume of end-of-life solar panels will increase significantly in the coming years.

By 2050, it is predicted that solar PV panel end-of-life material alone could total 78 million tonnes globally, with Europe producing a significant proportion of this, representing both a challenge and an opportunity.

Managing this end-of-life material responsibly, including recycling valuable materials and minimising environmental impacts, is crucial to ensure the sustainability of solar PV energy systems, and alignment with the EU's circular economy objectives.

3.5.2 Wind Power End-Of-Life Materials

Wind power has become critical to the European Union's transition to renewable energy sources. However, as the wind energy sector expands, it brings to the forefront a pressing concern: electronic waste.

Wind turbines, like other electronic devices, have a finite operational life, leading to the eventual generation of electronic waste. Understanding the nature of this waste, its key materials, and estimated projections is essential for effective waste management strategies.

Wind turbines comprise various materials, including steel, copper, rare earth magnets, and electronic components such as control systems and generators. The primary materials of concern for recycling and waste management are the electronic and electrical components.

These components can include sensors, converters, and electrical circuitry. While many of these materials are valuable, they can also contain hazardous substances like rare earth elements which require careful handling.

Projections of the volume of electronic waste generated by wind turbines in the EU vary based on several factors. These factors include the rate of wind turbine installations, the types of wind turbine technologies used, and the recycling and repurposing efforts in place. While exact figures are challenging to predict, it is expected that the volume of electronic waste from wind turbines will increase as the EU expands its wind energy capacity. By 2030, the European Commission estimates that there could be approximately 1.8 million tonnes of wind turbine blades alone reaching the end of their operational life in the EU.

Recycling and repurposing wind turbine components pose unique challenges. Wind turbine blades, for example, are typically made from composite materials that are difficult to recycle. However, innovative recycling methods, such as shredding blades into raw materials or converting them into construction materials, are being explored to address this challenge. Additionally, recycling and recovering valuable materials like rare earth magnets from wind turbines can contribute to resource sustainability.

3.5.3 Battery Energy Storage End-Of-Life Materials

Energy storage systems, particularly batteries, are instrumental in enhancing the reliability and efficiency of renewable energy integration. Yet, as these systems become more prevalent across the EU, they also have the potential to generate electronic waste. Understanding the nature of this waste, its key materials, and estimated projections is essential for effective waste management strategies in energy storage.

Energy storage systems, including lithium-ion batteries, consist of critical materials like lithium, cobalt, nickel and electronic components such as battery management systems (BMS) and control circuits. The primary materials of concern for recycling and waste management are the electronic and electrical components and the valuable metals used in batteries. Lithium-ion batteries, for instance, have a limited lifespan and eventually reach the end of their operational life, generating electronic waste.

Projections of the volume of electronic waste generated by energy storage systems within the EU vary based on factors such as the adoption rate, the size of energy storage installations, and recycling efforts. As the EU accelerates the deployment of energy storage to support renewable energy grids and electric vehicle infrastructure, the volume of electronic waste from batteries is also expected to increase. By 2030, it is estimated that the EU could generate significant quantities of battery waste, potentially exceeding millions of tons.

Recycling and repurposing energy storage system components, particularly batteries, pose several challenges. Batteries contain hazardous materials and require specialised recycling processes to recover valuable metals and ensure proper disposal. The longevity and performance of recycled batteries must also be considered.

3.6 Recommendations for Improving the WEEE Directive

By incorporating the following recommendations into the WEEE Directive, the EU can better address the unique challenges associated with solar PV, wind power and energy battery end-of-life management while aligning with the directive's broader objectives of promoting responsible electronics recycling, reducing hazardous substances, and advancing the circular economy. This would ensure the continued growth of the renewable energy sector in an environmentally sustainable manner.

3.6.1 Objective: Strengthening Extended Producer Responsibility (EPR)

Recommendation 1: Technology-Specific EPR.

Introduce regulations that explicitly establish EPR for the entire lifecycle of solar PV panels, wind turbines and energy-storage batteries, from manufacturing to end-of-life management. Renewable energy technology manufacturers should bear responsibility for ensuring proper recycling and disposal of their products.

Recommendation 2: Formal designation of PV panels as B2C EEE.

