

Equivalent conditions for waste electrical and electronic equipment (WEEE) recycling operations taking place outside the European Union

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Table of Contents

EXECUTIVE SUMMARY	7
LIST OF ACRONYMS	15
CHAPTER 1: CONTEXT AND OBJECTIVES	19
1.1 Context of the study	19
1.2 Objectives of the study	20
CHAPTER 2: UNDERSTANDING WEEE FLOWS	21
2.1 WEEE: a complex waste stream	21
2.1.1 Quantities of WEEE generated in the EU	21
2.1.2 The WEEE market structure	22
2.2 WEEE exports originating from the EU	24
CHAPTER 3: WEEE LEGISLATION AND KEY REQUIREMENTS	27
3.1 International legislation	27
3.1.1 International legislation on shipment of waste	27
3.1.2 International legislation and guidelines on treatment of WEEE	30
3.2 Waste Legislation in the EU	32
3.2.1 The Waste Shipment Regulation (EC) No. 1013/2006	33
3.2.2 The Waste Framework Directive (2008/98/EC)	34
3.2.3 The IPPC Directive/Industrial Emissions Directive and BAT for Waste Treatment	34
3.2.4 Directive on waste electrical and electronic equipment (WEEE) 2012/19/EU	35
3.3 Key Requirements of the WEEE Directive	35
3.3.1 Definition of WEEE and categories subject to the requirements of the WEEE Directive	35
3.3.2 Export of WEEE	36
3.3.3 Proper Treatment and Disposal of WEEE	36
CHAPTER 4: IDENTIFICATION AND ANALYSIS OF POLICY OPTIONS	39
4.1 Determination of potential policy options	39
4.1.1 Approach	39
4.1.2 Identified options	40
4.1.3 Discarded options	41
4.1.4 Retained options	45
4.2 Comparative analysis of the retained options	50
4.2.1 Approach	50

4.2.2 Analysis of the policy options	55
CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS	87
5.1 Conclusions	87
5.2 Recommendations	89
5.2.1 Recommendations as to the exclusion of certain options	89
5.2.2 Recommendations as to policy options that could be retained for proving “equivalent treatment conditions”	89
REFERENCES	93
ANNEX: LIST OF STAKEHOLDERS CONSULTED	95

List of Tables

Table 1: Overview of Basel Convention provisions and waste codes	28
Table 2: Overview of OECD Decision C(2001) 107 and its waste codes	29
Table 3: Overview of WSR objectives and waste codes	33
Table 4: Technical requirements for storage and treatment of WEEE	37
Table 5: Selective treatment for materials and components of WEEE	37
Table 6: Comparison of policy options	55
Table 7: SWOT analysis of Ex-post audit option	59
Table 8: SWOT analysis for WEEELABEX option	63
Table 9: SWOT analysis for R2/RIOS option	67
Table 10: SWOT analysis for e-Stewards option	72
Table 11: SWOT analysis for European (EN) standards option	76
Table 12: Material Disposition Hierarchy and Acceptable Processes for RQP	79
Table 13: SWOT analysis for RQP standards option	80
Table 14: New Zealand e-Waste Processing Overseas	82
Table 15: AS/NZ 5377 List of Components to be pre-treated	83
Table 16: SWOT analysis for AS/NZS 5377 option	85

List of Figures

Figure 1: Breakdown of WEEE arising in 2005	22
Figure 2: Typical WEEE Flows in EU MS	23
Figure 3: Only one-third of the WEEE collection is reported in the EU	24
Figure 4: Known and suspected routes of e-waste dumping	26
Figure 5: International instruments on the shipment of waste	27
Figure 6 : Timeline of EU legislation	32
Figure 7: Current list and future list of categories covered by the WEEE Directive	36
Figure 8: WEEELABEX organisation chart	46

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Executive summary

Background

Waste electrical and electronic equipment contains more than 1,000 different substances, many of which are toxic for human health and the environment, such as lead, mercury, arsenic, chromium, cadmium and plastics. Emissions resulting from end of life treatment may release hazardous compounds into the environment, such as dioxins and furans. Thus, EEE require specific end-of-life treatments to ensure proper recycling or disposal.

Traditionally, WEEE has been a complex waste stream to apprehend. Due to its heterogeneous nature and the many stakeholders involved in this sector compared to other waste streams, it is hard to define how much EEE is put on the market and how much becomes WEEE. However, it is expected that total WEEE will reach approximately 12.3 million tonnes by 2020 in the EU. Despite the existing binding EU collection target of 4 kg of WEEE per capita (representing about 2 million tonnes per year), it is also difficult to find out how much WEEE is actually collected and treated on national and EU levels. A certain amount indeed bypasses official schemes (national or producer's systems) to form complementary streams (door-to-door trade, second-hand shops, disposal through households waste). It is estimated that only 1/3 of the WEEE collected is treated domestically, in addition to the 15% exported to other countries, mostly for reuse. It is however hard to find the quantities of WEEE exported illegally out of the EU.

When Directive 2002/96/EC¹ was recast in 2012 (through Directive 2012/19/EC²), substantial changes were introduced to better reflect the issues raised by the expansion of the EEE market and to promote and ensure more quality recycling. In particular, Article 10 of the new WEEE Directive (Directive 2012/19/EC) specifically provides for the possibility of WEEE to be shipped for treatment outside the EU Member States (MS).. In particular, Article 10 sets out the conditions under which such shipments can take place. First, Article 10.1 stipulates that exported WEEE must comply with the EU Waste Shipment Regulation (EC) 1013/2006 ('WSR') and related Regulation (EC) 1418/2007. Second, Article 10.2 states that WEEE exported out of the EU shall only count towards the fulfilment of obligations and recovery targets if, in compliance with Regulation (EC) 1013/2006 and Regulation (EC) 1418/2007, the exporter can prove that the treatment took place in conditions that are equivalent to the treatment requirements set out in Article 8 and Annexes VII and VIII of the new WEEE Directive.

On the basis of Article 8 of the new WEEE Directive proper treatment of all separately collected WEEE is required. As a minimum, selective treatment requirements are set in Annex VII, while the treatment facilities shall be compliant with the technical requirements of Annex VIII (technical requirements for storage and treatment of WEEE)..

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 of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (recast)

Objectives and purpose of the study

The main purpose of the study is to lay the basis for delegated act(s) to be adopted by the Commission under Article 10(3) of the new WEEE Directive regarding what is considered to be “equivalent treatment conditions” for WEEE treated outside the EU. To this end, the objectives of this study are as follows:

- Identify different options via which the “equivalent treatment conditions” of Article 10(2) could be supplemented;
- Analyse the appropriateness and adequacy of those different options; and
- Provide recommendations as to the best possible policy option(s), based on the analysis carried out.

Identification of potential options, at the EU and international level

During this study, thirteen individual policy options to prove “equivalent treatment conditions”, as standalone options or in combination, were identified both following European Commission’s proposal and through desk-based research, literature review, and expert and stakeholder consultation (individual interviews) at the EU and international level. A preliminary screening of identified options has led to discarding some of them, while retaining others.

Discarded options

Seven options were discarded on the basis of:

- The complexity and uncertainty their implementation would entail: The option “**equivalent legislation in non-EU countries**” was excluded based on its great variability (difference in scope of WEEE), on the lack of harmonised regulations in a federal State, on the potential non- or ineffective application of the legislation in a given country, and on the difficulty in guaranteeing constant equivalency (for instance in the case of a revision of the WEEE Directive) and possible distortion of trade between countries. The options of compliance with **eWASA Technical Guidelines on Recycling of Electrical and Electronic Equipment (South Africa)** or the **PACE Guideline on Environmentally Sound Material Recovery/Recycling of End-of-Life Computing Equipment** were also excluded based on their narrow scope and/or limited geographical area, but also because of their potential non- or ineffective application that may result from a lack of standard and/or a lack of an (internationally) acknowledged process to prove compliance with the guidelines;
- A very narrow WEEE coverage and similarity with other options: **RAL Quality Assurance for the Demanufacture of Refrigeration Equipment Containing CFCs** is a private certification focusing on refrigeration equipment containing CFCs and is reportedly equivalent to the requirements of the European standard EN 50574:2012 developed by CENELEC, which covers the “Collection, logistics & treatment requirements for end-of-life household appliances containing volatile fluorocarbons or volatile hydrocarbons”;

- A narrower coverage of treatment steps compared to the WEEE Directive: **PAS 141** only covers re-use of WEEE, and the **Canadian Electronics Re-use and Refurbishing Standard** only covers re-use of WEEE and refurbishing; and
- An inconsistent material scope across provinces, due to provincial regulation across Canada: The project team thus discarded the policy option for compliance with the **Canadian Recycler Qualification Program (RQP)**.

Retained options

The six options retained for exporters of WEEE in order to prove that the treatment outside the EU takes place in conditions that are equivalent to the requirements of the Directive are the following:

- **Ex-post audit** report on compliance (Compliance with treatment conditions equivalent to the requirements of Directive 2012/19/EU certified by an independent verifier following a site inspection)³: an ex-post audit would be conducted and a report submitted, to prove compliance by the treatment facility in a third country with the treatment requirements of WEEE Directive 2012/19/EU. Compliance would have to be proven for each specific shipment of WEEE;
- **Compliance with the WEEELABEX:2011** (WEEE LABEL of EXcellence) **standard on treatment of WEEE**, developed by the WEEE Forum in cooperation with stakeholders from the producers' community and processing industry, and co-financed by the EU LIFE programme. Implementation of the standard is undertaken by the WEEELABEX Organisation set up in April 2013;
- **Compliance with R2/RIOS standard**: the R2:2013 standard sets responsible recycling ('R2') practices for use in accredited certification programmes that assess electronics (solely IT and audio equipment) recyclers' environmental, safety, and security practices. An R2:2013 electronics recycler is to be certified to one or more Environmental, Health and Safety management system standards that have been approved by R2 Solution. R2 Solutions has notably approved the Recycling Industry Operating Standard (RIOS) for this purpose;
- **Compliance with e-Stewards standard for Responsible Recycling and Reuse of Electronic Equipment**: it is an industry-specific standard developed under the "e-Stewards Initiative", a project of the Basel Action Network (BAN) and is an IAF (International Accreditation Forum) accredited standard;

³ The study refers to an ex-post audit. However, this option is equivalent to any option including compliance check through a site inspection by an independent verifier: either the inspection is conducted before the actual shipment of WEEE (ex-ante) or after the shipment (ex-post). Ex-ante audits have the advantage that the certification of compliance can be available to the competent authority of dispatch before the actual shipment of WEEE while ex-post audits can only confirm *a posteriori* that a third-country facility receiving WEEE for treatment meets the requirements set under the WEEE Directive. In case of the ex-post audit, compliance with the requirements would have to be demonstrated for every shipment of WEEE in order to enable a proper determination of the quantities that can count towards meeting the recovery targets set forth in Article 11 and Annex V to Directive 2012/19/EU.

- **Compliance with European standards (EN Standards) for the treatment of WEEE:** in application of Article 8(5) of WEEE Directive 2012/19/EU, the European Commission mandated the European Standardisation Organisations (ESO) to develop (a) standard(s) for the treatment of WEEE. These standards are being developed by CENELEC; and
- **Compliance with Australian/ New Zealand standard AS/NZS 5377:2013** on “Collection, storage, transport and treatment of end-of-life electrical and electronic equipment”: it is an Australian/ New Zealand standard that sets out principles and minimum requirements for the safe and environmentally sound recovery of household appliances, computers, telecommunications equipment, televisions, power tools, lighting products and other types of WEEE.

Approach for the analysis of options

All retained options were assessed and compared against a number of criteria in order to ensure the appropriateness and adequacy of the selected options to reach ‘equivalent treatment conditions’ required under Article 10(2) of the WEEE Directive. This resulted in an identification of the strengths, weaknesses, opportunities and threats (SWOT analysis) related to each policy option. The selected criteria used for the assessment were as follows:

- **Implementation status of the policy option:** to determine the level of practical efficacy of the policy option and whether it is currently applicable or if this will be possible only at a later date;
- **Geographical scope:** to determine whether the policy option is applicable only in a limited geographical area, or whether it has a broad geographical scope and applied in other countries already, or envisaged to in the future;
- **Export control (OECD/non-OECD):** to determine whether the policy option includes provisions concerning compliance with the requirements of the WSR and Regulation (EC) No 1418/2007. This criterion is not however an exclusion criterion as equivalent treatment conditions should in any case concern only legal exports. It is only used to give additional information on whether the policy option includes provisions related to compliance with the EU legislation on shipments of waste. Exports of WEEE that are not in accordance with the WSR are illegal shipments; they do not count towards the fulfilment of obligations and targets set out in Article 11 of the Directive.
- **Traceability of exported WEEE:** to determine whether the policy option includes provisions to ensure appropriate documentation and keeping of records of WEEE entering and leaving the different treatment phases;
- **Material scope:** to determine whether the policy option covers all WEEE, i.e. that the scope and definition of WEEE under the policy option is as broad as that under the WEEE Directive or is restricted only to specific categories of WEEE;

- **Stages of WEEE treatment covered by the policy option:** to determine whether the policy option provides for specific treatment operations and whether it includes provisions going beyond the requirements of the Directive, which are described in Article 8 and Annexes VII and VIII of the WEEE Directive (e.g. recovery of materials coming from WEEE). Information on provisions going beyond the requirements of the Directive is given in this study only as additional information but it is not used to set aside policy options that would not have any relevant provisions;
- **Establishment of an Environmental Management System (EMS):** to determine whether a specific policy option provides for the application of an environmentally sound management (ESM) of waste by WEEE treatment facilities, and additionally whether it imposes specific obligations for environmental management systems, workers' health and safety certifications, or both;
- **Treatment requirements:** to determine whether the policy option covers the minimum requirements for proper treatment in accordance with Article 8 and Annex VII of the Directive, as well as the use of best available techniques and the application of the technical requirements for treatment facilities, as provided in Annex VIII of the Directive. This criterion is used in order to give information on the extent to which the treatment conditions applied under each policy option can be considered equivalent to those of the Directive.
- **Conformity assessment:** to determine for each policy option the nature of the conformity assessment, i.e. whether exported WEEE have been treated in conditions that are equivalent to the requirements of the new WEEE Directive. The conformity assessment may be first-, second- or third-party (certification/verification), the latter being the most reliable way to ensure the highest independence in conducting the conformity audit;
- **Professional capacity of auditors:** to determine for each policy option whether auditors have sufficient training and knowledge of treatment requirements under the WEEE Directive, and whether their independence is guaranteed through notably the avoidance of conflict of interests; and
- **Costs:** to determine when possible the nature and amount of costs related to the implementation of each policy option.

As a general prerequisite, it is assumed that the treatment facility receiving WEEE is authorised to conduct WEEE treatment operations in accordance with the national legislation or national procedures of the country where it is established.

Analysis and comparison of policy options

After analysing the above-mentioned selected criteria for each of the retained policy options, the team created a comparative overview of each option, summarised in the table below. This enabled the team to suggest recommendations for the Commission on which policy options

would provide equivalent conditions for WEEE recycling operations taking place outside the EU, as standalones or in combination.

The table also presents the information with respect to the criteria, which are not considered for the exclusion of policy options but only for information.

Table A: Comparison of policy options

Main criteria	Policy option	Implementation status	Geographical scope	Export control (OECD/non-OECD countries) (For information)	Traceability	Material Scope		Treatment stages		Environmental management system	Treatment requirements		Conformity assessment		Capacity of auditors		Costs
						WEEE definition	Other definitions (e.g. treatment)	Treatment of WEEE	Treatment of materials coming from WEEE (For information)		Minimum requirements	BAT / Technical requirements for treatment facilities	Verification	Certification	Training	Independence	
	Ex-post audit																
	WEELABEX																
	R2/RIOS																
	e-Stewards																
	European standards	*		*	*												
	AS/NZS 5377:2013																

LEGEND:

- Ambitious interpretation of the requirements of the new WEEE Directive/ High level of requirement / High costs
- Middle-ground interpretation of the requirements of the new WEEE Directive/ Medium level of requirement / Medium costs
- * Least ambitious interpretation of the requirements of the new WEEE Directive as of current status of policy option
- Not applicable / No information

Conclusions and recommendations

Based on the SWOT analysis, all retained options present assets and shortcomings with regard to essential criteria and requirements. Each one of them could be suitable to the objective of providing equivalent treatment conditions of WEEE under certain conditions, which are necessary to ensure that all relevant requirements of WEEE Directive 2012/19/EU are fully covered and, consequently, to ensure a level playing field.

The project team recommends providing to the Member States and exporters a list of possible options instead of one preferred option. The exporter of WEEE can prove that the treatment takes place in conditions that are equivalent to the requirements of the WEEE Directive when he can prove that any one of these policy options is applied by the treatment facility to the country of destination. In order to ensure the greatest efficiency, it is proposed that the application of any one of the proposed policy options shall be accompanied by the following:

- A statement / declaration of compliance with:
 - i. the treatment requirements of WEEE Directive 2012/19/EU or with treatment requirements which are equivalent to those of the Directive,
 - ii. Regulation (EC) No 1013/2006 on shipments of waste (WSR), and
 - iii. Regulation (EC) No 1418/2007.
- A declaration stating that the facility receiving the WEEE is authorised to conduct WEEE treatment operations in compliance with the national legislation or national procedures. The declaration, where applicable, shall be accompanied by relevant documentations.
- Evidence that the facility in the third country, receiving WEEE, applies any one of the proposed policy options. As regards the conformity assessment under the possible options, it could be a mandatory third-party assessment, to avoid conflicts of interest. A third-party assessment is the more stringent requirement but it can nonetheless entail very significant administrative costs.

Moreover, the project team proposes the following additional recommendations that are specific to each of the retained options:

- Ex-post audit/Compliance with treatment conditions equivalent to the requirements of Directive 2012/19/EU certified by an independent verifier following a site inspection: this option would ensure a certain degree of flexibility. However, since such an audit would not necessarily be based on specific and detailed standards but on the sole requirements of the WEEE Directive and related legislation, the assessment of compliance with these requirements could be rather subjective in the absence of any guidance. The technical requirements developed by CENELEC or guidance documents developed under any of the proposed policy options could be used as guidance for the auditors;
- European standards for the treatment of WEEE: these standards will be highly valuable once finalised. The CENELEC EN standards could potentially be

retained as a stand-alone policy option for exported WEEE, provided that export control and traceability requirements are achieved to the above-mentioned statement of compliance with the requirements on shipments of waste;

- WEEELABEX: 2011 standard on “Treatment of WEEE”: this standard is already established and comprehensive. Although not a certification scheme, but a second- or third-party verification, the implementation of the WEEELABEX standard is a relevant option;
- R2/RIOS standard: this standard is applied worldwide, including in non-OECD countries. However, it does not cover all WEEE falling within the scope of the WEEE Directive. For this policy option, the equivalency of treatment conditions should be limited to WEEE covered by R2/RIOS;
- E-Stewards standard for “Responsible Recycling and Reuse of Electrical Equipment”: this standard has shortcomings related notably to its material scope. For this policy option also, the equivalency of treatment conditions should be limited to WEEE covered by the standard; and
- Australian/New Zealand standard AS/NZS 5377:2013 on “Collection, storage, transport and treatment of end-of-life electrical and electronic equipment”: the requirements contained in this standard appear equivalent to those of WEEE Directive 2012/19/EU, and even go beyond the binding treatment requirements of the Directive covering both treatment of WEEE and treatment of materials coming from WEEE.