There needs to be more clarity about categorising PV panels, i.e., whether B2B or B2C EEE. A formal designation of the panels as B2C EEE would remove this doubt in the industry, and it would improve the ability of environmental authorities to enforce EPR obligations on actors in the PV panel sector.

Recommendation 3: Prohibition of option for self-compliance by producers with WEEE legislation.

Self-compliance can facilitate the use of loopholes and weaknesses in EPR legislation, and so can be challenging to enforce.

Recommendation 4: Proactive Take-Back Schemes.

Mandate the creation of proactive take-back schemes specifically designed for solar PV systems, wind turbines and energy-storage batteries. These schemes should facilitate the return and recycling of solar panels at the end of their useful life.

Recommendation 5: Mandate for Longer Solar PV Manufacturer Warranty Times.

Many projected solar PV end-of-life material projections are based on the assumption of a lifetime of only 25 years, as dictated by standard module manufacturers. These warranties guarantee operational performances over 80% in year 25, and we therefore recommend that these warranty periods should be extended to reduce end-of-life material projections.

3.6.2 Objective: Development of Specific Collection and Recycling Targets

Recommendation 1: Dedicated Renewable Energy Technology Collection Targets.

Develop specific collection targets for solar PV panels, wind turbines and energy-storage batteries within the framework of the WEEE Directive. These targets should be based on the growing volume of renewable energy technologies reaching end-of-life, ensuring they are correctly collected and not end up in landfills. This should be a separate collection rate target to existing WEEE recycling targets due to the timescale on which they will reach end-of-life compared with traditional EEE items with typically shorter warranty periods.

Recommendation 2: Recycling and Recovery Standards.

Establish clear recycling and resource recovery standards and Best Available Techniques (BATs) for: a) solar PV components, including materials like silicon, glass, and metals; b) wind turbine components, including materials such as steel, copper, rare earth magnets, and electronic components; and, c) battery components, including materials such as lithium, cobalt, nickel, and electronic components.

Promote the development of recycling facilities capable of efficiently processing renewable energy technologies.

3.6.3 Objective: Hazardous Substance Reduction

Recommendation 1: Hazardous Material Minimisation.

Extend the Directive's focus on hazardous substance reduction to include solar PV panel production, wind turbine production, and battery manufacturing. Encourage the renewable energy technology industry to minimise the use of dangerous materials and explore alternatives.

3.6.4 Promotion of the Circular Economy

Recommendation 1: Eco-Design.

Incentivise solar panel, wind turbine and energy-storage battery manufacturers to adopt eco-design principles prioritising recyclability, durability, and reduced environmental impact. Encourage and promote the design of solar panels, wind turbines and batteries with modular components for easier recycling.

Recommendation 2: R&D for Sustainable Materials

Invest in research and development initiatives that promote the use of sustainable and recyclable materials in renewable energy technologies (including alternative materials to replace critical materials like cobalt and lithium), thereby supporting the circular economy.

Recommendation 3: Public Awareness and Education

Launch public awareness campaigns and educational programmes to inform consumers, installers, and the solar industry about the importance of responsible disposal and recycling of solar PV panels, wind turbine components, and batteries.

4. Assessing WEEE through the 3Rs

Households, businesses, and public institutions frequently discard WEEE by placing it in regular waste bins, where it becomes part of the general mixed waste stream. Subsequently, this mixed waste is typically either incinerated, used as co-fuel in cement production plants or sent to landfills in Europe. However, in some cases, it passe3s through a transfer station before reaching a Materials Recycling Facility, where various recyclable materials are sorted and separated.

According to Article 16, paragraph 4 of the WEEE Directive 2012/19/EU, Member States are obligated to annually gather data, including well-supported estimates of the quantities and categories of Electrical and Electronic Equipment (EEE) introduced into their markets, EEE collected through all channels, EEE prepared for reuse, EEE that has been recycled and reclaimed within their borders, and separately collected WEEE exported by weight.

These substantiated estimates, as the name implies, are based on credible scientific research studies related to WEEE. Both the research conducted and audits should be periodically revisited to update these substantiated estimates. When the WEEE Directive was originally implemented, it recognized that achieving its targets might be challenging for some countries, and therefore, the use of substantiated estimates for reporting WEEE collection was deemed appropriate.