List of acronyms

AMDEA	UK Association of Manufacturers of Domestic Appliances
ANAB	American National Accreditation Board
BAN	Basel Action Network
BAT	Best Available Techniques
BATRRT	UK Best Available Treatment Recovery and Recycling Techniques
BIR	Bureau of International Recycling
BREF	Best Available Techniques Reference Document
BSH	Bosch & Siemens Household appliances
BSI	British Standards Institution
CB	Certification Body
CECED	European Committee for Domestic Equipment Manufacturers
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
C&F appliances	Cooling and Freezing appliances
CFC	ChloroFluoroCarbons
CRT	Cathode Ray Tube
EEA	European Environment Agency
EEE	Electrical and Electronic Equipment
EERA	European Electronics Recyclers Association
EFC	Electro-Federation Canada
EFTA	European Free Trade Association
EH&S	Environmental Health and Safety
EHSMS	Environmental Health and Safety Management System
EoL	End of Life
EMS	Environmental Management System
EN	European Norm
EPA	Environmental Protection Agency
EPAT	Environmental Protection Administration of Taiwan
EPR	Extended Producer Responsibility

EPRA	Electronic Products Recycling Association
EPSC	Electronics Products Stewardship Canada
ERRS	Canadian Electronics Reuse and Refurbishing Standard
ERS	Canadian Electronics Recycling Standard
ESM	Environmentally Sound Management
ESO	European Standardisation Organisation
ETC/SCP	European Topic Centre on Sustainable Consumption and Production
ETSI	European Telecommunications Standards Institute
EU	European Union
eWASA	e-Waste Association of South Africa
FM	Focus Materials (under R2 standard)
GWP	Global Warming Potential
HC	HydroCarbons
HCFC	HydroChloroFluoroCarbons
HEW	Hazardous e-Waste
HFC	HydroFluoroCarbons
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
IED	Industrial Emissions Directive (2010/75/EU)
IPPC	Integrated Pollution Prevention and Control
ISO	International Organisation for Standardisation
ISRI	Institute of Scrap Recycling Industries
IT	Information Technology
ITAC	Information Technology Association of Canada
ITU	International Telecommunication Union
JAS-ANZ	Joint Accreditation System of Australia & New Zealand
LCD	Liquid-Crystal Display
LHA	Large Household Appliance
OECD	Organisation for Economic Cooperation and Development
OHSAS	Occupational Health and Safety Assessment Series
MS	Member State(s)
NGO	Non-Governmental Organisation

NZ	New Zealand
PACE	Partnership for Action on Computing Equipment
PAS	Publicly Available Specification
PCB	PolyChlorinated Biphenyls
PCT	PolyChlorinated Terphenyls
PDCA	Plan Do Check Approach
PWB	Printed Wiring Board
R2	Responsible Recycling
R2S	R2 Solution
RIOS	Recycling Industry Operating Standard
RQO	Recycling Qualification Office
RQP	Canadian Recycler Qualification Program for EOLE Recycling
RRW	Regulated Recycled Waste (Taiwan)
SHA	Small Household Appliance
SWOT	Strengths, Weaknesses, Opportunities, Threats
UBA	German Federal Environment Agency
UEEE	Used Electrical and Electronic Equipment
UKAS	United Kingdom Accreditation Service
UNEP	United Nations Environment Program
UNU	United Nations University
VHC	Volatile hydrocarbons
VFC	Volatile fluorocarbons
WEEE	Waste Electrical and Electronic Equipment
WEEELABEX	WEEE LABEL of EXcellence
WFD	Waste Framework Directive (2008/98/EC)
WRAP	Working together for a world without Waste Programme
WSR	Waste Shipment Regulation (No. EC 1013/2006)

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Chapter 1: Context and objectives

1.1 Context of the study

Electrical and Electronic Equipment (EEE) contain many materials requiring special end-of-life (EoL) handling, most predominantly lead, mercury, arsenic, chromium, cadmium and plastics, which are capable of releasing, among other compounds, dioxins and furans and other harmful emissions. Thus, EEE require specific treatments to ensure proper recycling or disposal at the end of their lives. High recycling and disposal costs encourage waste electrical and electronic equipment (WEEE) flows out of the developed world and down to the points of lowest-cost disposal. Lowest cost, however, usually means little oversight over the treatment process, assuming the waste had been treated and not directly dumped into landfills.

The 2008 impact assessment in the context of the review of Directive 2002/96/EC showed that more than half of collected WEEE was potentially the object of improper treatment and illegal exports. Even when collected WEEE is properly treated, it is not always reported. This results in losses of valuable secondary raw materials, environmental degradation, and provision of inconsistent data (European Commission 2008).

In the light of the expansion of the EEE market, with shorter innovation cycles and an acceleration of replacement of equipment, and growing concern as to the environmental and human health impacts resulting from WEEE, the European Union (EU) decided to recast the original WEEE Directive (2002/96/EC)⁴ by introducing substantial changes. Directive 2012/19/EU (hereafter referred to as 'WEEE Directive') was adopted on 4 July 2012, entered into force on 13 August 2012 and is to be transposed by Member States (MS) by 14 February 2014. One of the main objectives of this revised Directive is to promote and ensure proper recycling and recovery of WEEE which is important for sound resource management and will optimise supply of resources.

In its Article 10, the WEEE Directive foresees that the treatment operation of WEEE may also be undertaken outside the EU MS, provided that the shipment of WEEE is in compliance with the Regulations related to the shipment of waste (Regulation (EC) No 1013/2006 and Regulation (EC) No 1418/2007). More specifically, Article 10(2) provides that WEEE exported out of the EU will count towards the recovery targets set in the Directive if, in compliance with the above Regulations related to waste shipment, "the exporter can prove that the treatment took place in conditions that are equivalent to the requirements of this Directive."

Pursuant to Article 10(3) of the WEEE Directive, the Commission has until 14 February 2014 to adopt notably a delegated act laying down the criteria for the assessment of equivalent conditions mentioned in Article 10(2).

⁴ Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE).

1.2 Objectives of the study

The main purpose of the study is to lay the basis for delegated act(s) to be adopted by the Commission under Article 10(3) of the WEEE Directive. To this end, the objectives of this study are as follows:

- Identify different options via which the 'equivalent treatment conditions' of Article 10(2) could be supplemented, including at a minimum the policy options identified in the tender specifications for this study;
- Analyse the appropriateness and adequacy of those different options; and
- Provide a recommendation as to the best possible policy option(s), based on the analysis carried out.

Chapter 2: Understanding WEEE flows

In this chapter, the aim is first to provide better insight into EU WEEE flows in order to identify who generates WEEE, in which quantities and who are the key players for WEEE collection and treatment.

2.1 WEEE: a complex waste stream

Within the meaning of the WEEE Directive (article 3.e), WEEE is defined as EEE which is waste, including all its components, sub-assemblies and consumables which are part of this product at the time of discarding. At the international level, WEEE is also referred to as e-waste.

Traditionally, WEEE has been a complex waste stream to apprehend. Due to its own heterogeneous nature and many stakeholders involved compared to other waste streams, it is hard to define the quantities of EEE put on the market and the quantities of WEEE generated. Moreover, it is difficult to find out the quantities of WEEE collected and treated on a national level by the compliance schemes versus complementary recycling (reported by national recyclers to local or regional authorities), and how many other complementary collection streams exist (for example small door-to-door trade, second-hand shops). In addition, it is difficult to have data for WEEE in residual waste from households or businesses as well as for WEEE exported illegally. This sub-section thus intends to provide an overview of the WEEE market structure in EU countries to understand which actors are at stake, and who collects and treats WEEE.

2.1.1 Quantities of WEEE generated in the EU

The estimates of the United Nations University (UNU) indicate that in 2008, the 27 MS of the EU produced about 9.5 million tonnes of WEEE (Huisman 2010). A number of forecasting assumptions were applied which predict that total WEEE will grow between 2.5% and 2.7% annually, reaching approximately 12.3 million tonnes by 2020 (United Nations University August 2007). The average compositional breakdown of WEEE generated for the EU calculated by UNU and is shown in Figure 1 below (United Nations University August 2007).

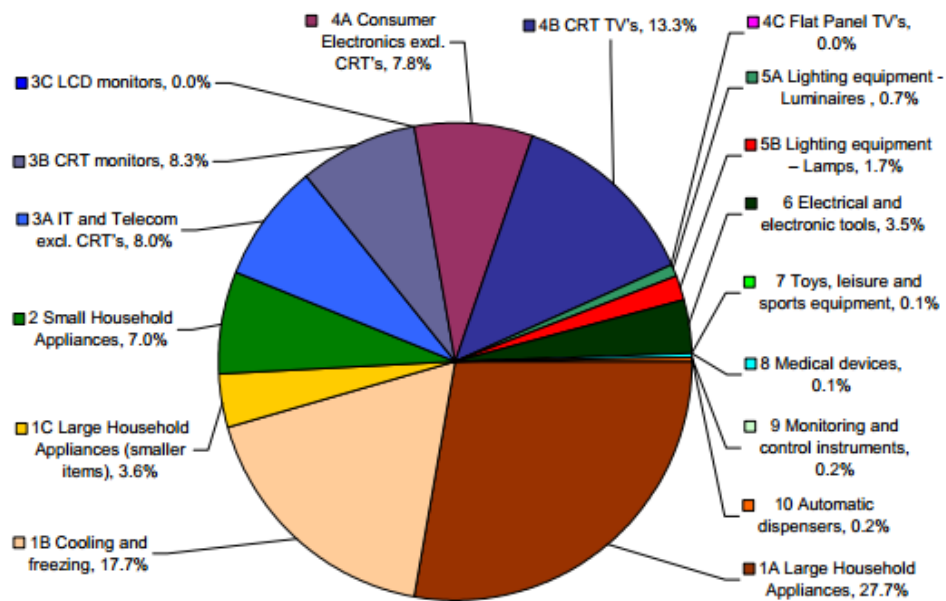


Figure 1: Breakdown of WEEE arising in 2005⁵

The WEEE Directive identifies two types of WEEE streams: products discarded by private households and waste from equipment which is solely intended for professional use/applications, as well as establishing an ambitious collection target of roughly 20 kg of household WEEE per capita (i.e. around 10 million tonnes of WEEE) to be achieved from 2019 onwards. The existing binding EU collection target is 4 kg of WEEE from private households per capita, representing about 2 million tonnes per year, out of around 10 million tonnes of WEEE generated per year in the EU.

2.1.2 The WEEE market structure

There are many actors involved in WEEE collection, trading, and recycling.

Figure 2 below shows, through a simplified structure, the main actors and relationships between them. WEEE flows start with consumers/households and businesses: they decide in first instance if WEEE moves into the direction of the national and/or producers' collection system⁶ or not. Households can, for example, deliver WEEE at a municipal collection point (or container park) or retail collection point.

By law, municipalities are required to provide households at least one location where they can discard WEEE. The producer systems or compliance schemes (i.e. 'national' systems) have contracts in place with municipalities to collect and recycle all WEEE collected. Alternatively, as the UNU 2012 study on Dutch WEEE flows shows, households can also give their WEEE to local scrap processors (WEEE bought as ferrous metal) or door-to-door collectors (United Nations

⁵ Source: United Nations University, August 2007

⁶ In Europe, there are two common forms of product take-back legislation implementation: (i) manufacturer-operated systems, where the State imposes certain take-back objectives on manufacturers, and (ii) State-operated systems, where manufacturers or consumers finance take-back through recovery fees.

University and Wecycle 2012). In urban areas, WEEE left on the kerbside is most of the time picked up by scrap metal dealers. WEEE is also taken back by installers (e.g. plumbers, or the delivery contractors working for retailers), and often directly sold by them to scrap dealers. Furthermore, some individuals also steal saleable WEEE in retailer or municipal collection points and sell it to scrap metal collection points. Generally, this WEEE ends in ferrous metal shredders along with other ferrous metals. At this point, WEEE becomes unrecognisable as WEEE. UNU calls these alternative options 'complementary WEEE flows' (illustrated by red arrows in Figure 2) as WEEE is sold to other parties than the official schemes (national or producers' systems). Finally yet importantly, small household appliances (SHA) are sometimes thrown away with residual household waste.

Like consumers, businesses also dispose of their WEEE, but through different channels. Business WEEE principally flows via WEEE processors, refurbishers, regional scrap metal processors or goes directly to national recyclers. Typically, almost all of Business WEEE results in complementary streams.

It is important to note that in reality there are many loops between the actors in the chain.

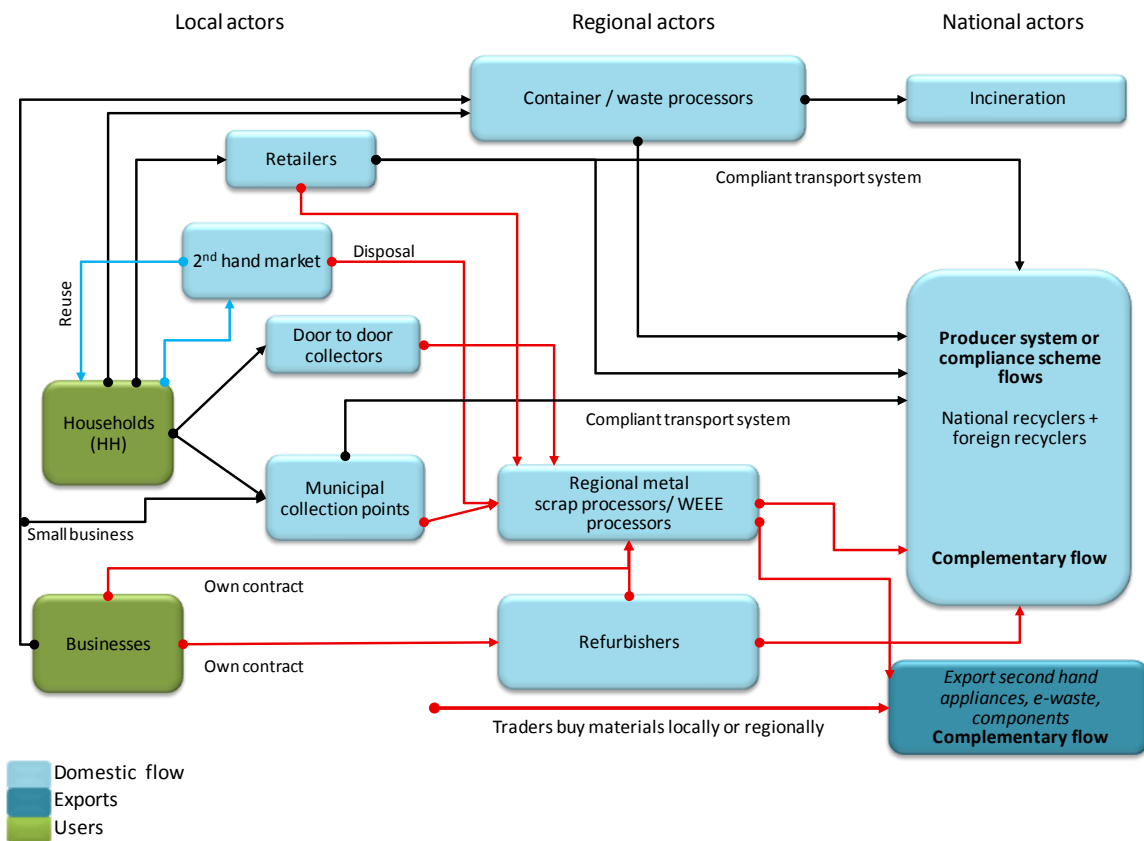


Figure 2: Typical WEEE Flows in EU MS⁷

Figure 3 below maps some of the routes of used EEE (UEEE) and WEEE flows in Europe. On the right hand side are the producer systems (take-back systems), which collect from municipalities

⁷ Inspired by the UNU illustration of the Dutch WEEE market in the UNU/Wecycle 2012 "Dutch WEEE Flows" study

and retailers. According to media reports,⁸ this channel is collecting approximately one-third of WEEE arising. The flows on the left hand are collected in parallel to producer flows and are not reported nor measured by statistics. Estimates from several recent studies indicate that around 40% of WEEE is collected and recycled by this sector.⁹

Figure 2 shows that part of the WEEE arising from end-users goes into unsorted municipal waste (around 10%). Furthermore about 15% of UEEE is exported, mainly for re-use. It is important to note that part of this UEEE either becomes WEEE during the transport (e.g. if there is not appropriate protection of the product during the transport) or a short period of time after arriving in the destination country.

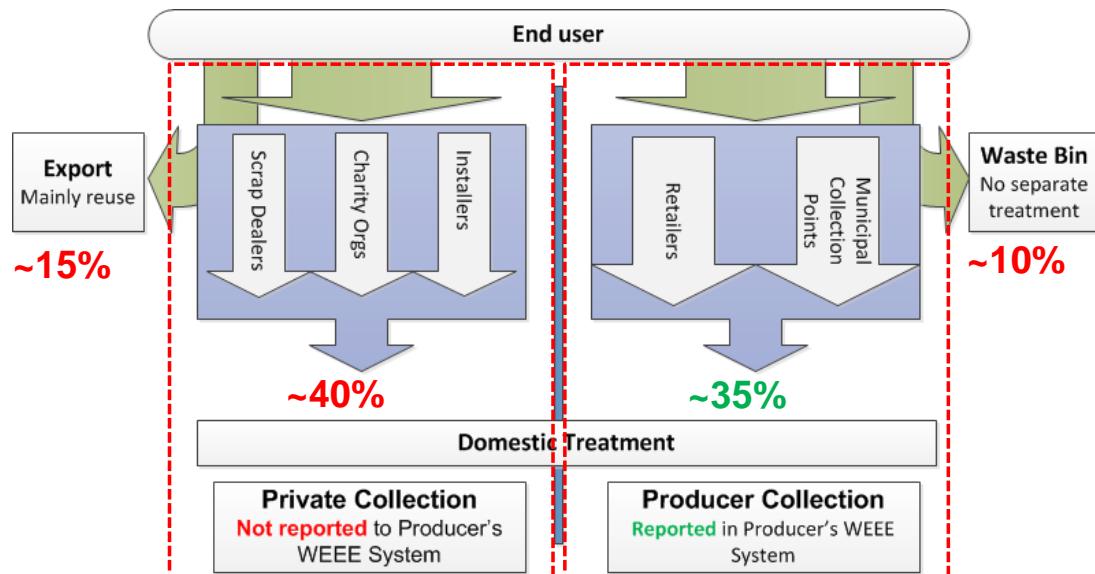


Figure 3: Only one-third of the WEEE collection is reported in the EU¹⁰

2.2 WEEE exports originating from the EU

The European Environment Agency (EEA, 2009), the European Topic Centre on Sustainable Consumption and Production (ETC/SCP, 2008), the Danish Environmental Protection Agency (Danish EPA, 2006) and the German Federal Environment Agency (UBA, 2010) have all analysed the issue of missing WEEE (i.e. flows not reported in producers' WEEE system), as compiled by the ETC/SCP (2012). The EEA and the ETC/SCP have documented how, for example, 15 000 tonnes of colour televisions were exported from the EU to African countries in 2005 (EEA, 2009; ETC/SCP, 2008). According to EU trade statistics, these sets had an extremely low average value

⁸ "The Waste Electrical and Electronic Equipment (WEEE) Directive is failing to live up to what it originally set out to do" (MRW.com 2008); "Barely one-third of such items are recycled at home, researchers say, while the bulk goes into landfills" (EurActiv.com 2012).

⁹ See UK 2011 EA Data, NL 2012 Wecycle and UNU data (Dutch WEEE Flows study), DE 2010 EAR Data, France OCAD3E and ADEME 2012 data (study conducted by BIO Intelligence Service and expected to be released in Sept. 2013).

¹⁰ Source: Hieronymi, 2012

of €28 per unit, signifying that they were used products rather than new products. Such old products are not always fully functional; they are likely to end up as WEEE after a short time in use, or even before they reach their destination if no proper protection measures have been taken (for instance, if screens are badly packed, they might break during the transfer). (EEA 2012). The exports of WEEE disguised as UEEE is an existing phenomenon and in order to diminish this phenomenon the WEEE Directive provides in Annex VI for the minimum requirements for shipments of UEEE suspected to be WEEE. In any case, this study does not further refer to the distinction between UEEE and WEEE. The study focuses on the treatment requirements for WEEE legally exported from the EU. For any illegal shipment, there is no further consideration of the treatment conditions and whether these are equivalent to the treatment conditions in the EU since illegally exported WEEE in any case cannot be taken into account for the achievement of the WEEE targets.

WEEE contains more than 1,000 different substances, many of which are toxic, such as lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame-retardants that create dioxins emissions when burned. Hence, the uncontrolled disposal and recycling of WEEE in informal sector, also called 'backyard recycling', is a main concern. Indeed, backyard recyclers employ archaic tools and methods to recover valuable materials and components from WEEE with little or no safeguards to human health and the environment. For instance, informal workers heat printed wiring boards (PWBs) over an open flame to free components and recover lead solders. Then, naked PWBs are sent to an acid bathing process to recover gold and copper, and the acid solution ends in the nearby surroundings, discharged freely (Research Unit (Larrdis) 2011).

Aware of such health and environmental hazards due to crude recycling, some countries have now banned WEEE imports, such as Nigeria, Cambodia, China, India, Malaysia, Pakistan and Vietnam. Some of the bans are based on Annex VIII and Annex IX of the Basel Convention for specified hazardous waste, including some WEEE as hazardous materials under their domestic regulations (Li, Lopez and al. 2012), or the Bamako Convention (entered into force in 2008; it has until now been ratified by 24 countries), which promote the import ban into Africa and the control of transboundary movement and management of WEEE (Li, Lopez and al. 2012). Countries have also banned imports of non-hazardous WEEE through EU Regulation 1418/2007, further discussed in Section 3.2.1.

Figure 4 shows the known and suspected routes of WEEE flows across the globe in 2005. The 2012 UNU/Wecycle study on Dutch WEEE Flows shows that the export of UEEE from the EU to Africa consists mainly of cooling and freezing (C&F) appliances, CRT Monitors and CRT TVs. Indeed, C&F appliances are repaired relatively easily in Africa, while CRTs or fractions of the latter are used to repair other appliances. WEEE exports to Eastern Europe concern more large household appliances (LHAs) including dishwashers and dryers, small household appliances (SHAs) and Information Technology (IT) equipment.



Figure 4: Known and suspected routes of e-waste dumping¹¹

Under EU legislation, shipment of UEEE and WEEE is subject to specific regulations and requirements, addressed in the following chapter.

¹¹ Source: Doucette, et al., 2005

Chapter 3: WEEE legislation and key requirements

This chapter provides an overview of international legislation on waste and corresponding waste directives and regulations within the EU. The purpose of this chapter is to have a global overview of existing legislation and how they are interconnected in order better to understand the key requirements for WEEE exported and treated outside the EU, specifically regarding the requirements on the treatment conditions.

3.1 International legislation

3.1.1 International legislation on shipment of waste

The trend to ship waste abroad, as described in the previous chapter, provided the context to begin the control of the transboundary shipment of hazardous waste in the late 1980's and early 1990's. Since WEEE is a significant source of hazardous waste, it is important to look at legislation on the control of transboundary shipments of waste.

The figure below provides a graphical overview of the three relevant international instruments on the shipment of hazardous waste: the Basel Convention, the OECD Decision C(2011)107 and the EU's Waste Shipment Regulation (WSR, (EC) No 1013/2006).

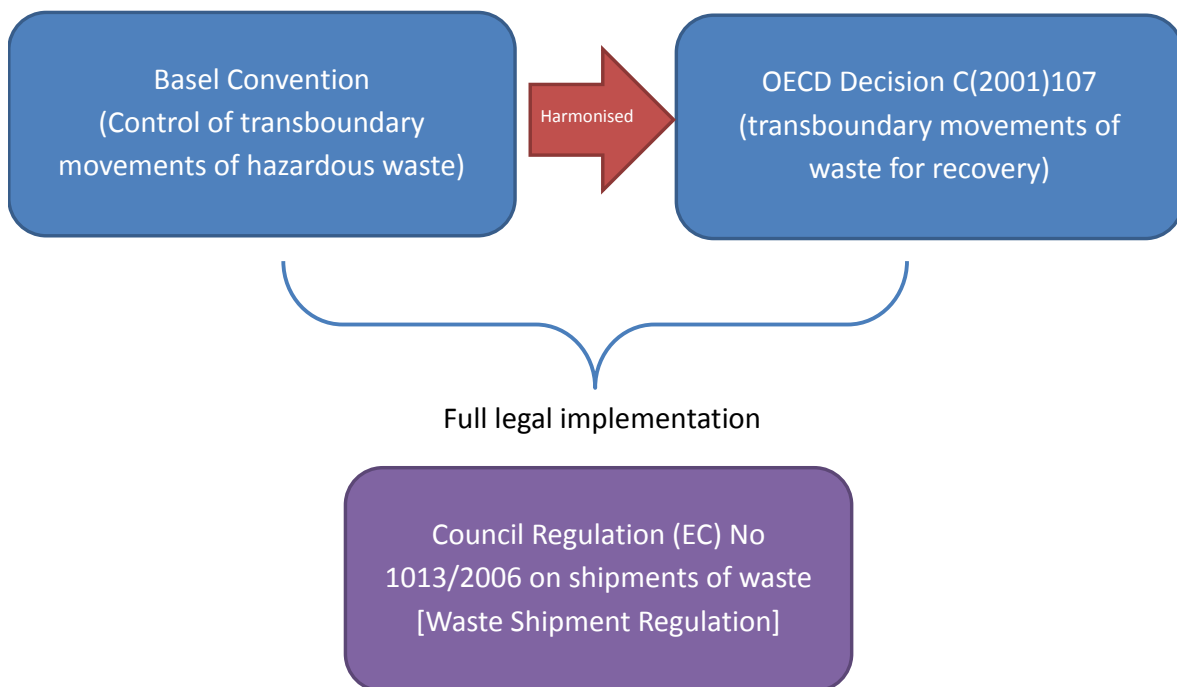


Figure 5: International instruments on the shipment of waste

3.1.1.1 *The Basel Convention*

The most important and widespread initiative that would affect the movement of WEEE is the Basel Convention,¹² which came into force in 1992, considered as 'the international legislation governing the management of e-waste' (Oliveira 2011). The Convention was created with the intention to keep hazardous waste within countries capable of handling it.

The Convention operates under the core concept of Extended Producer Responsibility (EPR). EPR is defined as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage, including its final disposal (Oliveira 2011). This kind of approach has two main purposes: to transfer the responsibility of managing the waste from governments to industries, and to encourage the development of more sustainable products and more cost effective recovery processes since producers will try to reduce the cost of this waste management. Given that the Basel Convention serves as umbrella legislation for e-waste, it comes to no surprise that EPR is propagated as a new paradigm in waste management. Countries and legislators are increasingly adopting EPR policies to manage various kinds of waste, as evident in EU waste legislation (discussed in sections below).

In the framework of e-waste, the Basel Convention contains two lists of wastes, List A (Annex VIII) of wastes characterised as hazardous and List B (Annex IX) of wastes characterised as non-hazardous. These two lists present an overview of e-waste without specific classifications into different types of e-waste, which has the disadvantage that it allows for different interpretations and hinders strict international implementation (Oliveira 2011).

The Basel Convention provides technical guidelines for the environmentally sound management (ESM) of wastes subject to the Convention (see section below). However, while the Convention provides rules and guidelines on the shipment of waste, there are no provisions for penalties in cases of infringement. These are left to individual States to enact. Table 1 below provides an overview of Basel Convention provisions and waste codes.

Table 1: Overview of Basel Convention provisions and waste codes

Basel Convention provisions and waste codes
1. Reduce transboundary movements to a minimum
2. Prohibit or not permit export of waste to countries with import ban
3. Prohibit or not permit export of waste to countries where no ESM
4. Illegal traffic is criminal
5. Not permit export to or import of hazardous waste from non-Party
Annex VIII wastes (A-Codes): Characterised as 'hazardous'
Annex IX wastes (B-Codes) : Non-hazardous unless containing hazardous material to an extent

¹² Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. The Convention was opened for signature on 22 March 1989, and entered into force on 5 May 1992.

3.1.1.2 *The OECD Decision concerning the Control of Transboundary Movements of Wastes Destined for Recovery Operations*

In the same year as the Basel Convention came into force, the OECD Council passed a Decision that applies to the transboundary movements of waste destined for recovery between OECD Member countries.¹³ The purpose of the Decision was to harmonise the procedures and requirements of the OECD Decision with those of the Basel Convention to eliminate duplicate activities between the two international organisations. In 2002, the OECD issued the revised Council Decision C(2001)107/FINAL, which reviewed some technicalities of the original Decision.

The Annexes of the Revised Decision are divided into “Green” and “Amber” lists (G and A Codes), which are slight adaptations of the Basel Convention codes. Wastes falling under the Green control procedure do not typically exhibit hazardous characteristics and are deemed to pose negligible risks. Wastes falling within the Amber codes are subject to specific control procedures due to their hazardous nature. The Decision is legally binding on OECD Member countries. The OECD Decision prohibits the export of hazardous waste to non-OECD countries.

Table 2 below provides an overview of OECD Decision C(2001)107 and its respective waste codes.

Table 2: Overview of OECD Decision C(2001) 107 and its waste codes

Countries abiding by OECD Decision and waste codes
Control of transboundary transport of waste for recovery purposes within the OECD area :
EU MS
European Free Trade Association (EFTA) countries (Norway, Switzerland, Iceland)
USA, Canada, Australia, New Zealand
Japan, Korea, Turkey
Green control procedure: wastes in Annex IX of the Basel Convention plus some additional wastes (G-codes) – wastes that present low risk for human health and the environment and, therefore, are not subject to any other controls than those normally applied in commercial transactions
Amber control procedure: wastes in Annex VIII of the Basel Convention plus some additional wastes (A-codes) – for wastes presenting sufficient risk to justify their control.

¹³ Decision C(92)39/FINAL Concerning the Control of Transfrontier Movements of Wastes Destined for Recovery Operations (30 March 1992).

3.1.2 International legislation and guidelines on treatment of WEEE

3.1.2.1 *Technical guidelines under the Basel Convention*

The Basel Convention also provides technical guidelines for the environmentally sound management (ESM) of wastes subject to the Convention.

Managing hazardous or other wastes in an environmentally sound manner is a fundamental obligation of Parties to the Basel Convention. Work is being carried out in that context to help Parties, in particular developing countries, to apply environmentally sound management (ESM) principles. Non-legally binding technical guidelines have been developed within the Basel Convention for specific waste streams, such as used tyres, plastic waste, lead-acid batteries, ships, biomedical and healthcare waste. In the context of a mobile phone partnership with the OECD, guidelines on ESM of end-of-life mobile phones¹⁴ were developed by a working group that included manufacturers of mobile phones¹⁵. Such guidelines are particularly useful for developing countries insofar as the elaboration of their waste management infrastructure may still be at an early stage and they may not yet possess environmental know-how and technologies required to ensure ESM. The concept, described in more detail in the “Framework Document” (Basel Convention Secretariat 1994) encompasses the objectives of preventing, minimising, recovering and disposing of wastes in an environmentally sound manner, while taking into account social, technological and economic constraints. To achieve these ESM objectives, a number of tools and actions are recommended, such as the use of cleaner technologies, the reduction of transboundary movements of waste, the prevention and control of illegal traffic, the promotion of institutional and technical capacity-building, the transfer of environmentally sound technologies to developing countries, the development of training and information exchange, etc.

In addition to the mobile phone partnership, guidelines were also developed by the Partnership for Action on Computing Equipment (PACE) that was launched in 2008 at the ninth meeting of the Conference of the Parties to the Basel Convention. The PACE guideline, on environmentally sound material recovery/recycling of EoL computing equipment,¹⁶ covers only computing equipment (computers and peripherals, such as central processing units, desktop, laptop, monitors using CRT and LCD flat screen technology, keyboards and mice, printers and scanners).

¹⁴ For further information see the Mobile Phone Partnership Initiative Guidance Document : <http://archive.basel.int/industry/mppi/gdfd30Jun2010.pdf>

¹⁵ Fonebak, ReCellular, MICORE, HOBI International, France Telecom Orange Group, Vodafone, Motorola, Nokia, Sharp, and Sony-Ericson

¹⁶ The guideline is available at archive.basel.int/industry/compartnership/docdevpart/ppg21DraftGuidelineFinal-2011-03-15.pdf

3.1.2.2 OECD guidelines

Under the OECD Decision C(2001) 107, there is specific OECD Environmental Management System Guidelines for Waste Management¹⁷ (“The OECD Recommendation”). It outlines specific recommendations to OECD governments on the ESM of waste in general. Structurally, the Council Recommendation envisages implementation by governments of general policy “principles” (the “recommendations part” of the Council Recommendation), combined with six types of measures to be implemented at the facility level. Because it has been recognised that the efforts needed to implement ESM may vary significantly from country to country, from site to site, and from waste type to waste type, the non-legally binding approach was preferred to the mandatory approach. Member countries therefore adopted a “Recommendation”, which is not legally binding, rather than a “Decision”, which is. To facilitate the implementation of the OECD Recommendation by both governments and waste treatment facilities a guidance manual was issued¹⁸. It does not specify treatment of WEEE; however, the guideline refers to the EU WEEE Directive, as mostly contributing to the ESM.

In parallel to the OECD Recommendation, work has also been carried out elsewhere in the OECD on ESM, in particular by producing specific ESM guidance for one particular waste stream- used and scrap personal computers [ENV/EPOC/WGWPR(2001)3/FINAL].¹⁹

3.1.2.3 Other technical guidelines

In addition to the above-mentioned guidelines adopted under the Basel Convention or the OECD, technical guidelines for the treatment of WEEE have also been adopted in non-EU countries. Examples of such guidelines include the following:

- Guidelines for the Management of Waste Electrical and Electronic Equipment (WEEE) in Latin America, developed and published in 2011 as a result of a regional public-private roundtable²⁰: they include a “Protocol for handling WEEE during its life cycle” (chapter 3) notably listing the basic standards for WEEE management that should be adopted;

¹⁷ <http://acts.oecd.org/Instruments/ShowInstrumentView.aspx?InstrumentID=51&InstrumentPID=48&Lang=en&Book=False>

¹⁸ OECD Environmental Management Guidelines for Waste Management can be found here : <http://www.oecd.org/env/waste/39559085.pdf>

¹⁹ [http://search.oecd.org/officialdocuments/displaydocumentpdf?doclanguage=en&cote=ENV/EPOC/WGWPR\(2001\)3/FINAL](http://search.oecd.org/officialdocuments/displaydocumentpdf?doclanguage=en&cote=ENV/EPOC/WGWPR(2001)3/FINAL)

²⁰ This document was prepared in the context of the Regional Project on Harmonisation of Electronic Waste Management in Latin America implemented by the RELAC Platform with support from the International Development Research Centre, IDRC. The document is available at http://www.basel.int/Portals/4/Basel%20Convention/cop10/side-events/e-Waste-initiative_Wednesday/guidelines.pdf

- Guidelines for E-waste Management in Kenya of in December 2010, published by the Kenyan Ministry of Environment and Mineral Resources (National Environment Management Authority)²¹: the document notably provides guidelines for treatment technology for e-waste (first, second and third level e-waste treatment), as well as guidelines for establishment of unit treatment facility, an integrated processing treatment facility and disposal sites for e-waste;
- eWASA Technical Guidelines on Recycling of Electrical and Electronic Equipment (South Africa)²²: the e-Waste Association of South Africa (eWASA) is an industry association, non-profit organisation set up in 2008 to manage the establishment of a sustainable environmentally sound e-waste management system for South Africa. The technical guidelines are part of the recycling contract on environmentally-friendly treatment of waste electrical and electrical appliances concluded between eWASA and a recycling company; and
- Guidelines for Environmentally Sound Management of e-Waste developed in 2008 by the Indian Ministry of Environment & Forests – Central Pollution Control Board²³: the objective of these guidelines is to provide guidance for identification of various sources of WEEE and prescribed procedures for management, handling and disposal of e-waste in an environmentally sound manner. This reference document provides guidance and broad outline, but not the specific methods of treatment and disposal for specific wastes.

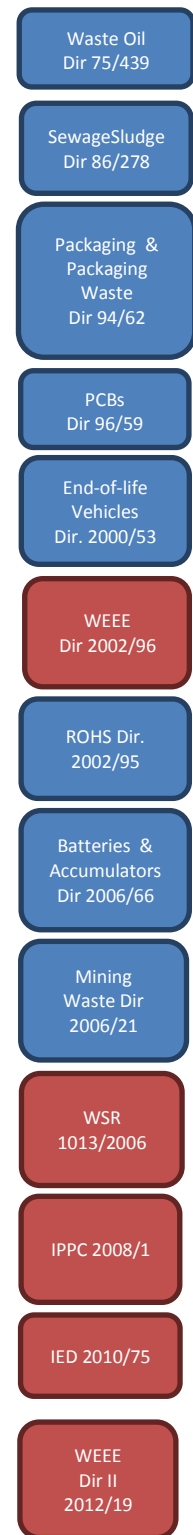


Figure 6 :
Timeline of EU
legislation

3.2 Waste Legislation in the EU

The EU has a series of waste-related Directives and Regulations. Management of WEEE was especially initiated based on the obligation on the producers of EEE to take back EoL or waste products free of charge in an effort to reduce the amount of waste going to landfills. This initiative is outlined in the WEEE Directive. However, it is important to understand the inter-linkages between other EU waste legislations applicable to WEEE. Figure 6 shows the timeline of EU waste legislation. The ones highlighted in red are those pertinent to this study.

²¹ Available at http://www.gesci.org/assets/files/E-Waste%20Guidelines_final%20copy27jan2011.pdf

²² Available at <http://www.ewasa.org/downloads/files/Technical%20Guidelines%20eWASA.pdf>

²³ Available at <http://www.cpcb.nic.in/latest/27.06.08%20guidelines%20for%20E-Waste.pdf>

3.2.1 The Waste Shipment Regulation (EC) No. 1013/2006

The WSR adopted by the EU in 2006²⁴ sets out legal procedures and control regimes for the shipment of waste to 'harmonise' (recital 5 of the WSR) the Basel Convention and the OECD Decision (referenced in Annex VIII of the Regulation). It is a legally binding legislation, with its waste categories derived from the two international agreements detailed in section 3.1. Table 3 below provides an overview of WSR objectives and waste codes.

Article 36 of the WSR prohibits the export of waste for disposal and export of dangerous wastes to non-OECD countries (listed in Annex V). Within the 'Green' list of waste are categories of WEEE that are considered to be non-hazardous. The export of 'Green Waste' is permitted, as long as the importing country allows it, or allows it with specific controls (Article 37 of the WSR).

Despite specific waste being listed under the 'Green List,' third countries and MS have the legal right to ban or limit waste. The corresponding Regulation 1418/2007²⁵ provides a list of these countries and the types of waste they limit, which for some countries includes WEEE (for example, China completely bans the importation of electronic scrap, despite it being considered a "Green" Listed Waste in the WSR).

Table 3: Overview of WSR objectives and waste codes

EU WSR objectives and waste codes
1. Ensure shipment and disposal/recovery without endangering human health and the environment
2. Require ESM in case of export from the EU
3. Prohibit export and import if reason to believe that waste will not be managed accordingly ('management' of waste is referring to the best available techniques reference documents (BREFs) from the IPPC Directive ²⁶ which should be used as a reference)
Annex III: 'Green list' made up of G codes from OECD Decision and B Codes of Basel Convention – shipment of waste subject to general information requirements
Annex IV: 'Amber List' includes a list of selected A Codes of the Basel Convention – shipment of waste subject to the procedure of prior written notification and consent
Annex V : defines 'dangerous' waste subject to an export prohibition in article 36 of the WSR. There are two lists: List A (from Annex VIII to the Basel Convention) and List B (Annex IX to the Basel Convention). Wastes in List A are completely prohibited from being exported. Wastes listed in List B are <i>potentially</i> permitted to be exported.

The WSR provides waste codes for WEEE-related wastes and not for WEEE as defined in the WEEE Directive. For example, there are codes for electronic scrap, for assemblies, for cathode-ray tubes, for waste lead-acid batteries, copper alloys etc. Such codes have been identified in the

²⁴ Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste.

²⁵ Commission Regulation (EC) No 1418/2007 of 29 November 2007 concerning the export for recovery of certain waste listed in Annex III or IIIA to Regulation (EC) No 1013/2006 of the European Parliament and of the Council to certain countries to which the OECD Decision on the control of transboundary movements of wastes does not apply.

²⁶ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control

Correspondents' Guideline No. 1 on the shipments of WEEE, as well as in the draft technical guidelines on e-waste of the Basel Convention.

In its article 49, the WSR provides that for exported waste that is to be recovered outside the EU, the MS are required to ensure that the facility which receives the waste will be operated in accordance with human health and environmental protection standards that are "broadly equivalent to standards established in Community legislation".

3.2.2 The Waste Framework Directive (2008/98/EC)

The Waste Framework Directive (WFD) of 2008 (2008/98/EC) sets the basic concepts and definitions related to waste management such as definitions of waste, recycling, and recovery.²⁷ It thus provides a general framework of waste management requirements and sets the basic waste management definitions for the EU. Along with the waste management definitions, the WFD applies a waste management hierarchy as follows: prevention, preparing for re-use, recycling, recovery and disposal. Further, it establishes a legal framework for the treatment of waste, where waste treatment facilities must obtain permits and registrations to operate (Article 23). Further, the WFD includes requirements regarding the control of hazardous waste (Art. 17), mixing ban (Art. 18), labelling (Art. 19) and record keeping of hazardous waste (Art. 21).

3.2.3 The IPPC Directive/Industrial Emissions Directive and BAT for Waste Treatment

To prevent emissions to an extent critical for human health and the environment, EU legislation includes several requirements regarding the handling and management of hazardous waste either referring to specific hazardous waste streams (i.e. WEEE) or referring to specific treatment operations (i.e. for incineration and landfilling of hazardous wastes).

The IPPC Directive (codified by Directive 2008/1/EC), which is repealed by the 2010 Industrial Emissions Directive (IED, 2010/75/EU²⁸) with effect from 7 January 2014,²⁹ sets out minimum requirements through their BREFs for MS. This will likely impact the treatment conditions of WEEE as (i) the IED expressly provides that "BAT conclusions shall be the reference for setting the permit conditions" (Article 14(3)), and (ii) BAT may be defined for the treatment of WEEE in accordance with the IPPC/IED, as contemplated by the WEEE Directive.³⁰

²⁷ The WFD of 2008 repealed the 2006 WFD (the codified version of Directive 75/442/EEC), and incorporated the hazardous waste Directive (91/689/EC) and the Waste Oils Directive (75/439/EEC).

²⁸ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), OJ L 334, 17.12.2010, p.17.

²⁹ IED, Article 81

³⁰ Directive 2012/19/EU provides (recital 17) : "*The best available treatment, recovery and recycling techniques should be used, provided that they ensure human health and a high level of environmental protection. Best available treatment, recovery and recycling techniques may be further defined in accordance with the procedures of Directive 2008/1/EC.*"

However, it is specially noted that the requirements under this Directive are relevant only for the treatment facilities that fall within its scope; they are not relevant for all WEEE treatment facilities in the EU.

3.2.4 Directive on waste electrical and electronic equipment (WEEE) 2012/19/EU

The first WEEE Directive (2002/96/EC) was adopted on 27 January 2003 and has since been revised. The new WEEE Directive 2012/19/EU ('WEEE Directive') covers all types of EEE, for which it establishes different categories and sets targets for their collection, recovery and recycling. According to Article 10(2) of the WEEE Directive, WEEE that is exported out of the Union must comply with the WSR (and related Regulation (EC) 1418/2007), which consolidates the Basel Convention and the abovementioned OECD Decision. The WEEE exported out of the EU will count towards the fulfilment of recycling/recovery targets only if the exporter can prove that the treatment took place in conditions that are equivalent to the requirements of the Directive.

WEEE that is treated within the EU must be done so at a treatment facility that has been approved by the relevant MS authority.

3.3 Key Requirements of the WEEE Directive

This section analyses the key requirements regarding the treatment of WEEE within the EU. The first section outlines the definition of WEEE and the categories subject to the requirements of the WEEE Directive. The second section focuses on the interaction between the treatment of WEEE and their export provisions of the WFD. The third section presents the proper treatment and disposal of WEEE as outlined by the WEEE Directive.

3.3.1 Definition of WEEE and categories subject to the requirements of the WEEE Directive

Article 3(1)(a) of the WEEE Directive defines EEE as "equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1 000 volts for alternating current and 1 500 volts for direct current". WEEE is in turn defined (Article 3(1)(e)) as "electrical or electronic equipment which is waste within the meaning of Article 3(1) of Directive 2008/98/EC, including all components, sub-assemblies and consumables which are part of the product at the time of discarding".