4.1. Emphasizing the Importance of Reducing E-Waste: The Imperative of Reducing E-Waste: A Call to Action

The imperative to reduce e-waste transcends environmental concerns; it is a collective responsibility that demands our unwavering commitment. Our journey begins with a profound understanding of the dire consequences of allowing used electronics to enter Europe's landfills.

A massively revised or new WEEE Directive must emphasise the importance of waste reduction, transcending even the merits of reuse and recycling. This strategic focus is necessary to reduce the increasing of volume of e-waste being deposited in our landfills. The Directive should require new policies needed to catalyse a shift in consumer behaviour, encouraging the purchase of fewer electronic products designed for short-lived usage.

Reducing e-waste is not just a preference; it is an absolute necessity in our mission to safeguard our environment. By prioritising reduction, we can dramatically mitigate the incessant stream of electronic devices destined for premature obsolescence and landfill disposal.

The revised or new WEEE Directive's role must be to champion a sustainable ethos, motivating consumers to make more conscious choices when it comes to electronic consumption. It should demand a paradigm shift from a throwaway culture to one characterized by thoughtful and responsible product consumption. Buying electronic products with shorter lifespans perpetuates a cycle of e-waste generation that strains our resources and endangers our ecosystem.

To truly make a difference, the Directive must instigate a transformation in how consumers perceive electronic products. It should encourage the adoption of longer-lasting, repairable, and upgradable devices, fostering a culture of longevity and resource efficiency. The merits of reducing e-waste are manifold, encompassing environmental preservation, resource conservation, and the promotion of a sustainable future.

It is our strong submission that a revised or new WEEE Directive must underscore the paramount importance of reducing e-waste as a cornerstone of its mission. By altering consumer behaviour and advocating for durable, long-lasting electronic products, we pave the way for a more sustainable and responsible approach to electronics consumption. This shift not only benefits us in the present but also safeguards the well-being of future generations and our planet.

4.2 Elevating the Role of E-Waste Reuse: A Critical Component in WEEE Management

The actions of households and businesses wield considerable influence over the collection of Waste Electrical and Electronic Equipment (WEEE). While some behaviours, such as improper disposal in waste bins or leaving WEEE on the streets, can contribute to challenges in proper collection and management, two other behavioural aspects – hoarding and reuse – hold immense potential for extending the lifespan of electronic equipment and minimising its entry into the WEEE stream.

Hoarding and reuse can significantly prolong the useful life of electronic equipment, allowing it to remain in households and businesses for more extended periods before being discarded and classified as WEEE. These behaviours are influenced by cultural and economic factors, potentially leading to variations across different regions in Europe.

Recent studies have indicated that the culture of reuse in certain European countries, like Romania, may differ significantly from others. However, these studies have not conclusively determined the precise impact of reuse on WEEE collection, leaving the true significance of this practice somewhat uncertain.

Hoarding also has the potential to influence disposal behaviours throughout the lifespan of electronic devices, thereby affecting the volume of WEEE generated and collected. When individuals engage in hoarding more frequently, the lifespans of devices are extended, resulting in less WEEE being generated and collected. Conversely, when people declutter their homes, device lifespans shorten, leading to increased WEEE generation and collection.

To shed light on the potential impact of hoarding, estimates suggest that a considerable amount of non-functioning electronic equipment (non-functional EEE) is present in households, along with functional but rarely used EEE. This hoarded equipment, which includes both non-functional and rarely used items, is roughly equivalent in quantity to the amount of WEEE generated. Extracting these items from households can be challenging, as people often form emotional attachments to them or intend to use them in the future, donate them, or give them to charity shops.

The easily accessible portion of hoarded EEE that can potentially be collected as WEEE consists of items that have not yet been discarded. Such items may be targeted through anti-hoarding campaigns. Extrapolating data from France to the broader region, taking into account varying WEEE generation levels, indicates that the average impact of hoarding ranges between 4 and 5 kg/inh. However, the collection of hoarded WEEE can only occur every 3 to 5 years, as hoarded items gradually decline following a campaign.

In Britain, research reveals that hoarding accounted for approximately 2.6 kg/inh of WEEE in 2017, with a similar outflow. This effectively neutralized the net impact of hoarding for that year. Thus, over several years, the net effect of hoarding on WEEE collection remains minimal in many countries.

While hoarding and reuse behaviours undoubtedly have their role, the most substantial factors influencing collection rates are related to other WEEE flows:

- Around 2.1 kg/inh of WEEE comprises metal scrap, often unreported as WEEE and potentially recycled non-compliantly.

- Approximately 1.4 kg/inh of WEEE is disposed of in waste bins, destined for landfill or incineration.

- Illegal exports of WEEE beyond the EU range between 0.5 and 1.4 kg/inh.

- A unique case involves exports for reuse, particularly Business-to-Business (B2B) equipment that is refurbished, repaired, or directly reused. While this accounts for an estimated 1 to 2 kg/inh, such exports are frequently unreported in the countries studied.

- Enhanced reporting of B2B WEEE could potentially boost collection rates to approximately 1.8 kg/inh.

In conclusion, while hoarding and reuse behaviours hold promise, the most impactful strategy for increasing reported WEEE collection lies in effectively diverting or accounting for WEEE within metal scrap flows. Various countries are addressing scrap flows to varying degrees and with varying degrees of success, employing approaches such as substantiated estimates, the 'all actors' approach, mandatory handover, and financial incentives.

4.3 Unlocking the Potential of E-Waste Recycling: A Vital Imperative

E-waste recycling holds a multitude of advantages that extend far beyond safeguarding human health and the environment. The materials within our computers and smartphones are predominantly derived from non-renewable minerals. Recycling these materials not only protects us from potential disruptions in the supply chain but also offers significant economic benefits, even for minerals that are abundant but non-renewable.

Take lithium, for example — a relatively common but non-renewable mineral found in numerous places worldwide. It has recently experienced a surge in demand, primarily driven by the growing interest in electric vehicles as a means of decarbonizing transportation. However, the slow pace of lithium extraction and refinement has led to shortages in the market. Recycling lithium-ion batteries can inject additional lithium into the market, enabling the production of eco-friendly electric vehicles and batteries at more affordable prices.

Despite these compelling advantages, only a mere 17.4% of documented e-waste was recycled in 2019, according to Statista. This dismal figure is partly attributed to the fact that many electronic devices today are not designed with recycling in mind. The trend towards lighter, sleeker smartphones with non-removable batteries has made recycling a daunting and labour-intensive task. Manual sorting in recycling facilities exposes workers to toxic substances over prolonged periods, making it an unattractive proposition. Moreover, facilities must continually upgrade their machinery to keep up with evolving technology, diminishing the incentive to recycle already challenging-to-disassemble e-waste.

Another pressing challenge is that, currently, only 10 out of 60 chemical elements found in e-waste can be recycled through mechanical processing. These include valuable metals like gold, silver, platinum, as well as critical elements like cobalt, tin, copper, iron, aluminium, and lead.

Recycling e-waste serves a dual purpose: it shields us from toxic substances and reduces the environmental toll of mining virgin materials. The economic potential of this industry is colossal, with discarded e-waste in 2019 alone estimated to be worth over US$57 billion. Yet, several hurdles must be surmounted, such as electronic producers designing products with recyclability in mind and further research into mechanical processing techniques for the remaining chemical elements.

WEEE has emerged as one of the world's fastest-growing waste streams, owing to the unprecedented proliferation of electronics. However, its mismanagement can lead to severe health and environmental crises.

In 2021, Ireland collected a record 71,811 tonnes of WEEE for treatment, narrowly missing the EU's 65% collection target by a margin of 1%. While Ireland exceeded EU targets for recycling, reuse, and recovery of WEEE, achieving the new 65% target needs ongoing collaboration and targeted efforts, encompassing both household and professional (B2B) WEEE. A multi-stakeholder WEEE Collection Working Group, led by the EPA, is steering these endeavours.

Transitioning to a circular economy demands severing the link between economic activity and resource consumption. Enhancements in product design that extend lifespans, enable repair, refurbishment, and facilitate reuse are imperative. These innovations ensure that electrical products remain in circulation longer, ultimately making full recycling at the end of their life a reality.