There are two lists of categories of products covered by the WEEE Directive:

- The current 10 categories, with the inclusion of photovoltaic panels, which are covered from 13 August 2012 to 14 August 2018 (transitional period), and
- 6 categories (open scope), which will be covered from 15 August 2018.

The 10 transitional categories have been compiled into the 6 open scope categories (Annex III of the WEEE Directive) as illustrated in Figure 7 below:

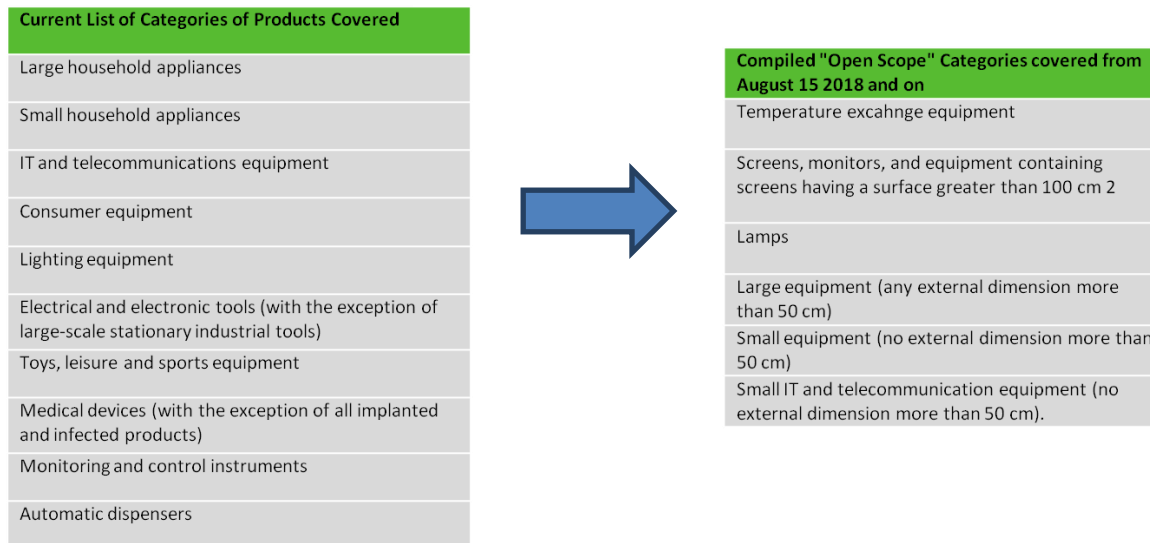


Figure 7: Current list and future list of categories covered by the WEEE Directive

3.3.2 Export of WEEE

Article 10(1) of the WEEE Directive provides that shipments of WEEE must comply with the WSR and the corresponding Regulation (EC) No 1418/2007,³¹ in terms of limitations on the hazardous and non-hazardous waste shipped to OECD and non-OECD countries as defined by WSR Annexes.

From 2016, MS will be required to collect 45% of the average weight of EEE placed on the market. From 2019 onwards, MS will be required to collect 85% of WEEE generated on the territory of that MS. Currently, the EU collects about 4kg of WEEE per capita; by 2020 the target for the collection of WEEE is 20 kg per capita (as e-waste is expected to rise).

Recovery targets are highly relevant to the export of WEEE. Starting in 2014, WEEE exporters will have to prove that the treatment of WEEE outside the EU takes place in conditions equivalent to those required by the Directive for the waste to be counted towards their collection and recovery target rates (Article 10(2)).

3.3.3 Proper Treatment and Disposal of WEEE

Article 8 of the WEEE Directive provides that MS must ensure that all separately collected WEEE undergoes proper treatment. At a minimum, this includes the removal of all fluids and a selective treatment in accordance to Annex VII and Annex VIII of the Directive.

Table 4 below lists the technical requirements for storage and treatment of WEEE:

³¹ As previously mentioned, Regulation (EC) No 1418/2007 sets out the list of countries and their respective import prohibitions of waste.

Table 4: Technical requirements for storage and treatment of WEEE

WEEE Directive, Annex VIII Technical Requirements
1. Sites for storage (including temporary storage) of WEEE prior to its treatment requirements
impermeable surfaces for appropriate areas with the provision of spillage collection facilities and, where appropriate, decanters and cleanser-degreasers
weatherproof covering for appropriate areas
2. Sites for treatment of WEEE
scales to measure the weight of the treated waste
impermeable surfaces and waterproof covering for appropriate areas with the provision of spillage collection facilities and, where appropriate, decanters and cleanser-degreasers
appropriate storage for disassembled spare parts
appropriate containers for storage of batteries, PCBs/PCTs containing capacitors and other hazardous waste such as radioactive waste
equipment for the treatment of water in compliance with health and environmental regulations

Annex VII outlines the minimum selective treatment for materials and components of WEEE. This is summarised in Table 5 below.

Table 5: Selective treatment for materials and components of WEEE

Selective treatment for materials and components of WEEE
1. As a minimum the following substances, mixtures and components have to be removed from any separately collected WEEE:
PCB containing capacitors in accordance with Council Directive 96/59/EC of 16 September 1996
mercury containing components, such as switches or backlighting lamps
batteries ³²
printed circuit boards of mobile phones generally, and of other devices if the surface of the printed circuit board is greater than 10 square centimetres
toner cartridges, liquid and paste, as well as colour toner
plastic containing brominated flame retardants
asbestos waste and components which contain asbestos
CRTs
chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC)

³² The EU has a specific Directive (2006/66/EC) on batteries and accumulators and their waste with required minimum treatment standards.

Selective treatment for materials and components of WEEE
gas discharge lamps
LCDs (together with their casing where appropriate) of a surface greater than 100 square centimetres and all those back-lighted with gas discharge lamps
external electric cables
components containing refractory ceramic fibres as described in Commission Directive 97/69/EC of 5 December 1997
components containing radioactive substances with the exception of components that are below the exemption thresholds set in Article 3 of and Annex I to Council Directive 96/29/Euratom
electrolyte capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume). These substances, mixtures and components shall be disposed of or recovered in compliance with the WFD.
2. The following components of WEEE that is separately collected have to be treated as indicated:
CRT: the fluorescent coating has to be removed
equipment containing gases that are ozone depleting or have a global warming potential (GWP) above 15, such as those contained in foams and refrigeration circuits: the gases must be properly extracted and properly treated. Ozone-depleting gases must be treated in accordance with Regulation (EC) No 1005/2009,
gas discharge lamps: the mercury must be removed.

The WEEE Directive does not specifically provide standards for the treatment of WEEE beyond the preceding lists. However, it does provide (Article 9) that MS must ensure that any establishment or undertaking carrying out WEEE treatment operations obtains a permit from the competent authority in compliance with Article 23 of the WFD.

This means that the permit shall specify at least the following:

- (a) the types and quantities of waste that may be treated;
- (b) for each type of operation permitted, the technical and any other requirements relevant to the site concerned;
- (c) the safety and precautionary measures to be taken;
- (d) the method to be used for each type of operation;
- (e) such monitoring and control operations as may be necessary; and
- (f) such closure and after-care provisions as may be necessary.

MS shall also ensure that the permit includes all conditions that are necessary for the compliance with the requirements of Article 8 (2), (3) and (5) and for the achievement of the recovery targets set out in Article 11 of the WEEE Directive.

Chapter 4: Identification and analysis of policy options

The present chapter aims to analyse policy options that would be potentially pertinent to prove that treatment of WEEE legally exported out of the EU took place in conditions that are equivalent to the requirements of the WEEE Directive, pursuant to Article 10(2) and (3) of said Directive.

The chapter thus:

- Identifies potential policy options and provides a shortlist of options to be thoroughly analysed; and
- Assesses each shortlisted option, highlighting the main differences between each option and analysing their respective strengths, weaknesses, opportunities and threats (SWOT analysis), to serve as a basis for recommendations.

4.1 Determination of potential policy options

4.1.1 Approach

The tender specifications listed the following options, which are analysed under section 4.2 below:

- Ex-post audit report on compliance with the requirements as regards the specific waste shipment, carried out by a person or organisation authorised by the respective MS;
- Compliance with the WEEELABEX (WEEE LABEL of EXcellence) standard on "Treatment of WEEE";
- Compliance with R2, RIOS, or e-Stewards standards; and
- Compliance with the relevant European standards for the treatment of WEEE.

Additional policy options were identified through:

- Desk-based research on existing national and international programmes, standards, guidelines and legislation that could be of relevance when identifying potential options for 'equivalent conditions' of treatment of WEEE outside the EU;
- Literature review regarding each identified programme, standard, guidelines or legislation; and

- Expert and stakeholder consultation (in the form of individual interviews), at the EU and international levels. A list of consulted experts and stakeholders is available in the Annex.

For all additional options identified, the project team carried out a rapid analysis of the relevance of each option, in terms notably of their scope, interest and implementation, to determine the options to be retained for further analysis (shortlist) and those to be discarded as not being relevant for the purpose of the study. Reasons for discarding options are provided below.

4.1.2 Identified options

Based on the approach described in the previous section and the tender specifications, the project team identified thirteen options as potentially relevant for further analysis:

- Ex-post audit report on compliance (Certification of compliance with the requirements of Directive 2012/19/EU by an independent verifier following a site inspection);
- Compliance with WEEELABEX:2011 standard on treatment of WEEE;
- Compliance with "Responsible Recycling" (R2) and "Recycling Industry Operating Standard" (RIOS) standards (R2/RIOS standards);
- Compliance with e-Stewards standard for "Responsible Recycling and Reuse of Electronic Equipment";
- Compliance with European standards on treatment of WEEE ;
- Compliance with equivalent legislation in non-EU countries;
- Compliance with Australian/New Zealand standard AS/NZS 5377:2013 on "Collection, storage, transport and treatment of end-of-life electrical and electronic equipment" ;
- Compliance with Publicly Available Specification PAS 141: 2011 on reuse of used and waste EEE (UEEE and WEEE re-use standard, UK);
- Compliance with Canadian Electronics Reuse and Refurbishing Standard (ERRS);
- Compliance with Canadian Recycler Qualification Program (RQP);
- Compliance with RAL Quality Assurance for the Demanufacture of Refrigeration Equipment Containing CFCs (German certification scheme);
- Compliance with eWASA Technical Guidelines on Recycling of Electrical and Electronic Equipment (South Africa); and
- Compliance with PACE guideline on environmentally sound material recovery/ recycling of end-of-life computing equipment

Review of these options has led to discarding some of them, while retaining others.

4.1.3 Discarded options

► Compliance with equivalent legislation in non-EU countries

The project team considered whether legislation in non-EU countries could be considered as guaranteeing equivalent conditions for the treatment of WEEE as those imposed under the WEEE Directive.

Most of the identified non-EU legislations come from OECD countries, although a few were from non-OECD countries such as China. Examples of reviewed legislation (non-exhaustive list) include:

- State Mandatory Electronics Recovery Programs (USA): there are currently 25 states with applicable WEEE legislation, but no consensus on a federal approach;
- Canadian provincial WEEE legislations: there is no national WEEE law in Canada, but in June 2004 the Canadian Council of Ministers of Environment, a body made up of ministers from each province and territory, endorsed a series of extended producer responsibility principles to help the provinces create uniform and effective WEEE regulations; certain provinces have adopted such legislation (e.g., Alberta, British Columbia, Nova Scotia, Ontario, Saskatchewan);
- South Korean amended Act on the Promotion of Saving and Recycling Resources. Effective: establishes the EPR System that applies to a specified list of products (including electronic products, batteries and fluorescent bulbs) and packaging materials. Under the EPR System, producers and importers must pay for the mandatory recycling of their products;
- Specified Home Appliances Recycling Law (Japan): under this law, recycling is mandatory for air conditioners, tube television sets, refrigerators, washing machine, and since 2008 LCD/plasma television sets and clothing dryers;
- Taiwan Waste Disposal Act (1979, amended in 1997): it requires recycling and resource recovery for selected municipal solid waste, or regulated recyclable wastes (RRW); the Environmental Protection Administration of Taiwan (EPAT) then established a Recycling Program, and all RRW, including WEEE, must be recycled in accordance with EPAT standards (issued in 2002 and revised in 2007); and
- Chinese legislation: Pollution Control Management Method for Electronic Information Products and Regulation on the Administration of the Recovery and Disposal of Waste Electrical and Electronic Products.

The review of identified and potentially relevant legislations, such as those mentioned above, has led to the exclusion of the option of equivalent legislation in non-EU countries for a number of reasons listed below:

- Not all WEEE covered by EU legislation are necessarily covered in the legislation in non-EU countries (some cover for instance only electronic waste, others only home appliances, etc.);
 - Federal States may lack harmonised regulations (e.g. USA., Canada);
 - Legislation may be complex or difficult to understand: the adopted legislation is not always stand-alone legislation but can be included in various legal texts;
 - In case of a revision of the WEEE Directive or other EU legislation concerning the waste treatment requirements, the identified pieces of legislation in non-EU countries would not necessarily correspond to the revised version. In addition, amending a law can be quite cumbersome; and
 - The evaluation of legislation in non-EU countries in order to assess the equivalency of the treatment conditions may be regarded as an action interfering with matters under national jurisdiction. It is assumed that the treatment facility to which WEEE is exported is authorised to operate under the national legislation or national procedures of the country where the facility is established. The audit of the compliance of facilities with the terms of their authorisation is under the national jurisdiction.
 - Finally, 'mutual recognition' of non-EU legislation would require a thorough review of all foreign legislations to ensure there is no distortion of trade between countries (for instance, if a country with equivalent WEEE treatment conditions is inopportunately left out) and that the requirements are strictly equivalent to those of the WEEE Directive.
- ▶ **Compliance with guidelines with a limited material or geographical scope and potential ineffective application**

The project team has identified guidelines related to the treatment of WEEE. However, they were considered as not being pertinent in the framework of this study because of their narrow scope and/or limited geographical area, but also because of their potential non- or ineffective application that may result from a lack of standard and/or a lack of an (internationally) acknowledged process to prove compliance with the guidelines.

▶ **eWASA Technical Guidelines on Recycling of Electrical and Electronic Equipment (South Africa)**

The e-Waste Association of South Africa (eWASA) is an industry association, non-profit organisation set up in 2008 to manage the establishment of a sustainable environmentally sound e-waste management system for South Africa.

The technical guidelines are part of the recycling contract on environmentally-friendly treatment of waste electrical and electronic appliances concluded between eWASA and a recycling company (section A.1.3 of the guidelines). Compliance with the requirements included in these technical regulations is assessed by the eWASA Technical Control Committee via a bi-annual auditing process (section A.1.4 of the guidelines). However, the guidelines do not include any

information on how the eWASA Technical Control Committee is set up or the way in which it functions. Additional research in that regard was unsuccessful.³³

Consequently, and although the eWASA technical guidelines could *prima facie* be considered as pertinent, its geographical limitation and the lack of an internationally acknowledged process (including a lack of transparency regarding the Technical Control Committee) to prove compliance by the facility with the guidelines entail that it is not relevant for WEEE exported out of the EU.

▶ **PACE Guideline on Environmentally Sound Material Recovery/Recycling of End-of-Life Computing Equipment**

This guideline was developed by the Partnership for Action on Computing Equipment (PACE)³⁴. It covers only computing equipment (computers and peripherals, such as central processing units, desktop, laptop, monitors using CRT and LCD flat screen technology, keyboards and mice, printers and scanners). Its scope is therefore much narrower than that of the WEEE Directive.

For this reason, and because of the lack of a process/mechanism to prove compliance with the guidelines, the PACE guideline is considered as not being sufficiently pertinent under the present study and is therefore excluded from the scope of the thorough analysis that is performed in subsequent sections.

▶ **Compliance with standards with a limited material or geographical scope**

The project team has identified additional standards applicable to WEEE. However, some were considered as not being pertinent in the framework of this study because of their narrow scope and/or limited geographical area.

▶ **PAS 141: 2011 on reuse of used and waste EEE (UK)**

PAS 141: 2011 is a process management specification for the re-use of UEEE and WEEE. It was developed by industry experts from manufacturers of new appliances and reuse organisations. Although it was approved in 2011, the launch of the PAS 141 Certification Scheme took place in February 2013. Certification Bodies (CB) are accredited by the UK national accreditation body, UKAS, as are auditors who carry out assessments. The Technical Advisory Committee oversees the on-going operation of this scheme, and provides technical advice, strategic direction and guidance.³⁵ The PAS 141:2011 standard has been published by the British Standard Institute (BSI).³⁶

The standard includes specifications on the handling, tracking, segregation, storage, and protection of electronic equipment and components, as well as specifications on how to prepare

³³ eWASA's website does not include any information in that regard. The Technical Control Committee is mentioned only in the guidelines.

³⁴ The guideline is available at archive.basel.int/industry/compartnership/docdevpart/ppg21DraftGuidelineFinal-2011-03-15.pdf

³⁵ An organisation chart of how the PAS 141 Certification Scheme works is available here: www.wrap.org.uk/sites/files/wrap/How%20the%20scheme%20works.pdf

³⁶ PAS 141:2011 is available for a fee at shop.bsigroup.com/en/ProductDetail/?pid=00000000030245346

for re-use. Some interviewed stakeholders highlighted that PAS 141:2011 test the functionality of UEEE and WEEE for re-use, but does not assess if some components in the product have been changed when refurbished.

The scope of this standard was considered too narrow for it to be assessed in the framework of this study for the following reasons:

- PAS 141:2011 was developed to cover equipment found in the home, not professional equipment, and as such its scope is narrower than the WEEE Directive;
- PAS 141:2011 only covers re-use of WEEE, which is only a small aspect of the WEEE Directive, but does not address other aspects related to the treatment of WEEE.

▷ **Canadian Electronics Re-use and Refurbishing Standard (ERRS)**

The stated purpose of the Canadian Electronics Re-use and Refurbishing Standard (ERRS) is to “foster responsible environmental, safety and social management practices for the re-use and refurbishing of electronics, providing assurance that products re-used through an organisation recognised under this program are handled in a responsible manner, thus facilitating the extended use of electronic products before disposition into an end-of-life recycling program.”³⁷

The scope of ERRS was considered too narrow for the purpose of this study as it only covers re-use of WEEE and refurbishing, but does not address other aspects related to the treatment of WEEE. Eligible organisations thus include only organisations performing re-use and/or refurbishing, but not recycling organisations.

▷ **German certification scheme: RAL**

The RAL Quality Assurance for the Demanufacture of Refrigeration Equipment Containing CFCs (*Gütegemeinschaft Rückproduktion von Kühlgeräten e.V.*) is a worldwide private certification for companies that manage waste refrigeration equipment containing CFCs.³⁸

The scope of RAL was considered too narrow for it to be assessed in the framework of this study for the following reasons:

- The RAL certification focuses on refrigeration equipment containing CFCs, and as such is much narrower than the scope of the WEEE Directive; and
- The RAL certification is reportedly equivalent to the requirements of the European standard EN 50574:2012 developed by CENELEC, which covers the “Collection, logistics & treatment requirements for end-of-life household appliances containing volatile fluorocarbons or volatile hydrocarbons.” As the European standards policy option is reviewed and analysed in the following sections, it would be redundant also to analyse the RAL certification.

³⁷ EPEAT and the Green Electronics Council, Comparison of selected End-of-Life Electronics Processing Programs with the Requirements in the IEEE 1680 series of standards for end-of-life electronics processing, 2012, available at arcadiansolutions.com/wp-content/uploads/R008-EOLE-Comparison-2012-12-21.pdf

³⁸ Further information is available at www.ral-online.org/html_engl/verantwortung.html

4.1.4 Retained options

► **Ex-post audit (Certification of compliance with the requirements of Directive 2012/19/EU by an independent verifier following a site inspection)**

Under this option, an ex-post audit would be conducted and a report submitted, to prove compliance with the treatment requirements of the WEEE Directive.

This option can be used in order to demonstrate compliance with the requirements of the Directive for each specific shipment of WEEE, which will serve to determine whether a particular waste shipment can count towards meeting the recovery targets set forth in Article 11 and the corresponding annex to the WEEE Directive.

The conformity assessment would have to be performed on the basis of a site inspection by an independent verifier with appropriate qualifications.

NOTE: The study refers to an ex-post audit. However, this option is equivalent to any option including compliance checking through a site inspection by an independent verifier: either the inspection is conducted before the actual shipment of WEEE (ex-ante) or after the shipment (ex-post). Ex-ante audits have the advantage that the certification of compliance can be available to the competent authority of dispatch before the actual shipment of WEEE while ex-post audits can only confirm *a posteriori* that a third-country facility receiving WEEE for treatment meets the requirements set under the WEEE Directive. In case of the ex-post audit, compliance with the requirements would have to be demonstrated for every shipment of WEEE in order to enable a proper determination of the quantities that can count towards meeting the recovery targets set forth in Article 11 and Annex V to the Directive 2012/19/EU.

► **Compliance with the WEEELABEX:2011 standard on “Treatment of WEEE”**

WEEELABEX was a four-year project run by the WEEE Forum from 1 January 2009 to 31 December 2012, in co-operation with stakeholders from the producers’ community and processing industry, and co-financed by the EU LIFE programme (LIFE07 ENV/B/000041). The WEEE Forum, set up in the early 2000s, is a European non-profit association representing 39 WEEE compliance schemes; all of them run on behalf of producers³⁹. The WEEELABEX project aimed at (i) developing a harmonised set of standards for EU countries, reflecting the legislative requirements of the WEEE Directive, and (ii) developing a set of rules and monitoring procedures to guarantee harmonised conformity verification.

The WEEELABEX standards were introduced in April 2011, which was followed by the creation of an official WEEELABEX Organisation to help implement these standards across Europe. The set of WEEELABEX standards approved include a standard on collection, a standard on logistics and

³⁹ The 39 non-profit organisations are based in Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Italy, Ireland, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

a standard on treatment of WEEE.⁴⁰The WEEELABEX Organisation mainly trains auditors in verifying conformity with the WEEELABEX standards, and promotes the adoption of these standards by EU operators and MS. So far, twenty-six organisations have joined the WEEELABEX organisation, while all thirty-nine EU producer compliance schemes of the WEEE Forum have voluntarily committed to implementing the standards in their contracts with suppliers.

The organisation chart below shows how the WEEELABEX Organisation relates to the WEEE Forum and CENELEC.

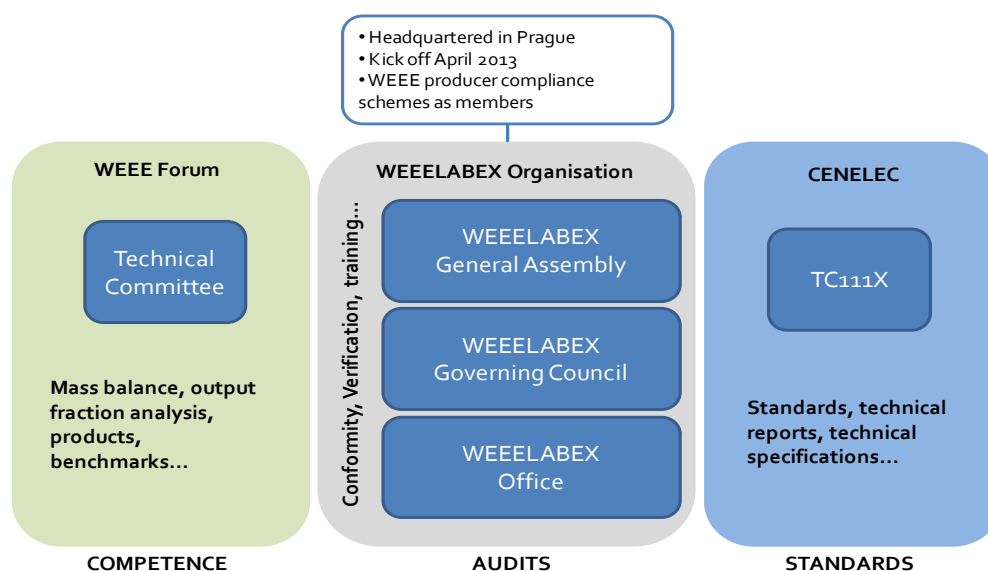


Figure 8: WEEELABEX organisation chart⁴¹

The standards and guidance developed within this project remain voluntary and do not replace legal obligations.

The geographical scope of the WEEELABEX standards consists of EU MS and some EFTA MS (i.e. Iceland, Liechtenstein, Norway and Switzerland).

► **Compliance with “Responsible Recycling” (R2) and “Recycling Industry Operating Standard” (RIOS) standards (R2/RIOS standards)**

The R2:2013 standard sets “responsible recycling” (“R2”) practices for use in accredited certification programmes that assess electronics (solely IT and audio equipment) recyclers’ environmental, safety, and security practices. Recyclers include but need not be limited to electronics resellers, refurbishers, recyclers, remanufacturers, asset recoverers, and brokers, as well as leasing companies that engage in these activities. The certification demonstrates to customers that electronics equipment is being recycled with the highest standards for environmental protection, worker health and safety, data privacy and facility security.

R2 was developed by a broad-based cooperative of electronics recycling stakeholders that included the US Environmental Protection Agency (US EPA), state governments, manufacturers,

⁴⁰ The documents of the WEEELABEX standards can be downloaded from the WEEE Forum website (<http://www.weee-forum.org/news/weeelabex-standards-for-sustainable-weee-management>)

⁴¹ Chart inspired by the WEEELABEX organisation chart of the WEEE Forum website.

recyclers, trade groups and non-governmental organisations. The R2 Governing Council, an independent governing body made up of representatives from all stakeholder groups, is responsible for future updates of the standard (all of the work of the Governing Council is open to public review and comment). R2 Solutions (R2S) is the owner of the R2 Standard; it is a non-profit organisation established to administer and promote the R2 standard. The R2 Technical Advisory Committee is a voluntary group of concerned stakeholders appointed by the R2S Board and charged with the responsibility for maintaining the integrity and effectiveness of the R2 standard and related guidance.

The R2 Practices for Use in Accredited Certification Programs for Electronics Recyclers is an open source document which can be used by any accredited electronics recycling certification program (R2 Solutions 2013). There are currently multiple programs using the R2 Practices document, which has no owner.

An R2 electronics recycler is to be certified to one (Recycling Industry Operating Standard (RIOS)) or more certifications (a combination of ISO 14001 and OHSAS 18001) to fulfil their EHSMs requirement. R2S has notably approved RIOS for this purpose, although a combination of ISO 14001 and OHSAS 18001 could also be used. RIOS is the recycling industry's standard for quality, environmental, and health & safety management systems. RIOS provides a framework for scrap recyclers of all sizes and scrap materials, including electronic scrap, to improve their quality, environmental, health and safety performance and their bottom line. RIOS certification has been produced by the Institute of Scrap recycling Industries (ISRI), and is available from independent third-party CBs accredited by the ANSI-ASQ National Accreditation Board (ANAB).⁴²

► **Compliance with e-Stewards standard for "Responsible Recycling and Reuse of Electronic Equipment"**

The e-Stewards Initiative is a project of the Basel Action Network (BAN), a non-profit charitable organisation based in Seattle, USA. BAN was founded in 1997 and is named after the Basel Convention.

In late 2008, BAN launched the e-Stewards Certification program, which was published on 1 July 2009, after revision by the e-Stewards founders and leaders in many sectors. It is an IAF (International Accreditation Forum) accredited standard. Those who are eligible to become e-Stewards certified are electronics recyclers (i.e. those who recycle IT and audio equipment only), refurbishers, asset managers, refiners, and electronics processors. Brokers, transportation companies, or those solely engaged in collection of WEEE are out of scope.

The first version of e-Stewards standard is still in force, but version 2 is due for 1 September 2013.

► **Compliance with European standards on treatment of WEEE**

In application of Article 8(5) of the WEEE Directive, the European Commission mandated the European Standardisation Organisations (ESO), namely CENELEC, CEN and ETSI, to develop (a) standard(s) for the treatment (including recovery, recycling and preparing for re-use) of WEEE.⁴³

⁴² See ISRI website: www.isri.org

⁴³ EC DG ENV, Mandate to the European standardisation organisations for standardisation in the field of Waste Electrical and Electronic Equipment (Directive 2012/19/EU (WEEE)), 24 January 2013, Ref. M/518 EN.

These standards are being developed by CENELEC, and more particular its committee CLC/TC111X (Environment) Working Group 6, which is the main technical body for producing standards under the Commission's mandate.

The 33 current CENELEC members are national organisations entrusted with electrotechnical standardisation, recognised both at national and European level as being able to represent all standardisation interests in their country. The members of the working group are producers, producer compliance schemes, WEEE recyclers, metal recyclers, conformity assessment bodies and other specialists in fields of chemistry and plastics as well as specialist experts on specific categories of EEE. CENELEC CLC/TC 111X Work programme currently includes the development of a series of standards for the treatment of WEEE: EN 50625 series "Collection, logistics & Treatment requirements for WEEE".⁴⁴

- EN 50625-1: Collection, logistics & treatment requirements for WEEE - Part 1: General treatment requirements;
- EN 50625-2-1: Collection, logistics & treatment requirements for WEEE -- Part 2-1: Treatment requirements for lamps;
- EN 50625-2-2: Collection, logistics & treatment requirements for WEEE -- Part 2-2: Treatment requirements for WEEE containing CRTs and flat panel displays;
- EN 50625-2-3: Collection, logistics & treatment requirements for WEEE -- Part 2-3: Treatment requirements for WEEE containing volatile fluorocarbons or volatile hydrocarbons; and
- EN 50625-2-4: Collection, logistics & treatment requirements for WEEE -- Part 2-4: Treatment requirements for photovoltaic panels.

Other European standards had been prepared and developed by CENELEC to fulfil the requirements of the original WEEE Directive (2002/96/EC), such as:

- EN 50574:2012 "Collection, logistics & treatment requirements for end-of-life household appliances containing volatile fluorocarbons or volatile hydrocarbons" (CENELEC 2012).

The standard only applies to WEEE household appliances that use heat-transfer media other than water e.g. refrigerators, freezers, heat pump tumble dryers, de-humidifiers and portable air conditioners. However, this standard only describes the results to be achieved, it does not specify how they are to be achieved nor does it prescribe the use of any specific technology.

Some Member States already envisage including as a requirement in their national legislation that, in the case of export of WEEE, receiving treatment operators will need to comply with WEEELABEX/European standards. This is reportedly the case in The Netherlands.⁴⁵

⁴⁴ Information provided by the Commission – DG ENV.

⁴⁵ See European Electronics Recyclers Association (EERA) Regional Thought Meeting Bucharest 27 June 2013, presentation by Norbert Zonneveld, available at www.eera-recyclers.com/news/invitation-eera-regional-thought-meeting-bucharest-27-june-2013

► **Compliance with the Canadian Recycler Qualification Program (RQP)**

Following this preliminary screening of options, the project team was well aware that RQP might have some shortcomings, given the heterogeneity in the related legislation between Canadian provinces. The heterogeneity allows for some significant differences in WEEE material scope between provinces, for example. Nonetheless, RQP was deemed to be interesting to maintain (at least for analysis purposes) as it is an industry-led standard, and thus may provide some pertinent insight.

In 2003, Electronics Products Stewardship Canada (EPSC) was founded by two industry-led organisations, Information Technology Association of Canada (ITAC) and Electro-Federation Canada (EFC). EPSC is a not-for profit industry-led organisation created to design, promote and implement sustainable solutions for the recycling of end-of-life electronics (EOLE).

In 2004, EPSC developed the Electronics Recycling Standard (ERS) which was intended to ensure that EOLE collected through the provincial stewardship programmes was handled in a safe, environmentally sound and responsible manner. The ERS was created out of necessity as the Canadian Provinces were releasing EPR regulations. These regulations did not necessarily include provisions to ensure the safe and environmentally sound recycling of these materials. Nonetheless, the ERS provides the base minimum requirements for electronics recyclers to address where the environmental, health and safety regulatory requirements were non-existent, insufficient or not enforced to ensure the adequate control and proper management of this material.

The ERS has been revised three times, with its most recent version being incorporated into a broader programme, the Recycler Qualification Programme (RQP). The RQP is managed by the Recycling Qualification Office (RQO), which operates under the Electronic Products Recycling Association (EPRA), a national non-profit entity created by Canada's electronic industry in order to improve the efficiency and effectiveness of Canada's industry-led and regulated electronics stewardship programmes. EPRA's Board of Directors includes senior executives from Hewlett-Packard, Sony, Toshiba, Samsung, Best Buy, London Drugs, Staples, Retail Council of Canada, Compugen and CDW. EPRA is a member of EPSC.

Primary recyclers who are interested in processing material on behalf of the provincial programmes are required to be audited by the RQO and verified to be operating in conformance with the requirements of the RQP.

The RQP is an eight-part publication that defines the Electronic Product Stewardship Programmes' minimum requirements and approach to auditing and approving EOLE. The first part of the RQP is where ERS is incorporated so that recyclers can ensure that EOLE are handled in an environmentally sound and socially acceptable manner that protects the environment and safeguards worker health and safety.

► **Compliance with Australian/New Zealand standard AS/NZS 5377:2013 on “Collection, storage, transport and treatment of end-of-life electrical and electronic equipment”**

Australian/New Zealand standard (AS/NZS 5377, published in 2013) on “Collection, storage, transport and treatment of end-of-life electrical and electronic equipment” outlines minimum requirements for the safe and environmentally sound handling of e-waste. It is intended for the

collection, storage, transport and treatment of EoL EEE. It sets out the principles and minimum requirements for the safe and environmentally sound recovery of household appliances, computers, telecommunications equipment, televisions, power tools, lighting products and other forms of EEE. According to Standards Australia (the Australian non-governmental Standards organisation), the new standard will help ensure that 90 % of all e-waste collected from mid-2014 will be recycled.

The development of the standard was an Australian-led initiative by Standards Australia in order to support the 2011 Australian Product Stewardship Scheme, and provided an opportunity for New Zealand (NZ) to work with Australia in the realm of electronics recycling. The standard was inspired by the WEEE Directive requirements and also by the UK's Guidance on Best Available Treatment Recovery and Recycling Techniques (BATRRRT), WRAP e-waste guidelines ('working together for a world without waste programme', a governmentally funded programme in the UK) and the New Zealand WEEE guidelines.

The standard was developed in collaboration between NZ and Australian stakeholders. NZ had five representatives help develop the Standard from the Central Government, Community Recyclers Network (NGO), Scrap Metal Association, Local Government, eDay Trust (Academia). There were 19 representatives from Australia, from the national, state and local government, electronic manufacturers, accreditation bodies, workplace health & safety representatives, NGOs, and those from the recycling/waste industry.

The standard also contains guidelines about worker training for the handling of e-waste, and other elements such as signage.

4.2 Comparative analysis of the retained options

4.2.1 Approach

In order to determine and recommend the best suited option(s) to ensure that treatment of WEEE exported outside the EU is carried out under equivalent conditions as within the EU, the approach adopted by the project team was to select a number of criteria deemed the most relevant for reaching the objectives of the study, against which all shortlisted policy options were assessed.

An overview of each option has been provided in the previous sections. The analysis of these options against the selected criteria enabled the project team to compare each option and assess their pertinence and relevance to prove that exported WEEE was treated under equivalent conditions (as they would have been in the EU) in the country of destination. This resulted in a SWOT analysis, whereby the project team identified the strengths, weaknesses, opportunities and threats related to each policy option. This analysis was based on literature review and expert/stakeholder consultation (individual interviews).⁴⁶

The selected criteria are listed and explained in the following paragraphs:

⁴⁶ The list of interviewed experts and stakeholders is available in the Annex.

► **Evaluation of the implementation status of the policy option including its added value (e.g., efficient compliance requirements or burdensome)**

The rationale behind this criterion is to determine the level of practical efficacy of the policy option, i.e. whether the option is already being implemented in practice or whether it remains to be tested. This also entails to determine whether the policy option is currently applicable or whether implementation will be possible only at a later time.

► **Geographical scope**

This criterion aims to determine whether the policy option is applicable only in a limited geographical area or whether it has a broad geographical scope. The policy option may already be applied in various countries (OECD or non-OECD countries) or may have the potential to apply to such countries.

► **Export control (OECD/non-OECD countries)**

The international shipment of waste is subject to certain requirements, as described in Chapter 3. These requirements vary depending on whether the destination country is an OECD or non-OECD country, and on the type of waste to be exported (hazardous vs. non-hazardous).

As such, whether the policy option includes requirements for, or ensures, export control is an additional criterion to supplement the 'statement of compliance' that constitutes the common wording of each policy option, and would ensure practical compliance with the requirements of the WSR and Regulation (EC) No 1418/2007. However, it should be clear that this is a criterion to be taken into consideration insofar as it provides additional information, but it may not be used as an exclusion criterion to set aside policy options that would not have any relevant provisions. This is because the requirements for the shipments of waste must be followed in any case in order to have legal shipments of WEEE and it is only these cases of legal shipments of WEEE that should be considered for any of the policy options identified.

► **Traceability of exported WEEE**

This criterion looks at whether the policy option includes provisions to ensure traceability of exported WEEE, from the time it leaves EU territory up to the moment where it is treated in the country of destination. Traceability of WEEE ensures accuracy of collection target rates. Traceability is required under Article 11(4) of the WEEE Directive, and is therefore necessary to ensure that exported WEEE count towards the fulfilment of the recovery targets set by said Directive. Traceability must notably be ensured through appropriate documentation and keeping of records of the WEEE. Various traceability techniques can be used. New RFID traceability techniques, for example, prove to decrease carbon emissions and increase recovery target rates as exemplified in WEEE collection pilot programmes (European Commission DG Environment 2013).

► **Material scope**

To ensure that exported WEEE is treated in conditions that are equivalent to the requirements of the WEEE Directive, it is necessary that the policy option covers all WEEE, i.e. that their scope and definition of WEEE be as broad as that under the Directive. This implies to analyse whether the definitions of WEEE and other relevant terms (EEE, treatment, etc.) found in the applicable

EU legislation are equivalent in the policy option, and whether all EEE and materials listed in the WEEE Directive are encompassed (see Figure 7).

► **Stages of WEEE treatment covered by the policy option**

For the purposes of this study it is considered that the recovery value chain of WEEE is composed of three steps: collection, preparation for material recovery (largely analogue to the treatment of WEEE as in Article 8 and Annexes VII and VIII of the WEEE Directive and also mentioned as “treatment” in this study), and material recovery (recovery of materials coming from WEEE). Preparation for material recovery/treatment includes activities such as disassembly, shredding, and mechanical separation of WEEE; its aim is to allocate each material in a WEEE device to a fraction from which it can be recycled in subsequent process.

The recovery of materials coming from WEEE is done through a metallurgical process, such as smelting and refining in smelters to recycle materials from components and fractions (printed circuit boards for instance) produced in the preparation for material recovery step. The recovery of material coming from WEEE appears to go beyond the scope of the recycling targets addressed in Article 11(2) of the new WEEE Directive, which however may be revised based on the specific mandate given in Article 11(6).

This criterion aims to determine what provisions each policy option includes for the treatment of WEEE and, in particular, whether the option provides only for specific operations or whether it includes provisions going beyond the requirements of the Directive described in Article 8 and Annexes VII and VIII to the new WEEE Directive. Any information on provisions going beyond the requirements of the Directive is given in this study only as additional information but is not used to set aside policy options that would not have any relevant provisions.

► **Establishment of an Environmental Management System (EMS)**

Article 8(6) of the WEEE Directive requires that MS encourage establishments or undertakings which carry out treatment operations to introduce environmentally sound management (ESM) of waste through, as through certified environmental management systems (EMS).

This criterion permits to give information on whether a specific policy option provides for the application of EMS for the WEEE treatment operations, through for instance imposing that a treatment facility be certified ISO 14001 (environmental management system standard), and thus complies with the requirements under EU legislation. It also permits to determine whether the policy option imposes specific obligations for environmental management systems, workers’ health and safety certifications (EHSMS/EH&S), such as requiring certification under the OHSAS 18001 standard, or both.

► **Treatment requirements**

▷ **Minimum requirements for proper treatment**

Chapter 3 highlighted that, pursuant to Article 8(2) of WEEE Directive 2012/19/EU, collected WEEE shall undergo proper treatment, which includes, as a minimum, the removal of all fluids and a selective treatment in accordance with Annex VII. Each policy option was assessed against the criterion of minimum requirements for proper treatment, based on the definition of

“removal” contained in Article 3(1)(l) of the WEEE Directive,⁴⁷ and on the specifications of its Annex VII (see Table 5 in Chapter 3).

► **Use of Best Available Techniques (BAT) and technical requirements for treatment facilities**

Pursuant to Article 8(3) of the WEEE Directive, producers or third parties acting on their behalf shall set up systems to provide for the recovery of WEEE using BAT. The treatment facilities shall comply with Annex VIII technical requirements (these requirements are listed in Table 4).

The analysis of the various policy options therefore aims to determine whether the use of BAT is required and the technical requirements for treatment facilities are fulfilled.

This criterion is used in order to give information on what extend the treatment conditions applied under each policy option can be considered equivalent to these of the Directive. It is assumed that the treatment facility to which WEEE is exported is authorised to operate under the national legislation or national procedures of the country where the facility is established. The role of this criterion is not to evaluate the terms of the national permit but to assess to what extent the policy option itself provides for treatment requirements that can be considered as equivalent to those laid down in the new WEEE Directive.

► **Conformity assessment**

A conformity assessment is indispensable to determine whether exported WEEE has been treated in conditions that are equivalent to the requirements of WEEE Directive 2012/19/EU.

The nature of the conformity assessment may vary as it may be:⁴⁸

- A first-party conformity assessment (i.e. self-assessment): conformity assessment that is performed by the person or organisation that provides the object or service (e.g., EoL operator);
- A second-party conformity assessment: conformity assessment that is performed by a person or organisation that has a user interest in the object or service (e.g., a producer contracting an EoL operator); and
- A third-party conformity assessment: conformity assessment performed by a person or body that is independent of the person or organisation that provides the object or service and of user interests in that object or service (e.g. certification).

In the case of first- and second-party conformity assessments, conflicts of interest may arise. Third-party conformity assessment is therefore the most reliable way to ensure the highest independence in conducting the conformity audit.

⁴⁷ “Removal” means manual, mechanical, chemical or metallurgic handling with the result that hazardous substances, mixtures and components are contained in an identifiable stream or are an identifiable part of a stream within the treatment process. a substance, mixture or component is identifiable if it can be monitored to verify environmentally safe treatment.”