4.4. Case Study: ecoATM – Transforming Used Phones into Cash, and Reducing Environmental Impact

The following case study has been included here to show how recycling e-waste can be both a profitable and environmentally conscious effort, and something that can be replicated across EU member states as a new technology.

Company: ecoATM

Location: Over 5,000 locations across the United States.

Objective: To provide a simple, secure, and environmentally responsible solution for individuals to sell their used phones for instant cash while simultaneously reducing electronic waste.

Background

In a world dominated by rapid technological advances, the lifecycle of electronic devices is becoming increasingly shorter. As a result, there is a growing concern about the environmental impact of electronic waste (e-waste). Recognising the need for a sustainable solution, ecoATM became a pioneer in the field.

The ecoATM Solution

Based on "*Instant Cash for Used Phones*", ecoATM offers a hassle-free and instant cash reward system for trading in used phones. Unlike traditional trade-in programmes that often provide store credit, ecoATM puts cash directly into the hands of the sellers, allowing them the flexibility to use the funds as they please.

The Process

1. Visit a Local ecoATM Kiosk: Sellers bring their used phone and a valid state ID to their nearest ecoATM kiosk.
2. Evaluation in Real-Time: Placing the phone in the kiosk initiates a real-time evaluation process.
3. Instant Cash Offer: ecoATM determines an instant cash offer based on the phone's model, condition, and current market value.
4. Cash on the Spot: If the seller agrees to the offer, ecoATM provides cash on the spot.

Environmental Impact

ecoATM is not only about convenience and instant cash but also about making a significant positive impact on the environment. By providing a responsible way to sell used phones, ecoATM has collected over 37 million devices, which equates to more than 6.25 million pounds of e-waste diverted from landfills.

Why ecoATM Stands Out

1. Safe Selling Process: ecoATM offers a safe and contactless selling process, eliminating the need to meet with unfamiliar buyers from online platforms — ideal for adhering to social distancing guidelines.
2. Sustainability: As the name suggests, ecoATM is committed to sustainability. By preventing used phones from ending up in landfills and

keeping toxic chemicals out of the environment, ecoATM contributes to a greener tomorrow.

3. Accepts Broken Phones: ecoATM accepts not only used phones but also broken ones. Even if a broken phone doesn't yield instant cash, ecoATM ensures it is properly recycled, further reducing environmental harm.

EcoATM states that it is not only a solution for turning used phones into instant cash; but it is a force in the fight against e-waste. With a commitment to environmental sustainability, safe and contactless transactions, and a mission to reduce electronic waste, ecoATM states that it offers individuals a way to benefit financially while contributing to a healthier planet.

Promotional material by ecoATM encourages people to visit an ecoATM kiosk on their next shopping trip, where their old mobile phone could provide cash for their next grocery purchase, a fill-up of motor fuel, or even help towards the next electricity bill. The company's slogan is "*ecoATM empowers you to get green for going green, one used phone at a time*".

5. EPR (Extended Producer Responsibility)

Our further observations on Extended Producer Responsibility (see section 3.6.1 above) are:

- EPR may be a key to the circular economy and may contribute significantly to the EU Circular Economy Package.[8]

- Ecodesign is an objective of the Directive; and EPR can be an effective tool to help influence producers to implement ecodesign measures.

- Electronic and electrical waste producers are best positioned actors to make the required changes (e.g. collection and recycling) to minimise impacts of their products.

- EPR provides a basis for effective collection, reuse and recycling of products. Manufacturers will have an incentive to save resources to make products with a lower environmental impact.[9]

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[8] Europe, Z.W., 2017. Extended Producer Responsibility–Creating the frame for circular products. Zero Waste Europe, Brussels.

[9] OECD, S., 2014. The state of play on Extended Producer Responsibility (EPR): Opportunities and challenges. In Global Forum on Environment: Promoting Sustainable Materials Management through Extended Producer Responsibility (EPR). Tokyo, Japan: OSD Publishing. https://www. oecd. org/environment/waste/Global% 20Forum% 20Tokyo% 20Issues% 20Paper (pp. 2030-5).