⁴⁸ ISO/IEC 17000 standard on conformity assessment – vocabulary and general principles (Step Initiative 2012)

The criterion therefore serves, for each policy option, to determine the nature of the conformity assessment. In the case of a third-party conformity assessment, the analysis distinguishes and/or highlights whether the option falls under one or more of the following (Arcadian Solutions 2012):⁴⁹

- Certification: it is the attestation that an organisation complies with the requirements of specific standards, and is delivered following an evaluation (often an audit) by a CB, which is itself accredited by an accreditation body (e.g. IAF); and
- Verification: it is usually managed by industry or non-profit organisations and use a third-party unaccredited verification process.

► Professional capacity of auditors

This criterion means to analyse two main aspects regarding the objectivity and efficacy of audits carried out in the framework of the conformity assessment, namely:

- technical expertise: whether auditors have sufficient training and knowledge of treatment requirements under the WEEE Directive to ensure the audit is carried out in a sound and thorough manner;
- whether their independence is guaranteed through notably the avoidance of conflict of interests.

This criterion is important to ensure the highest objectivity of the audit performed and, hence, the most precise evaluation of the 'equivalent conditions' of treatment under the WEEE Directive.

► Costs

The implementation of a policy option to prove equivalent conditions for the treatment of exported WEEE will necessarily be a source of additional costs. These costs may include (depending on the policy option being considered):

- Internal preparation costs (e.g., training);
- Costs related to the conduct of external audits (e.g. fee to CB); and
- Marketing and licensing fee (e.g., in the case of use of a certification logo).

Costs may also vary depending on the size of the facility. For instance, Small and Medium Enterprises, which have less financial and human resources as well as less opportunities for economy of scale, may have to support relatively higher costs than large enterprises, especially if the policy options advocates the implementation of specific means of action rather than sets key objectives, achievable through flexible means.

The application of the 'costs' criterion enabled the project team to determine whether costs related to the implementation of the policy option constitute a potential burden that may represent an obstacle to the practical implementation of the option.

⁴⁹ See EPEAT and Green Electronics Council, Understanding the Certification Process for End-of-Life Electronics, 2012, available at <http://arcadiansolutions.com/wp-content/uploads/R007-eole-certification-process-2012-12-21.pdf>

4.2.2 Analysis of the policy options

Each of the retained policy options was analysed using the selected criteria defined in the previous section. The table below provides a comparative overview of each option, and all related relevant information is provided in the following sections.

Table 6: Comparison of policy options

Main criteria	Policy option	Implementation status	Geographical scope	Export control (OECD/non-OECD countries) (For information)	Traceability	Material Scope		Treatment stages		Environmental management system	Treatment requirements		Conformity assessment		Capacity of auditors		Costs	
						WEEE definition	Other definitions (e.g. treatment)	Treatment of WEEE	Treatment of materials coming from WEEE (For information)		Minimum requirements	BAT / Technical requirements for treatment facilities	Verification	Certification	Training	Independence		
	Ex-post audit																	
	WEELABEX																	
	R2/RIOS																	
	e-Stewards																	
	European standards	*		*	*													
	RQP		*			*												
	AS/NZS 5377:2013																	

LEGEND:

- Ambitious interpretation of the requirements of the new WEEE Directive/ High level of requirement / High costs
- Middle-ground interpretation of the requirements of the new WEEE Directive/ Medium level of requirement / Medium costs
- * Least ambitious interpretation of the requirements of the new WEEE Directive as of current status of policy option
- Not applicable / No information

The above summary table is based on and highlights, in a comparative way, the strengths and weaknesses of each of the policy options, providing information concerning certain specific criteria. The analysis of each option provided in the following sections will go a little further and will include a SWOT analysis, in order to identify also opportunities and threats.

4.2.2.1 Ex-post audit (Certification of compliance with the requirements of Directive 2012/19/EU by an independent verifier following a site inspection)⁵⁰

► Implementation status

Carrying out of an ex-post audit through a site inspection and the preparation of an audit report is not related, *per se*, to the implementation of a standard or certification scheme. This entails that such an audit could be immediately implemented based on the overall WEEE Directive requirements for equivalent treatment conditions without having to wait for the coming into force of a set of standards or for treatment facilities to be certified under a standard.

► Geographical scope

An ex-post audit could be conducted in any country where treatment operations for WEEE exported from the EU take place provided that it is a legal shipment of WEEE. However, ex-post audits can only confirm a posteriori that the facilities receiving WEEE for treatment meet the requirements set under the WEEE Directive.

► Export control (OECD / non-OECD countries)

Given that the ex-post audit would be conducted for the specific waste shipment, there would be no overall export control system. The auditor would then have to verify, in the light of the 'statement of compliance' to be provided, that the WSR and Regulation (EC) No 1418/2007 have been applied. However, the audit would take place after the shipment and treatment of WEEE have occurred, and would be based only on documentation review. The falsification of documents may be a risk that cannot be excluded.

► Traceability of exported WEEE

Traceability is a requirement under the WEEE Directive. The auditor therefore would have to review all relevant documentation. However, there would be no requirement that the treatment facility has a general traceability system and, as such, there could be two levels of traceability at

⁵⁰ The study refers to an ex-post audit. However, this option is equivalent to any option including compliance checking through a site inspection by an independent verifier: either the inspection is conducted before the actual shipment of WEEE (ex-ante) or after the shipment (ex-post). Ex-ante audits have the advantage that the certification of compliance can be available to the competent authority of dispatch before the actual shipment of WEEE while ex-post audits can only confirm a posteriori that the facilities receiving WEEE for treatment meet the requirements set under the WEEE Directive. In case of the ex-post audit compliance with the requirements would have to be demonstrated for every shipment of WEEE in order to enable a proper determination of the quantities that can count towards meeting the recovery targets set forth in Article 11 and Annex V to the Directive 2012/19/EU.

foreign treatment facilities: one for WEEE imported from the EU, and one (or the absence of one) for WEEE imported from other countries.

► **Material scope**

The audit's objective is to determine whether treatment of WEEE exported outside of the EU is equivalent to what would have been the case had they been treated within the EU. The evaluation therefore would be based on the requirements of EU legislation and in particular the WEEE Directive. Consequently, the relevant definitions and categories of WEEE listed in the EU legislation would apply. Therefore, all WEEE within the scope of the WEEE Directive would be covered by an ad-hoc audit.

► **Treatment stages**

For this option, there can be no prior differentiation between whether it covers only the treatment of WEEE or both treatment of WEEE and recovery operations of materials coming from WEEE, as there would be no established framework. This type of audit can cover all treatment stages if appropriate.

► **Environmental Management System (EMS)**

The ex-post audit is an evaluation at a given date and site, and therefore cannot guarantee that environmentally sound management of waste is carried out throughout. However, the audit would require the review of evidence showing that requirements of existing and approved guidelines, as regards the environmental sound management of WEEE, are fulfilled.

Evidence that there is no danger to human health and the environment could result from the provisions of operating permits delivered by the foreign countries of destination, provided such permits are required under the national legislation of the country where the facility is established.

► **Treatment requirements**

The auditor would have to determine, when visiting the treatment facility, whether conditions of treatment in place are equivalent to and comply with the minimum requirements for proper treatment specified in Article 8 and Annex VII to the WEEE Directive.

This evaluation therefore would be based on existing EU legislation, but would not be based on specific standards unless, in application of Article 8(5), paragraph 4, the Commission adopts implementing acts laying down minimum quality standards (based in particular on EN standards). Consequently, and in the absence of precise standards, the audit would necessarily carry a part of subjectivity based on the auditor's interpretation of the requirements and of equivalent conditions.

These considerations also apply to BAT and technical requirements for treatment facilities set forth in Annex VIII to the WEEE Directive.

► **Conformity assessment**

Under this policy option, the audit must be carried out by an independent verifier who must be in good standing with the national laws and regulations of the country it operates in. It must

notably be an authorised business according to national legislation where applicable.^{51,52} The conformity assessment therefore could take the form of a verification carried out by a third party, thus ensuring a lesser risk of conflict of interest. However, as previously mentioned, the conformity assessment verification would take place at a given date, with no guarantee that the conditions are permanent throughout the year and with no direct penalties (whatever their nature) incurred by the recycler, i.e. the treatment facility in the foreign country. This is a weakness compared to certification schemes notably, where non-compliance with the certification standard could lead the recycler to lose its certification, and hence clients (when certification is a requirement imposed by their clients).

► Professional capacity of auditors

► Training

In the case of an ex-post audit, the professional capacity and skills of auditors are paramount, as the auditor must have thorough knowledge of the general, legal and technical requirements under EU WEEE legislation. Accredited independent verifiers are expected to have appropriate training. However, it is important that they have specific training on inspections at WEEE treatment facilities..

► Independence

Independence of auditors is essential. In the case of an ex-post audit such as the one contemplated in the policy option, it would be a third-party verification. To demonstrate independence and aptitude, independent verifiers should comply with the requirements for third party inspection bodies of the ISO/IEC 17020 standard, which outlines the requirements for the operation of various bodies performing inspections. As such, who pays the auditor is an important issue as it would necessarily affect his/her level of independence. It is the responsibility of the owner of the treatment facility to select and contract the independent verifier and to cover the relevant cost. The contract between the owner of the treatment facility and the independent verifier must entitle the latter to carry out in an independent way all activities needed to check and report on the compliance of the facility with treatment conditions equivalent to those of Directive 2012/19/EU. Contractual obligations of the independent verifier must not in any way prevent or limit activities of the latter.

⁵¹ Verifiers established in the EU should seek accreditation from a national accreditation body according to Regulation (EC) No. 765/2008.

Verifiers based outside the EU may seek accreditation from either a national accreditation body according to Regulation (EC) No. 765/2008 or from an accreditation body outside the EU that is a signatory to the relevant scope of the mutual recognition arrangement of the *International Laboratory Accreditation Cooperation* (ILAC). A list of such bodies can be found on <http://www.european-accreditation.org/mla-and-bla-signatories#6> and https://www.ilac.org/documents/mra_signatories.pdf

⁵² Art. 11(2) of Regulation (EC) No. 765/2008 foresees that national authorities are to recognise the equivalence of the services delivered by those accreditation bodies which have successfully undergone peer evaluation, and thereby accept the accreditation certificates of those bodies and the attestations issued by the conformity assessment bodies accredited by them.

► **Costs**

Under the contemplated policy option, the statement of compliance with EU legislation must be “combined with an ex-post audit report on compliance with those requirements as regards the specific waste shipped and treated.” The costs incurred by the external audits will vary whether e.g. an audit is required following each such shipment, or whether an annual audit would suffice provided it covers all WEEE treated in a specific facility in a given year.

Internal preparation costs would not be as high as in the case of, for instance of a certification audit, where these costs are often related to the administrative burden (and hence human resources) resulting from implementation of the certification standards (and training requirements these may set forth). In addition, there would be no costs related to marketing and licensing fees.

The actual costs may differ depending on the person or organisation carrying out such an audit, and would depend on each person/organisation’s internal policy (e.g. differing costs depending on the size of the facility).

Table 7: SWOT analysis of Ex-post audit option

Ex-post audit	
STRENGTHS	WEAKNESSES
<p>Could be implemented 'immediately', as it is not subject to the coming into force of a set of standards or certification scheme or for treatment facilities to be certified under a standard.</p> <p>Broad geographical coverage (basically any country, provided the shipment is allowed).</p> <p>All WEEE and all treatment stages are covered, given the ad hoc nature of the audit.</p> <p>Possibility of having third-party conformity assessment.</p>	<p>Based on a case-by-case type of approach (i.e. auditing of the specific waste shipment) – unlikely to ensure a level playing field.</p> <p>No general EMS.</p> <p>No general traceability system required.</p> <p>Lack of specific standards/ guidelines lead to greater subjectivity in the assessment of equivalent conditions by the auditor.</p> <p>No precision as to who would pay the auditor(conflict of interest).</p>
OPPORTUNITIES	THREATS
<p>Introduces flexibility as to where exported WEEE could be treated and the treatment stages covered.</p> <p>Export higher standards for the management and treatment of WEEE to countries where potentially no such standards exist – improvement of conditions at local treatment facilities.</p> <p>Lower costs incurred from certification under a specific standard may potentially attract more treatment facilities (especially SMEs).</p>	<p>As an ex-post audit, it would mostly be based on documentary evidence as regards the shipment of WEEE itself, and hence more subject to potential fraud.</p> <p>Risk of WEEE being sent to treatment facilities where there is no overall management system, and thus there could be different levels of requirement for the same facility.</p> <p>The absence of a general traceability system could lead to various systems existing for the same</p>

	<p>treatment site (EU WEEE/non-EU WEEE).</p> <p>Conformity verification at a given date and site, with no guarantee that the conditions are maintained throughout (e.g., ESM).</p> <p>Potential risk of corruption of the auditor, if paid for instance by the recycler.</p>
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4.2.2.2 **WEEELABEX:2011 standard on "Treatment of WEEE"**

► **Implementation status**

To date, the WEEELABEX Organisation has carried some pilot audits whose aim was to test the 'Conformity Verification' Program. However, no real audit has been yet carried out. On 10-11 July 2013, the first pool of WEEELABEX auditors (about 20 people) were trained, based also on the feedback received from the pilot stage. A one-week follow-up training programme will take place before the end of 2013. According to representatives from the WEEE Forum managing the WEEELABEX initiative, the results of the pilot audits were positive although it is expected that most facilities that will soon be audited will not be able to comply with 100% of the WEEELABEX requirements. In order to encourage operators' participation to this programme, the WEEELABEX Organisation decided that applicants would initially have to meet only some of the WEEELABEX requirements, in the context of a continuous improvement of their performance. The terms of these temporary exemptions however remain to be defined, as to know which requirements can be optional and for which amount of time.

► **Geographical scope**

The WEEELABEX standard's geographical scope is the EU MS and EFTA MS (Iceland, Liechtenstein, Norway and Switzerland). Any producer compliance scheme⁵³ of these countries accepting WEEELABEX obligations can join the organisation.

However, there also have been expressions of interest of other organisations outside Europe who are seeking to get into a mutual recognition of WEEE auditors training programmes. According to the Committee of Domestic Equipment Manufacturers (CECED), Egypt has shown some interest in using the WEEELABEX scheme.⁵⁴

► **Export control (OECD / non-OECD countries)**

As stated in section 4.7.3-4 of the WEEELABEX:2011 standard on "Treatment of WEEE", components removed according to Annex II (Selective treatment of materials and components of WEEE) of Directive 2002/96/EC (WEEELABEX does not specifically refer to the WEEE Directive) unless tested and prepared for re-use (in accordance with section 4.6), must not be exported

⁵³ A producer compliance scheme is a non-profit organisation in which manufacturers and distributors (which are called "producers", i.e. those who put EEE on the market) pay an annual fee for the collection and recycling of associated WEEE from household waste recycling centres.

⁵⁴ Information provided by CECED during a stakeholder interview carried out by the project team in the framework of this study.

outside the EU and EFTA territory unless the operator can demonstrate compliance with WEEELABEX Treatment Normative Document and with Directive 2002/96/EC at the destination.

► Traceability of exported WEEE

The WEEELABEX standard (article 5.9.2) requires the treatment operator to keep a mass balance, which consists of the documentation of all material flows (summaries of incoming and outgoing deliveries of WEEE or WEEE fractions) in an annual overview under consideration of stored amounts. However, they do not require keeping records of WEEE entering the downstream processor facility (material recovery stage).

► Material Scope

WEEE definition in the standard is the same as in the WEEE Directive. The WEEELABEX standard cover all of the categories of WEEE identified in the Directive as well as all components and fractions (subassemblies and consumables) until the end-of-waste status is fulfilled, or until WEEE or components thereof are fit for re-use, or fractions are recovered or disposed of.

► Treatment stages

The WEEELABEX standard, like the WEEE Directive, covers preparing for re-use handling, sorting, storage (in particular for hazardous materials), collection, transport, and treatment, but not the material recovery step. In its article 5.5.2, the WEEELABEX standard only states that if non de-polluted WEEE or fractions are treated by a contracted third party, the subsequent treatment operator must be *informed* of the potential presence of hazardous material in accompanying documents.

► Environmental Management System (EMS)

The WEEELABEX standard requires a management system to be in place for environment, quality and health and safety (EH&S). This includes general and specific treatment requirements regarding handling, storage, de-pollution, de-pollution monitoring, further treatment of WEEE and related fractions containing hazardous wastes (hazardous waste should not be mixed with other categories of hazardous waste or with other types of waste), storage of fractions and components, recycling and recovery, disposal of fractions and corresponding documentation. These requirements are in conformity with Directive 2002/96/EC. Some of these requirements (training of the personnel at the treatment facility, downstream monitoring, documentation, storage and handling specifications) are inspired from the BAT for waste treatment and waste recycling developed in BREF documents.

Energy recovery (through incineration) and/or landfill may only be considered if applicable law and specific facilities with the correct permits for the materials being sent for recovery and/or disposal exist. Furthermore, re-use and material recycling should be preferred to energy recovery from waste.

► Treatment requirements

▷ Minimum requirements for proper treatment

Specific requirements concern CRT display appliances, flat panel displays, C&F appliances (temperature exchange equipment), and lamps which demand special requirements. Requirements related to treatment of WEEE from private households containing volatile

fluorinated hydrocarbons (VFC) or volatile hydrocarbons (VHC) are presently being developed by CENELEC as EN standards, which reportedly are entirely based on voluntary specifications developed by the WEEE Forum, CECED and the European Electronics Recyclers Association (EERA) in 2008.⁵⁵

▶ **Use of BAT and technical requirements for treatment facilities**

For the development of this standard, the Best Available Techniques for waste treatment and recycling developed in BREF documents have been taken into consideration.

The technical requirements for treatment facilities are based on Annex III to the WEEE Directive 2002/96/EC and cover the requirements of Annex VIII to the WEEE Directive.

▶ **Conformity assessment**

Audits of “Conformity Verification” are conducted each year. The first audit is expected to be the most comprehensive. Subsequent audits are considered more as follow-up audits. The audits make the basis for a decision to grant the status of ‘WEEELABEX process’ or ‘WEEELABEX facility’, in which case it will be identified as such on the website of the WEEELABEX Office. In addition, facilities and sites that meet the requirements will be identifiable through a visual identifier (or mark or quality label), issued by the WEEELABEX Organisation.

▶ **Capacity of auditors**

▶ **Training**

The WEEELABEX Organisation trains auditors who have to pass a theoretical exam, after a practical training. These professionals are selected on the basis of their demonstrated auditing skills and receive theoretical information specific to the WEEELABEX requirements.

▶ **Independence**

The WEEELABEX Organisation requires third-party verification of conformity (and not a certification). Second-party verification is also allowed for a transitional period. According to the representatives of the WEEE Forum, “this transitional period is necessary because some markets are less mature in auditing services than others, and some audit outfits or certification companies are not (yet) WEEE treatment specialists.”⁵⁶

▶ **Costs**

Implementing the WEEELABEX standard could constitute a high economic burden for operators that are not yet compliant with EU legislation (even though they are in any case legally required to comply with the applicable legislation). However, it is still too early to define what the costs are, and this will vary depending on the size and type of treatment of the operator.

⁵⁵ Information provided by the WEEE Forum during the stakeholder interviews conducted by the project team in the framework of the present study.

⁵⁶ *Ibid.*

Table 8: SWOT analysis for WEEELABEX option

WEEELABEX	
STRENGTHS	WEAKNESSES
<p>Adequate coverage of EEE.</p> <p>Flexibility offered by standard focused on conditions of treatments and not on specific technologies or processes (technology oriented).</p> <p>A Conformity Verification by trained WEEELABEX auditors must be recognised by other compliance schemes in the WEEELABEX Organisation (avoids new audits from other members of the Organisation).</p> <p>Reporting will follow a common template and principles that allow recyclers to calculate and communicate recycling and recovery quotas to WEEE systems.</p> <p>Third-party verification for conformity assessment (in principle).</p>	<p>.</p> <p>Until 31 December 2014, auditors can be second-party auditors.</p> <p>Verification, not certification for conformity assessment.</p>
OPPORTUNITIES	THREATS
<p>Future translation of the proprietary WEEELABEX standards into official EN standards.</p> <p>Amending a standard is less cumbersome than amending legislation.</p> <p>Expressions of interest of other organisations outside Europe who are seeking to get into a mutual recognition of WEEE auditors training programmes.</p>	<p>Application of the standard across the EU will depend on the choice made by each MS. If some MS do not apply or recognise the WEEELABEX standard (such as the UK), then it may inhibit its application as a possible option for the purpose of this study.</p>

4.2.2.3 **"Responsible Recycling" (R2) standard and the "Recycling Industry Operating Standard" (RIOS) (R2/RIOS Standards)**

► **Implementation status**

The R2 standard is fully implemented. The first facilities certified by R2 (which refers to RIOS) were certified in 2010.

► **Geographical scope**

Currently about 400 facilities in North America, about 5 in Europe and 8 in Asia have been certified under R2.

► **Export control (OECD / non-OECD countries)**

R2 respects the right of every nation to establish a legitimate electronics recycling industry by allowing trade with state-of-the-art partners where legal in the developing world.

Section 3 requires an organisation to have a plan identifying and documenting the legality – under the laws of the exporting, transit, and importing countries – of all international shipments of 'Focus materials' (FMs) and untested or non-functioning equipment or components containing FMs, that have passed through the R2 electronics recycler's facility or control. Prior to shipment, the recycler must identify the countries that are receiving or transferring such shipments, obtain documentation demonstrating that each such country⁵⁷ legally accepts such shipments, and demonstrate compliance of each shipment with the applicable export and import laws. The documentation must be in a language understandable to the electronics recycler, and consist of original documentation from the importing or exporting country's competent authority or a copy of a law or court ruling, that demonstrates the import country legally accepts such imports, and the export country legally allows such exports (3.a.2). It is important to bear in mind that export control of WEEE shipments to OECD or non-OECD countries does not imply that equivalent treatment in that respective foreign country is controlled.

► **Traceability of exported WEEE**

While the standard does not include a records control system, Section 7a requires the recycler to maintain for at least three years commercial contracts, bills of lading, or other commercially accepted documentation for all transfers of equipment, components and materials into and out of its facility, as well as for any brokering transactions.

► **Material scope**

R2's scope includes any type of equipment designed primarily to store or convey information electronically, and any new accessories to such equipment, i.e. IT and audio equipment. Large and small household equipment, in particular C&F appliances, are out of its scope.

Section 5 defines FMs as materials in EoL electronic equipment that warrant greater care during recycling, refurbishing, materials recovery, energy recovery, incineration, and/or disposal due to their toxicity or other potential adverse worker health and safety, public health, or environmental effects that can arise if the materials are managed without appropriate safeguards.

FMs contain:

- PCBs;
- Mercury;
- CRT glass, except for glass with lead content less than 5 parts per million, and clean of phosphors, CRT fines, coatings, and frit;
- Batteries; or
- Whole or shredded circuit boards, except for whole and shredded circuit boards that do not contain lead solder, and have undergone safe and effective

⁵⁷ This includes both OECD and non-OECD countries.

mechanical processing, or manual dismantling, to remove mercury and batteries.

Halogenated compounds and beryllium are not included in the definition of R2 FMs.

► Treatment stages

R2 covers handling, storage, removal of 'Focus Materials', including components, shredded, granulated, etc.

'Recycling Chain' refers to all the first tier downstream vendors that handle EoL equipment, components, or materials that have passed through an R2 electronics recycler's facility or control. It includes, but does not extend beyond materials recovery facilities such as smelters.

► Environmental Management System (EMS)

An R2 electronics recycler must be certified, throughout the duration of its R2 certification, to one or more EMS and EH&S management system standards that have been approved by R2 Solutions (section 1 b). As of July 1, 2013, R2 Solutions has approved the Recycling Industry Operating Standard (RIOS - the recycling industry's management system standard for quality, environment and health & safety), or a combination of both ISO 14001 and OHSAS 18001, to fulfil this requirement. In the future, additional EMS and EH&S management system standards may be approved.

► Treatment requirements

▷ Minimum requirements for proper treatment

Prior to shredding or materials recovery of equipment or components, FMs (as well as print cartridges) shall be removed using safe and effective mechanical processing or manual dismantling, with two exceptions:

- Items containing mercury if:
 - They are too small to remove safely at reasonable cost;
 - Workers are protected from the potential risks of handling mercury; and
 - The materials recovery occurs in facilities that meet all applicable regulatory requirements to receive and process mercury, and that use technology designed to safely and effectively manage equipment or components containing mercury.
- CRTs, batteries, and circuit boards contained in equipment or components destined for materials recovery need not be removed prior to shredding and/or materials recovery if the shredding and/or materials recovery occurs in facilities that meet all applicable regulatory requirements to receive these FMs, and that use technology designed to safely and effectively manage equipment or components containing these FMs.

However, equipment, components, or materials (whole or shredded) that have undergone safe and effective mechanical processing or manual dismantling to remove FMs, yet still retain de-

minus amounts of FMs, and are not subject to the R2 requirements that are triggered by the presence of FMs.⁵⁸

► Use of BAT and technical requirements for treatment facilities

Section 9) (a) of the standard requires an R2 electronics recycler to store WEEE equipment and components, in a manner that:

- Protects them from reasonably foreseeable adverse atmospheric conditions and floods and, as warranted, includes a catchment system;
- Is in full legal compliance;
- Is secure from unauthorised access; and
- Is in clearly labelled containers and/or storage areas.

R2 requirements for treatment facilities, though detailed in the R2 Guidance Document (R2 Solutions 2012),⁵⁹ cover Annex VIII to the WEEE Directive, except for the following:

- Scales to measure the weight of the treated waste; and
- Equipment for the treatment of water in compliance with health and environmental regulations.

► Conformity assessment

The conformity assessment is an accredited certification process.

The auditor first visits the site during one day and a half in order to ensure the facility is ready for the audit. Then the auditor returns a few weeks later for a 3- to 5-day audit (depending on the size of the facility), that will enable him to certify or not the site.

Once certification is attained, the CB conducts annual facility audits. Certification must be renewed every three years. Three certification bodies are currently accredited to R2.

► Professional capacity of auditors

► Training

The R2 Auditor Training Course is an online 8-hour course (fee: 225€) for R2 external auditors or internal auditors who want to implement R2 requirements. The course is based on Accelerated Learning Principles and follows the Plan, Do, Check, Act (PDCA) approach to instruction and learning. Delegates apply R2 principles and requirements to structured case studies, culminating in an interactive mock-audit based on the process approach to auditing.

The 'R2 Checklist' is a helpful tool to ensure facility operations are in conformity with the prescribed guidelines of the standard.

⁵⁸ Note: De-minimus is not defined in the standard although it is discussed at length in the R2 Guidance Document which essentially describes it as "the amount one would reasonably expect to remain following the utilisation of "safe and effective mechanical processing or manual dismantling." This will vary based on the technology employed.

⁵⁹ http://www.r2solutions.org/clientuploads/R2_2008%20Standard%20Guidance%20v.1.0%206-16-12.pdf

▷ **Independence**

All certification of recyclers is through independent third-party auditors employed by ANAB-accredited CBs.

▷ **Costs**

The costs associated with R2 certification are the costs of the CB audits and of an annual licensing fee (since June 2013). Typically, these costs range from US\$6,000 to \$15,000 (about €4,500 to €11,400) or more, depending on the activities being performed and the size of the facility. This fee however does not include the costs of getting into conformity with the standard, such as establishing the EMS system of their choice. Additional costs also include hiring a consultant to help identifying documentation relevant to the audits.

Table 9: SWOT analysis for R2/RIOS option

R2/RIOS	
STRENGTHS	WEAKNESSES
<p>Comprehensive EMS and EH&S, with direct reference (and requirement) to ISO 14001 and OHSAS 18001, or RIOS.</p> <p>Accredited third-party certification, with auditor certification training. Annual audits.</p>	<p>Does not cover all WEEE that falls under the scope of the WEEE Directive.</p> <p>Halogenated compounds and beryllium are not included in the definition of R2 "Focus Materials".</p> <p>No records control system for traceability, although some information required.</p>
OPPORTUNITIES	THREATS
<p>Standard already applied outside the EU.</p>	<p>The general principle suggests that R2 exports will comply with the laws of exporting, transit and importing countries. However, in principle R2 should indicate that the 140 non-OECD Basel (developing) countries cannot legally trade in toxic wastes (going for recycling or disposal) with the US.</p> <p>If some MS do not recognise the standard as a possible option for proving equivalent treatment conditions, this may inhibit its application for the purposes of this study.</p>

4.2.2.4 e-Stewards Standard for "Responsible Recycling and Reuse of Electronic Equipment"

▷ **Implementation status**

As of 9 July 2013, there were 115 e-Stewards certified facilities in 3 OECD countries, with an additional 68 facilities contracted for certification. According to recyclers, implementing the standard was not easy (especially if they were not already ISO 14001 certified), but was valuable

in streamlining their operations and in improving their protection of human health and the environment, as well as their marketability.⁶⁰

To date, the programme has suspended one license, and disallowed certification of another recycler. The program contains a Critical Non-Conformity Policy that allows the certification scheme programme administrator (currently BAN) to suspend or withdraw certifications.

► **Geographical scope**

E-Stewards has been written for international use and is available in all countries but if CBs wish to certify in a non-OECD country (as listed in Annex VII of the Basel Convention), they must first get written permission from e-Stewards programme administrator. The standard is currently in English only, however the US EPA is now translating some e-Stewards documents into Spanish for their Borders 2020 Project.

► **Export control (OECD / non-OECD countries)**

E-stewards (section 4.4.6.7) only permits export of Hazardous Electronic Wastes (HEW – Basel regulated wastes and additional nationally designated hazardous wastes) consistent with the decisions and agreements of the OECD, the Basel Convention, the Amendment to the Basel Convention, and other applicable national and international laws regarding such trade. It requires the following:

- HEW can be exported from OECD/EU countries and Liechtenstein to and through other countries in that same group;
- HEW may not be traded between any Basel Party and the US or any other non-Party to the Basel Convention (non-Party/Party prohibition) unless all countries concerned are Member countries of the OECD or have concluded a special bilateral or multilateral agreement; and
- Export not prohibited as above is acceptable if approved by the 'competent authority' of the importing and transit countries and only accomplished in full conformity with OECD Decisions, the Basel Convention or other international agreements or national legislation implementing these agreements.

The e-Stewards program does its own surveillance (in addition to CBs) of recyclers, and partners with INTERPOL and governments in importing countries to stop illegal trafficking of e-waste.⁶¹

► **Traceability of exported WEEE**

The standard (section 5.9.2) requires documentation of incoming, outgoing materials (Mass Balance Accounting of 100% of materials), and pre-approval of all downstream processing facilities for HEWs until they are no longer a waste (as defined by the Basel Convention).

⁶⁰ Information provided by BAN during the stakeholder consultation carried out by the project team in the framework of the present study.

⁶¹ Information provided by BAN during the stakeholder consultation carried out by the project team in the framework of the present study.

The documented system of direct controls and accountability (section 4.4.6.5) for the entire recycling chain to final disposition of HEWs, must include a) performing initial due diligence, b) contracting with next tier downstream recyclers, c) assuring on-going conformance, d) verifying Intermediaries are directing shipments to intended destinations, and e) providing transparency to customers (when asked).

Downstream processors⁶² must either be certified e-Stewards or must have the operational and technical capacity to process HEWs with full transparency, records and controls (section 4.5.1.1).

► Material Scope

E-Stewards' scope is only IT and audio-visual equipment. All other equipment is out of the scope, except a few small domestic equipment such as vacuum cleaners, so there is no equivalency in the equipment scope of e-Stewards and the WEEE Directive.

The standards' definition of HEW is based on the Basel Convention's definition, in order to effectively implement the Basel Convention and Ban Amendment for transboundary movements of Basel regulated e-waste.

► Treatment stages

E-Stewards standard covers handling, storage, removal of HEW (see *Minimum requirements for proper treatment* below) in any form, including components, shredded, granulated, etc. It does not cover collection nor transportation issues.

The standard does not define requirements for the recovery of materials coming from the treatment of WEEE, but has a number of requirements for facilities that are pre-approved to accept these waste (e.g. licensed, permitted, monitoring and controlling emissions, mercury retort facilities must capture 99.99% mercury, certain types must monitor dioxin/furans of the flue gas, etc.).

► Environmental Management System (EMS)

Section 4.1 of the standard requires an environmental management system certified to ISO 14001, and section 4.1.1 requires the system to include or refer to an occupational health and safety system.⁶³

In addition, OHSAS 18001 will be a binding pre-requisite in version 2 of the e-Stewards standard, which will be released in September 2013.⁶⁴

⁶² Processors, refurbishers, refiners, etc. who are downstream of the first tier e-Steward are considered "Downstream Recyclers".

⁶³ The e-Stewards Standard does not require compliance with or certification to SA8000 (Social Accountability Standard, a human rights standard based on conventions of the ILO, UN and national law to measure social compliance). An e-Steward's management policies should, however, reflect the values and principles described in the SA8000 standard for their own operations, either by directly referencing a commitment to the principles in the SA 8000 Standard, or listing appropriate specifics found in SA 8000 (e.g. no child labour, forced labour, right to organise, etc.).

⁶⁴ Information provided by BAN during the stakeholder consultation carried out by the project team in the framework of the present study.

It prohibits the use of prison labour in the recycling of toxic electronics, which often have sensitive data embedded.

▶ **Treatment requirements**

▶ **Minimum requirements for proper treatment**

E-Stewards standard (at section 4.4.6.4 a) requires removal and separate treatment of PCBs, mercury-containing devices (including gas discharge lamps), batteries, ink and toners, asbestos, CRTs, printer and copier drums and other components containing selenium and/or arsenic, and glycolant-based coolants (e.g., in rear-projection CRT display devices). The standard prohibits the shredding (under any circumstances) of these materials, however specialised end-processors are allowed to do this, in fully licensed and permitted mercury processing operations.

Re-use is clearly stated as the preferred management option in a hierarchy of options (section 4.4.6.4). However, in certain circumstances recycling might come before re-use because facilities certified with e-Stewards are not allowed to export WEEE fractions for re-use in non-OECD countries.

▶ **Use of BAT and technical requirements for treatment facilities**

Section 4.4.6.4(b) of the standard states that all removed items listed in section 4.4.6.4(a) mentioned above must be consolidated, stored, accurately labelled, transported, and managed as toxic, hazardous, or dangerous wastes, as appropriate, in conformance with all local, state/provincial, and federal/national requirements for these consolidated materials, and with downstream requirements in this Standard. Removed materials must be stored and transported in a manner that:

- Protects them from adverse atmospheric conditions and floods including shelter from wind and rain, and a rainwater catchment system, if appropriate;
- Minimises accidental spills or breakage;
- Is secure from unauthorised entrance or access;
- Includes clearly labelled containers and/or storage areas appropriate for the materials stored; and
- Batteries at risk for heat discharge or explosion must be stored and transported in a way that keeps them separated to avoid unintentional discharges.

E-stewards requirements for treatment facilities cover Annex VIII to the WEEE Directive, except for the following:

- Scales to measure the weight of the treated waste; and
- Equipment for the treatment of water in compliance with health and environmental regulations, which is covered by the EMS.

▶ **Conformity assessment**

The e-Stewards programme requires all certified organisations to be independently certified by e-Stewards CBs that are accredited by IAF-member accreditation bodies (i.e. meeting global

standards, rules, and norms for both certification and accreditation bodies). No entity may claim conformity to the e-Stewards Standard without this independent certification. Certification and on-site audits are required for all of the WEEE processing facilities owned by a company, on an annual basis for a 3-year cycle (initial certification, followed by 2 annual surveillance audits at a minimum), and then the 3-year cycle is repeated.

All minimum global procedures for certification and accreditation bodies are required (IAF mandatory documents), and additional e-Stewards rules are in place (Appendix B of the standard) regarding procedures such as minimum man-day audits for all e-Stewards audits, minimum requirements for all auditors (including formal mandatory auditor training, and existing ISO 14001 auditor certification), licensing of the use of the e-Stewards name and logo, and more. Facilities may not reduce these procedures.

Furthermore, training providers provide recyclers Internal Auditor Training and Implementation Training (e.g., how to set up an EMS in conformity with e-Stewards Standard).

► Professional capacity of auditors

▷ Training

There is a single professional training organisation (SAI Global) rigorous 3.5 day training with exam for all e-Stewards auditors, CBs and accreditation bodies.

In addition, all auditors must be ISO 14001 certified auditors.

▷ Independence

Auditors are third parties. BAN representatives assist to many of the Certification and Accreditation Body audits to assure quality and consistency across the conformity assessment programme.

► Costs

Costs include:

- Internal preparation costs (training);
- Setting up an EMS in conformity with the e-Stewards Standard;
- Auditing fees to the CB (based on cost restrictions found in global ISO standards for CBs);
- A sliding-scale marketing and licensing fee to BAN for on-going oversight of the certification and accreditation bodies, standard revisions, Questions & Answers, marketing, legal, and resources for e-Stewards recyclers. This fee is based upon revenues related to e-recycling only (US\$500 - \$90,000 per year, i.e. about €400 to €70,000); and
- Additional one-time initiation fee (based on 50% of annual license fee, not to exceed \$10,000, i.e. about €7 000).

Total costs vary based on the size of the company or facility to audit, and may be as follows:

- For one small facility, 5 employees, manual processing: about US\$5,000 (€3 800);

- For one larger facility, 20 or so employees, light automation: about US\$10,000 (€7,500); and
- For 5 facilities, 100+ employees, heavy automation: about US\$20,000 (€15,000).

Undergoing the process of certification is taking an important risk for a facility, because it has to incur many costs before the certification is issued, without being certain that the certification will really be granted to the facility.

Table 10: SWOT analysis for e-Stewards option

e-Stewards	
STRENGTHS	WEAKNESSES
<p>Environmental Management System required (notably ISO 14001).</p> <p>Export control and traceability provisions.</p> <p>Flexibility as e-Stewards only describes the results to be achieved; it does not specify how they are to be achieved nor does it prescribe the use of any specific technology.</p> <p>Third-party conformity assessment (accredited certification). Annual audits.</p> <p>BAN very present and active.</p>	<p>Does not cover all WEEE within the scope of the WEEE Directive: does not include LHAs, and in particular C&F appliances.</p> <p>The standard has never been applied in a non-OECD country yet.</p> <p>Costs could potentially be high.</p>
OPPORTUNITIES	THREATS
<p>Gives customers confidence of having a comprehensive shield from e-waste threats: global pollution, data loss, worker exposure, violation of international laws, and brand damage. Businesses can reduce their in-house recycling vendor qualification, due diligence, and monitoring costs by using certified e-Stewards recyclers.</p> <p>Several developing countries are either interested in or actively pursuing the development of technical capacity (Nigeria, Ghana, Kenya, Brazil, Trinidad and Tobago, etc.). Treatment facilities in these countries could potentially be e-Stewards certified in the future.</p>	<p>If some MS do not recognise e-Stewards as a possible option for proving equivalent treatment conditions, this may inhibit its application for the purposes of this study.</p>

4.2.2.5 *European Standards for the treatment of WEEE*

► **Implementation status**

CENELEC has published EN standards under the framework of the original WEEE Directive (2002/96/EC). It is now developing specific standards for the treatment of WEEE, reflecting the state of the art, pursuant to the mandate of 24 January 2013 of the European Commission that it has accepted.

Some EU MS, such as The Netherlands, have already adopted, or indicated that they would adopt, the future EN standards in their national legislations. The EN standards will thus be transposed into national standards. However, other MS such as the UK indicated that they would not refer to the CENELEC EN standards in their national legislation, at least not in the short term. The UK reportedly prefers deregulation and minimum measures.⁶⁵ Nevertheless, the Commission may in the future, pursuant to Article 5 of the WEEE Directive, adopt implementing acts laying down minimum quality standards based in particular on the EN standards developed by the ESO (and hence CENELEC).

However, the CENELEC EN standards are under development and will not in principle be finalised by 14 February 2014, date by which the MS must have transposed the WEEE Directive into their national legislation. The Commission's mandate indeed establishes the following deadlines for its execution:

24 months after acceptance	Publication of a first suite of standards
36 months after acceptance	Publication of full suite of standards

► **Geographical scope**

The European standards are being developed for the now 28 EU MS and the EFTA MS. However, CENELEC has an 'agreement on common planning of new work and parallel voting' (known as the Dresden Agreement) with the International Electrotechnical Commission (IEC), the international standards body for electrotechnology.⁶⁶ CENELEC may thus propose EN standards for an adoption as international standards by the IEC; such an adoption would create a worldwide level playing field for certified WEEE recyclers. Should IEC standards for WEEE treatment differ from EN standards and require a lower level of treatment, imposing compliance with EN standards for recyclers of EU WEEE located outside the EU would nonetheless ensure a level playing field for all WEEE that originated from the EU.

In addition, and as per the Commission's mandate, "where appropriate, alignment with equivalent activities in the International Telecommunication Union (ITU) and in ISO/IEC should be ensured. Due account should be taken of relevant legislation adopted or to be adopted outside European Union, as appropriate, so as to ensure a global market for equipment."

⁶⁵ Information provided by AMDEA (UK Association of Manufacturers of Domestic Appliances) during the stakeholder consultation carried out as part in the framework of the present study.

⁶⁶ Information on the Dresden Agreement is available at www.cenelec.eu/aboutcenelec/whoweare/globalpartners/iec.html and ftp://ftp.cencenelec.eu/CENELEC/Guides/CLC13_CENELECGuide13.pdf

► **Export control (OECD / non-OECD countries)**

The European standards being developed are of a technical nature and as such do not provide requirements for an export control system. Under this policy option, the export control would only take the form of the 'statement of compliance' with the WSR and Regulation (EC) No 1418/2007.

► **Traceability of exported WEEE**

The above considerations regarding export control also apply to the issue of traceability, which is not addressed in the EN standards as traceability is not a treatment requirement *per se*, but is a requirement for calculating the recovery targets. Any audit on the compliance of a treatment facility with EN standards could thus lead to the issuance of a certification of compliance, without having to take into account the traceability of exported WEEE (which would be covered by the 'statement of compliance').

► **Material scope**

The Commission's mandate specifically provides that the standards must cover the treatment of all products within the extended scope of the WEEE Directive. Consequently, the definition of WEEE and other relevant terms in said Directive applies for the elaboration of the EN standards.

► **Treatment stages**

The final suite of European standards will have to cover the treatment of WEEE, including recovery, recycling and preparing for re-use. In addition, the standards will cover the collection of WEEE where it is crucial that such collection is carried out in specific ways in order to allow for proper treatment (e.g., fluorescent lamps).

The CENELEC standards will thus cover both treatment of WEEE and recovery of materials coming from the treatment of WEEE (i.e. copper and precious metals).

► **Environmental Management System (EMS)**

Although the CENELEC standards will not provide for an Environmental Management System, which is not required by the Commission's mandate, they will nonetheless take into account environmental, health and safety aspects when elaborating the treatment requirements in the standards, in particular as these standards must reflect the state of the art.