- the average plastic content in WEEE is about 30%. Recycling of such plastic is quite problematic as far as it contains some hazardous parts such as heavy metals and brominated flame-retardants.[10]

- Product take-back, which is based on the concept of extended producer responsibility (EPR), is a popular form of such legislation. Under EPR-based take-back laws, producers are physically or financially responsible for the collection of end-of-life electronics (typically from designated collection points such as municipal junkyards) and their recovery (e.g., recycling materials or reusing components), so as to divert hazardous materials away from landfills.[11]

- Japan has introduced take-back schemes whereby the consumer returns electrical and electronic products to the retailer. The retailer then returns the products to the manufacturer where they are recycled, or passed to a contracted company to be recycled.[12]

6 Repairability and Repair Cafés

The circular economy is an alternative to the traditional linear economy of 'take-make-dispose'.[13] Repair cafés have a major role to play in the circular economy by extending the useful life of products, as repairing requires much less energy and materials than total replacement of a product. The first repair café was established by Martine Potsma in 2009 in Amsterdam. With funding from the Dutch Ministry for the Environment, the Repair Café Foundation was founded; 20 more repair cafes were set up in one year in The Netherlands and across Europe and the US.[14] The repairs tend to be smaller jobs that people could do at home but never get around to doing.[15] Electronic devices are the most common product repaired. Other products include clothes, bicycles, furniture and toys, and a mix of both old and new items.

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[10] Watkins, E., ten Brink, P., Withana, S., Russi, D., Illes, A., Mutafoglu, K., Ettlinger, S., Anderson, M. and Pedersen, A., 2017. Capacity building, programmatic development and communication in the field of environmental taxation and budgetary reform. Final report. European Commission, Brussels.

[11] Atasu, A. and Subramanian, R., 2012. Extended producer responsibility for e-waste: Individual or collective producer responsibility?. Production and Operations Management, 21(6), pp.1042-1059.

[12] https://www.japanfs.org/en/news/archives/news_id029030.html

[13] Moalem, R.M. and Mosgaard, M.A., 2021. A critical review of the role of repair cafés in a sustainable circular transition. Sustainability, 13(22), p.12351.

[14] Rosner, D.K., 2014. Making citizens, reassembling devices: On gender and the development of contemporary public sites of repair in Northern California. Public Culture, 26(1), pp.51-77.

[15] https://repaircafe.org/wpcontent/uploads/2013/09/Information_package_Repair_Cafe_USA.pdf

Repair cafés aim to:

- Reintroduce repairing into local society in a modern way;
- Foster repair knowledge,
- Promote social cohesion in the community by connecting neighbours from different backgrounds.

Research publications on repair cafes are increasing, especially from the period from 2016 to 2020; most articles were from Germany (13%) and the UK (12%), followed by Austria (5%), the US (4%), China and Finland (3%), with the remainder all below 2%: Netherlands, Romania, Belgium, Canada, Greece, Italy and New Zealand.[16]

7 Batteries from EVs (electric vehicles)

The EV market has expanded rapidly since the directive was adopted. Currently, end of life batteries from EVs (especially lithium ion batteries) are proving difficult to recycle.[17] In the transition away from internal combustion engines, meeting the challenge of EV battery waste is essential to a sustainable circular economy.

The EV lithium-ion battery market is expected to grow to over $90 billion by 2026.[18] Once the material value derived from recycling exceeds the cost of recycling, a closed loop system will emerge whereby maximum re-use of batteries is achieved. Therefore, the EU should aim to conduct research into EV battery recycling efficiency. A closed-loop EV battery industry will help replace fossil fuel-powered vehicles on one hand and reduce EV environmental impacts on the other.

A deposit-return scheme for electric vehicle batteries has potential to increase recycling rates. In the US ,a deposit-return scheme was introduced to encourage recycling of bottles and drink cans – the "bottle bill". A small deposit (~10c) is paid on each beverage, and the deposit is refunded when the container has been returned for recycling.[19] Applying this system for the return of EV batteries may help reduce waste and therefore reduce environmental impact.

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16 Moalem, R.M. and Mosgaard, M.A., 2021. A critical review of the role of repair cafés in a sustainable circular transition. Sustainability, 13(22), p.12351.

17 Chen, M., Ma, X., Chen, B., Arsenault, R., Karlson, P., Simon, N. and Wang, Y., 2019. Recycling end-of-life electric vehicle lithium-ion batteries. Joule, 3(11), pp.2622-2646.

18 https://www.globenewswire.com/news-release/2018/03/26/1452966/0/en/Global-Electric-Vehicles-Battery-Market-2017-2026-EV-Battery-Market-to-Reach-93-94-Billion.html

19 State of California Department of Conservation-Division of Recycling (DOC). Beverage Container Recycling Market Development and Expansion Grant Program. Sacramento, California; February 2007.

Increased EV battery recycling may reduce raw material extraction for new battery production. Lithium is in especially high demand due to its low weight and high energy storage properties. Natural lithium deposits can be found in brine salt flats and in a granitic type of rock called pegmatite.[20] Groundwater is exploited to extract lithium from brine. The mineral-rich water is pumped up from underground, and left to evaporate at the surface. This can lower the water table impacting the agriculture and ecology of the surrounding landscape.[21] The brine requires treatment with sulphuric acid, lime and soda ash to purify it; each of these is associated with negative environmental impacts in their extraction and processing, including fossil fuel use. Lithium pollution in water and soil remains an understudied phenomenon.[22]

Therefore, it can be concluded that any environmental benefits of EVs over conventional internal combustion engines are to some extent counteracted by negative environmental impacts during production. The overall impact of EVs in the EU may be estimated by an in-depth life cycle assessment, which would be no small challenge, considering the multitudes of supply chains, industries and countries involved. It may therefore be safe to assume that encouraging the recycling of spent EV batteries through deposit-return schemes will help achieve the aims of the Directive on Waste from Electrical and Electronic Equipment while minimising environmental impact.

8. WEEE Waste Traceability and Export

How do Member States keep track of their WEEE? How much is shipped outside of the EU, and where does it go?

Under the WEEE Directive, EU countries must report to the EU Commission yearly on their progress in achieving the Directive's targets. To do so, Member States are responsible for ensuring that producers or third parties acting on their behalf keep records on the weight of WEEE and its components, materials or substances when leaving the collection facility, entering and leaving the treatment facilities, and when entering the recovery, recycling or preparing for re-use facility.[23]

[20] Martin, G., Rentsch, L., Höck, M. and Bertau, M., 2017. Lithium market research–global supply, future demand and price development. Energy Storage Materials, 6, pp.171-179.

[21] Kaunda, R.B., 2020. Potential environmental impacts of lithium mining. Journal of energy & natural resources law, 38(3), pp.237-244.

[22] Schulz, K.J. ed., 2017. Critical mineral resources of the United States: economic and environmental geology and prospects for future supply. Geological Survey.

[23] Source: WEEE Directive

The WEEE Directive allows EU Member States to export their WEEE. However, WEEE that is exported outside of the European Union only contributes towards achieving a country's targets if the treatment of WEEE in the country to which it has been shipped is undertaken in conditions that meet the requirements of the Directive. The EU Member State which exported the waste is obligated to prove this is the case.[24] However, to be able to provide the necessary proof to the EU Commission, the Member State must be able to trace its exported WEEE to the treatment facility abroad.

It has proven challenging for Member States to measure all WEEE flows. As mentioned in the WEEE Forum's 2021 report, one obstacle for EU countries to reach the Directive's collection targets is that considerable amounts of WEEE are diverted into undocumented WEEE flows.[25] Member States have indicated that measuring the B2B (Business-to-business) WEEE flow poses the most significant challenge. Accounting for illegal WEEE shipments and exported used EEE were mentioned as examples of grey areas, and double counting of WEEE was mentioned as a point of concern.[26]

The WEEE Forum estimates that in 2021, approximately 0.8 billion kg of WEEE in the EU was disposed of in residual waste bins, ending up in incinerators and landfills. Additionally, they estimated that over half a billion kilograms of used EEE was exported for reuse, and another half a billion kilograms was illegally exported outside the EU. WEEE Forum advises that these unwanted WEEE flows must be reduced and the waste steered into a state's formal WEEE management system so that it can contribute to achieving the WEEE Directive's targets.[27]

From the WEEE that EU countries have been able to trace, the EUROSTAT dataset '*'WEEE by Waste Management Operations'*[28] reports the amount (that was collected through separate collection as established in the WEEE Directive) exported for treatment outside the EU. The most recent numbers show that this was 27.688 tonnes in 2020. That year, only 12 out of 27 countries exported any

[24] Source: WEEE Directive

[25] Source: WEEE Forum report: Update of WEEE Collection Rates, Targets, Flows, and Hoarding (2021)

[26] Sources: All WEEE Flows Workshop Report (2017) and WEEE Forum report: In-depth review of the WEEE Collection Rates and Targets (2020)

[27] Source: WEEE Forum report: Update of WEEE Collection Rates, Targets, Flows, and Hoarding (2021)

[28] Source: EUROSTAT dataset: Waste electrical and electronic equipment (WEEE) by waste management operations - open scope, 6 product categories (from 2018 onwards) [ENV_WASELEEOS] (2023)

WEEE outside the EU, and more than half of the total amount was exported by Ireland (18.535 tonnes). Ireland had a high reliance on export for the treatment of a number of key waste streams in 2020, including that of WEEE. Although 70% of WEEE pre-treatment was done in Ireland, almost all WEEE was exported for the final treatment step.[29] It is worth noting that Germany, one of the biggest EU countries, has not reported their WEEE data since 2018.

A report published on EUROSTAT states that WEEE exported from EU countries is ''mostly recovered''. Metals, metal compounds, and other inorganic materials are the majority of recovered waste.[30] However, whether WEEE exported outside the EU has a similar recovery rate to that exported to a country within the EU is not specified.

The EU countries' yearly reports to the Commission are assumed to include how much waste is shipped outside of the EU and where it was exported. The WEEE dataset previously mentioned does not include to which countries the WEEE is being shipped for treatment outside of the EU. If this information were to be made available, the recovery rate for WEEE shipped outside the EU could be evaluated, depending on the data available from the extra-EU countries where the waste is being shipped. It is our submission that this information must be made available in a similar fashion to the EUROSTAT dataset ''*Trade in Waste by Type of Material and Partner*'',[31] with the addition that multiple export countries can be viewed simultaneously for ease of use.

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[29] Source: Environmental Protection Agency Ireland National Waste Statistics Summary Report (2020)

[30] Source: EUROSTAT report: Waste shipment statistics (2023)

[31] Source: EUROSTAT dataset: Trade in waste by type of material and partner [ENV_WASTRDMP] (2022)

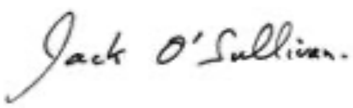
9. Conclusions

In conclusion, the principles of reduce, reuse, and recycling hold the transformative potential to reform the Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC and 2012/19). Emphasizing reduction involves designing electronic products for longevity, repairability, and upgradability, thus minimizing their entry into the WEEE stream. Encouraging reuse extends the lifespan of electronic equipment, reducing the overall volume of WEEE generated and enhancing resource efficiency. Lastly, prioritising recycling not only diverts toxic substances from our environment but also conserves valuable materials and mitigates the ecological consequences of mining virgin resources.

To revitalize and enhance the effectiveness of a reformed or entirely new WEEE Directive, a comprehensive approach is needed. This includes fostering a culture of sustainability among electronic producers, manufacturers, and consumers. By embracing these principles, the Directive would not only contribute to a greener and more sustainable future, but would also set the stage for a circular economy, where electronics are designed, used, and managed with environmental and economic considerations at the forefront.

Incorporating the principles of reduce, reuse, and recycling into the WEEE Directive is not just a regulatory mandate but a vital step toward building a more responsible, eco-conscious, and resource-efficient electronic industry. It underscores the importance of collective action in preserving our environment and creating a greener and more sustainable tomorrow.

Jack O'Sullivan, Orla Coutin Fitzsimons



Zero Waste Alliance Ireland

This submission was researched and written by Luke Fagan (ZWAI member), Sara Borkent (ZWAI member), Nazia Naheed Husain (ZWAI member), Jack Coffey (ZWAI member), Órla Coutin (ZWAI administrator and researcher), and Jack O'Sullivan (ZWAI founder member and director), and was edited by Órla Coutin and Jack O'Sullivan.

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