► **Treatment requirements**

The Commission's mandate to ESOs encompasses all treatment requirements.

According to the Commission's mandate, the purpose of the EN standards also is to assist relevant operators in fulfilling the requirements of the WEEE Directive, hence the need for them to be concrete, although different options of treatment may be placed to the disposal of operators.

Minimum treatment specifications provided in Annex VII to the WEEE Directive are therefore to be covered by the EN standards developed by CENELEC. Additional guidance may also be provided but the EN standards will have to "*distinguish between normative treatment requirements derived directly from the legal text of Directive 2012/19/EU, especially Annex VII, and*

between informative treatment requirements going beyond the strict requirements of Directive 2012/19/EU.”.

► **Conformity assessment**

Standards written by formal standardisation bodies, such as those currently being developed by CENELEC, are written so that they can be used by a first, second or third party. However, to be certified, an operator has beforehand to be audited by a third party.

CENELEC is not a CB; it only develops the standards that can be used by accredited CBs. These CBs will issue (or not) a certificate of compliance with EN standards following a conformity assessment audit.

The European standards do not indicate the interval at which the conformity assessment must be conducted.

► **Professional capacity of auditors**

▷ **Training**

Auditors will need to be trained to assess compliance with the European standards. Training is usually carried out by the CB (e.g., AFNOR in France). They could potentially be trained by the WEEELABEX Organisation (even if they are not members of compliance schemes) or by other experts having participated in the development of European standards.

▷ **Independence**

In principle, the audit can be paid by:

- CB;
- Producers;
- Compliance schemes, when they exist (in Germany there are no compliance schemes); and
- Directly by the WEEE recyclers.

There may be a conflict of interest affecting the auditor’s independence when the auditor is not paid by the CB, but by the treatment facility (with an increased risk of corruption, in particular in developing and emerging countries) or producers. Another case of conflict of interest is if auditors audit financially an operator that they also audit to assess its conformity with CENELEC EN standards: there can be a conflict of interest because the operator is a client of the auditor, at least for the financial audit, and the auditor might want to keep its client by all means.

► **Costs**

According to a representative from EERA, the cost of the European standard(s) will depend on the number of employees dedicated to the job, but the audit will cost between €500 and €2,000 while the total cost for a facility will range between €25,000 and €30,000.

Table 11: SWOT analysis for European (EN) standards option

European (EN) Standards	
STRENGTHS	WEAKNESSES
<p>All WEEE covered.</p> <p>Environmental, health and safety aspects taken into account in the elaboration of the European standards.</p> <p>All treatment requirements are covered.</p> <p>Training of auditors usually by CBs.</p> <p>Standards may place different options of treatment to the disposal of operators.</p>	<p>The European standards will, in principle, not be published before 2015.</p> <p>On the basis of available information, the EN standards do not explicitly mention of an export control mechanism or traceability requirements, due to the technical nature of EN standards.</p> <p>On the basis of available information, the EN standards do not currently require a general EMS (not within the scope of the Commission’s mandate).</p> <p>Costs could represent a heavy burden.</p>
OPPORTUNITIES	THREATS
<p>Ensuring a level playing field, through notably the proposal of CENELEC standards to the IEC, for the adoption of international standards.</p> <p>Standards may be modified before publishing date to incorporate minimum standards set out by the WEEE Directive.</p>	<p>If too precise, no room left for other technologies to be applied in non-EU countries.</p> <p>Risk of conflict of interest if auditors are not paid by CB but by, for instance, producer or recycler.</p>

4.2.2.6 Canadian Recycler Qualification Program (RQP)

► Implementation status

The RQP has been implemented in Canada. The Recycling Qualification Office (RQO) publishes a list of organisations that have successfully completed the assessment and have been verified under the RQP. Currently, 37 organisations are listed as ‘RQP verified’ on the RQP webpage.⁶⁷

► Geographical scope

The RQP is intrinsically linked to Canadian provincial legislations.

The geographical scope of the RQP currently covers nine of Canada’s provinces. New Brunswick government is reviewing the stewardship programmes, whereas WEEE is not regulated in the Northwest Territories, Yukon and Nunavut.

► Export Control (OECD / non-OECD countries)

Sections 4.5.4 and 4.5.5 of RQP regulate the exports of materials (including WEEE) or components. Much like the WEEE Directive, export of material (including WEEE) is only

⁶⁷ See www.rqp.ca/VerifiedRecyclers.html

permitted to downstream vendors located in a country legally permitted to accept the material or components.

As Section 16.14 of the RQP provides, priority is given to domestic processing of material to minimise transboundary movement wherever possible in order to limit other environmental impacts associated with such movement. However, certain export of materials (including WEEE) may be permitted on a case-by-case basis to be processed by downstream recyclers, but only where the primary recycler can demonstrate adequate processing facilities exist to their respective stewardship programme. The RQP has its own downstream recycler assessment process in which primary recyclers must use to determine the ability of the downstream recyclers to handle the waste in a safe and environmentally sound manner with the requirements of the ERS.

The primary recycler provides a paper compliance of RQP to the RQO, stating that the downstream recycler operates in accordance with the ERS.

Export of recovered material

The standard outlines requirements for the export of clean, recovered material from the recycling process to be used as raw material in manufacture processes in a foreign country. In this case, raw material feedstock in a manufacturing process is permitted and not subject to audit if the material undergoes certain treatment (i.e. no additional pre-processing of the material is required, has been cleaned in an OECD/EU country, etc.) and it will be fully consumed in the manufacturing process. The WEEE Directive does not specify material recovered to be used as raw material in foreign countries.

► **Traceability of exported WEEE**

The RQP standard provides explicitly under Section 6 (Operational Controls) that recyclers must maintain a process to track and report the quantity and chain of custody of program materials (including WEEE) received, processed, and shipped as well as provide certificates of recycling for all material once processed.

Section 12 of the RQP requires that any downstream recycler must be documented and assessed by the primary recyclers to ensure they operate in a safe and environmentally sound manner in accordance to the ERS minimum.

► **Material Scope**

The RQP defines EOLE (End-Of-Life Equipment), here mentioned as WEEE, as “unwanted or discarded electronic equipment obligated under the Stewardship Program that is designated for recycling.”

Each province defines the material designated for recycling or recovery,⁶⁸ which varies in scope significantly. For example, British Columbia includes household appliances in their list, whereas other provinces, such as Alberta, do not.

EPRA manages product clarification protocols. The organisation also publishes a list⁶⁹ of specific products to specify whether they fall under the respective provincial recycling regulation. As

⁶⁸ See www.epsc.ca/images/provincial%20regulations%20and%20obligated%20products_march%2028%202013.pdf

indicated earlier, certain electronic products are not relevant to all regions. Therefore, the scope of WEEE compared to the EU legislation cannot be determined on a Canadian level, but only on a provincial basis.

▶ **Treatment stages**

RQP defines recycling as “the recovery of materials from EOLE for use in manufacturing new products.” Unlike the WEEE Directive, the RQP does not concern itself with collection. The RQP has a separate verification programme for collection (Collection Site Approval Programme).

The policy option outlines a material disposition hierarchy along with acceptable processes and points of final disposition for material recovery in general. This information is presented in a table (see Table 12 below), where material is separated into three categories: electronic scrap, non-hazardous, and substances of concern (which include ink/toner, leaded glass, etc.).

▶ **Environmental Management System (EMS)**

The RQP requires recyclers to both implement and maintain a documented third-party verified Environmental Health and Safety Management System (EHSMS). While the RQP does not define a precise framework for EHSMS, the ISO 14001 structure is considered a generally accepted standard (Section 13.1.5 of the RQP). Recyclers were required to demonstrate third-party verification/certification of their EHSMS by January 2013.

▶ **Treatment requirements**

▶ **Minimum requirements for proper treatment**

The RQP provides treatment guidelines for specific materials (including WEEE) through a material disposition hierarchy presented in a table (see Table 12 below). This table indicates acceptable processes and acceptable points of final disposition depending on the category of waste. Further, in Section 16.16, the RQP indicates specific material that must be reclaimed from mercury lamps and batteries.

⁶⁹ See www.eprassociation.ca/pdfs/product_clarifications/Product%20Clarification%20Tracking%20Sheet.pdf

Table 12: Material Disposition Hierarchy and Acceptable Processes for RQP

		Disposition Hierarchy			Acceptable Processes & Points of Final Disposition							
		Material Recovery Required	Energy recovery Permitted	Other disposition Permitted	Manual dismantling and material separation	Mechanical material separation	Extraction/purification/refinement	Smelting to reclaim metal	EFW Incineration (use of material as an energy substitute)	Landfill	Hazardous Waste Landfill	Export to a non-OECD/EU country for processing
Electronic Scrap	EOLE	★			✓	✓	✗	✗	✗	✗	✗	✗
	Components (hard drives, chips, etc)	★			✓	✓	✓	✓	✗	✗	✗	✗
	Wires / Cables	★			✓	✓	✓	✓	✗	✗	✗	✗
	Copper Yokes	★			✓	✓	✓	✓	✗	✗	✗	✗
	Circuit Boards	★			✓	✓	✓	✓	✗	✗	✗	✗
	Metal / plastic laminates	★			✓	✓	✓	✓	✗	✗	✗	✗
Non Hazardous	Metal	★							✗	✗	✗	✗
	Mixed Metals	★							✗	✗	✗	✗
	Metal dusts (bag house)	★							✗	✗	✗	✗
	Non-lead Glass	★						✗	✗	✗	✗	✗
	Plastic		★	★				✗			✗	✓
	Mixed Plastics		★	★				✗			✗	✓
	Wood		★	★				✗			✗	✗
	Leather, cotton and other fibres		★	★				✗			✗	✗
Substances of Concern	Insulation (Fibreglass / composite)		★	★				✗			✗	✗
	Leaded Glass	★			✓	✓	✓	✓	✗	✗	✗	✗
	Washed leaded glass cullet	★			✗	✓	✓	✓	✗	✗	✗	✗
	Mercury Lamps	★			✗	✓	✓	✓	✗	✗	✗	✗
	Mercury	★			✗	✓	✓	✓	✗	✗	✗	✗
	Batteries	★			✗	✓	✓	✓	✗	✗	✗	✗
	Ink / Toner Cartridges		★		✓	✓	✓	✓	✓	✗	✗	✗
	Ink / Toner		★		✗	✓	✓	✓	✓	✗	✗	✗
	Phosphor Powder			★	✗	✓	✓	✓	✗	✗	✗	✗
	Ethylene Glycol			★	✗	✓	✓	✓	✗	✗	✗	✗
In accordance with the Disposition Hierarchy material recovery is always preferential over other disposition methods for all materials but only required where indicated with an '★'.												
Where the use of the material for energy recovery, or other disposition methods is permitted, they are indicated with an '★'.												
Process/application not permitted under the ERS											✗	
Process/application is permitted under the ERS & subject to on-site audit											✓	
Process/application is permitted under the ERS & subject to document review and verification												

► Use of BAT and technical requirements for treatment facilities

The RQP states that treatment of material (including WEEE) must be done indoors. In addition, it requires specific requirements for treatment facilities, including storage specifications, etc.

There are no BAT reference documents for specific treatment.

► Conformity Assessment

Recyclers were required to demonstrate third-party verification/certification of their EHSMS by January 2013. The EHSMS is not undertaken by the RQO. Recyclers must show they either have verification or certification of an EHSMS management system programme before applying to be RQP verified.

For the rest of RQP standards, a conformity assessment is carried out by the RQO, through a documentation review, an on-site audit, and downstream audits. These audits include a conformity assessment of the RQP’s legal requirements, traceability requirements, risk assessments requirements, data security requirements, corrective action plans, etc. Assessments are carried out every three years.

► **Professional Capacity of auditors**

▷ **Training**

RQO auditors undergo in-house training by the RQO.

▷ **Independence**

RQO auditors are in-house certified auditors. RQO may contract certified auditors which are outside of the RQO if need-be.

► **Costs**

There was no information available on costs.

Table 13: SWOT analysis for RQP standards option

RQP Standards	
STRENGTHS	WEAKNESSES
<p>Requirements for export control and traceability.</p> <p>The EHSMS of recyclers must be third-party verified/certified, with the recycler having the freedom to choose their respective EHSMS programme.</p> <p>Exported material (including WEEE) for treatment is considered on a case-by-case basis.</p> <p>The RQP gives a material hierarchy with acceptable processes for waste for certain substances and material.</p>	<p>RQP is based on Canadian legislation which is provincial-specific, and therefore difficult to implement internationally.</p> <p>No general, harmonised definition of WEEE (depends on the Canadian provincial legislation being applied).</p> <p>Recyclers are audited by the RQO, which operates under EPRA, an industry-led non-profit organisation comprised of large electronics manufacturers.</p> <p>The RQP material hierarchy allows for landfill disposal for certain material, without explicitly stating recovery targets for those materials.</p>
OPPORTUNITIES	THREATS
<p>Freedom to choose EHSMS allows flexibility and can be cost-effective for treatment facilities.</p> <p>The RQP material hierarchy allows operators flexibility in treating certain materials.</p>	<p>Conflict of interest: RQO auditors are in-house.</p> <p>The RQP material hierarchy can lead to loopholes for certain material.</p> <p>The possible non-recognition of RQP as an option for proving equivalent treatment conditions could inhibit its application for the purposes of this study.</p>

4.2.2.7 ***Australian/New Zealand standard AS/NZS 5377 on "Collection, storage, transport and treatment of end-of-life electrical and electronic equipment"***

Please note that the following analysis is based on the draft AS/NZS, as the final version was not freely accessible.

► **Implementation status of the policy option**

The Standard was developed in 2011, and is being enforced across Australia by the end of 2013.

The Standard has been implemented in Australia, where all recyclers working with 'approved arrangements' under the IT/TV regulations must follow the standard. This means that materials which fall under the National Television and Computer Recycling Scheme will follow the Standard guidelines (which are only televisions, computers, printers, and computer products).

However, it is voluntary in New Zealand, where adoption of the standard is a business decision. Ad-hoc decision could exacerbate uneven playing field, but a voluntary scheme is more flexible. Adherence to the Standard is financially encouraged by requiring it as a condition of funding from the Waste Minimisation Fund for e-waste projects.

► **Geographical scope**

AS/NZS 5377 is currently implemented in Australia and New Zealand. There is some consideration of 'exporting' the certification to the South East Asian countries that receive the majority of Australian and New Zealand WEEE, however this is not set in stone.

► **Export control (OECD/non-OECD countries)**

In Australia and New Zealand there is very limited technology for WEEE processing, and none for the processing of hazardous materials coming from WEEE. Thus, the treatment (for both whole appliances and components of WEEE) is done overseas. Operators shipping WEEE must respect domestic legislation and international legislation (notably the Basel Convention). Table 14 provides a list of the types of components/ fractions coming from WEEE New Zealand sends overseas for processing.

Table 14: New Zealand e-Waste Processing Overseas⁷⁰

What?	Where?
Non-Brominated Flame Retardant Plastics	China
Printed circuit boards	Japan, Singapore, Belgium
Whole units	Singapore
CRTs	Korea, The Netherlands, Australia, permits pending for UK
E-waste (all types)	Korea, Singapore
Batteries	Korea

In the case of New Zealand, the national EPA publishes a list⁷¹ of companies that have permits to export hazardous waste, companies that have permits to import hazardous waste abroad (and the corresponding waste product permitted), as well as a list of which wastes are permitted to transit in New Zealand en route from one country to another. New Zealand also has several Environmental Cooperation Agreements with some countries in Asia in exchange of environmental information and good practice.⁷²

The Standard also outlines a specific process primary recyclers must undertake to evaluate their downstream processors. Primary recyclers must document a downstream processors' ability to provide data and ensure that proper handling to the point of final disposal is maintained. The documented process must include annual audits by the operator or an independent auditor to assess the environmental, health and safety impacts of the operation of suppliers who are immediately downstream.

► **Traceability of exported WEEE**

The weight and flow of handling of materials and components from used electrical and electronic equipment⁷³ must be reported from receipt at the facility to final disposition downstream.

The downstream flow must be tracked through each downstream processor to the point of final disposal, including details of how goods are processed at each point, the percentage recovered and the percentage of processed materials sent to each downstream processor and recovered by each downstream processor.

⁷⁰ Source: NZ Ministry of the Environment presentation on New Zealand e-waste.

⁷¹ www.epa.govt.nz/Publications/Exports_imports_transits_permits_20130709.pdf

⁷² www.mfe.govt.nz/laws/trade/trade.html

⁷³ Used electrical and electronic equipment in this standard is defined as "Electrical and electronic equipment that is considered to be waste, including all components, batteries, power supplies, subassemblies and consumables."

► **Material scope**

The WEEE Scope for the AS/NZ standard covers all EEE designed for a supply voltage not exceeding 1,000 volts for alternative current and 1,500 volts for direct current. The standard provides an Appendix (Appendix A) for a list of all concerned items. The scope is therefore equivalent, if not more comprehensive than under the WEEE Directive, as the only scope limitation for the definition of WEEE is a relatively high supply voltage and alternative current.

► **Treatment stages**

All stages of recycling are concerned: collection, storage, transport, re-use, recycling, treatment, material recovery (for certain components), and final disposal.

► **Environmental Management System (EMS)**

Although the standard does not explicitly state that the treatment facility must have a specific Environmental Management System certification/verification, it does require that the recycler abide by domestic occupational health and safety legislation and environmental performance legislations. The standard has other organisational requirements, where the operator must have a documented risk assessment and management process. The standard indicates that ISO 31000⁷⁴ is a suitable process for this.

► **Treatment requirements**

▷ **Minimum requirements for proper treatment**

The standard provides a list of components that must be removed before being processed, much like the WEEE Directive. The list is presented in Table 15 below.

Table 15: AS/NZ 5377 List of Components to be pre-treated

Components that must be removed prior to treatment
Mercury containing lamps and globes
Gas discharge lamps
Ink and toner cartridges
Batteries
Components containing refractory ceramic fibres
Petroleum products
Asbestos
Components containing refrigerant
Components containing beryllium

In addition, the standard provides a table in Section 5 on the minimum acceptable processing, end-use and method of disposal for specific WEEE and fractions coming from WEEE. These are the following:

⁷⁴ ISO 31000 provides principles and generic guidelines on risk management to identify and control any potential environmental health or safety hazards associated with the entity’s operations.

- Batteries;
- CRT, LCD, LED, and rear projection lamps;
- Printed circuit boards;
- Cable and wires;
- Components containing PCBs;
- Components containing petroleum products;
- Components with radioactive materials;
- Components containing engineered material such as asbestos;
- Ferrous and non-ferrous metals;
- Heat exchange units (i.e. CFC, HCFC);
- Ink and toner cartridges;
- Mercury containing lamps;
- Plastics;
- Packaging; and
- Printer and copier drums containing selenium or arsenic.

Appendix B provides additional guidance on the treatment for material (as indicated in the following section.)

▶ **Use of BAT and technical requirements for treatment facilities**

There are no BAT and technical requirement guidance documents beyond the standard itself. However, Appendix B of the standard provides detailed overview of the minimum acceptable processing, end-use and methods of disposal of WEEE, expanding on the table in Section 5 mentioned above.

▶ **Conformity assessment**

The government-appointed Joint Accreditation System of Australia & New Zealand (JAS-ANZ) accredits Conformity Assessment Bodies (Standards Australia, Standards New Zealand) that audit recyclers for the standard. Annual audits typically take 3 days on site plus report writing time. The conformity assessment for the standard is undertaken by Conformity Assessment Bodies.

The standard also provides for downstream recycling assessment to be done either by the operator itself (second-party paper compliance) or by a third-party auditor. It is up to the operators to decide whether they have a third-party auditor to evaluate their downstream recyclers.

▶ **Professional capacity of auditors**

Auditors must be members of Conformity Assessment Bodies (JAS-ANZ) and be qualified environmental auditors.

► **Costs**

In New Zealand, environmental audits cost between NZ\$5,000 and NZ\$10,000 (between €3,000 and €6,000).

No information was available on such costs for implementation in Australia.

Table 16: SWOT analysis for AS/NZS 5377 option

AS/NZ Standards	
STRENGTHS	WEAKNESSES
<p>All WEEE covered.</p> <p>Treatment requirements covered.</p> <p>Provisions for conformity assessment to be undertaken by Accredited Conformity Assessment Bodies.</p>	<p>Conformity assessment may be second-party verification.</p>
OPPORTUNITIES	THREATS
<p>This new standard could potentially be 'exported' to South-east Asian countries, which receive many Australia/NZ WEEE.</p>	<p>Voluntary standards may mean that the New Zealand government must provide further financial incentives to promote their uptake and implementation by businesses.</p>

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Chapter 5: Conclusions and Recommendations

The present Chapter aims to present general conclusions stemming from the analysis conducted in Chapter 4, and to provide recommendations as to the best policy option(s) to determine “equivalent conditions” to the requirements of the WEEE Directive for treatment taking place outside the EU.

5.1 Conclusions

It results from the SWOT analysis carried out for each contemplated policy option that no option is the only suitable option for proving equivalent treatment conditions of WEEE. They all present advantages and disadvantages with regard to essential criteria and requirements. Thus:

- Some policy options may be implemented immediately because they have been successively applied before (e.g., R2, e-Stewards, RQP and even AS/NZS 5377) or are more easily implementable because of greater flexibility (e.g., ex-post audit), while others are at the testing (WEEELABEX) or development stage (European standards);
- Not all options have a broad geographical scope: facilities have been effectively certified by R2/RIOS in OECD and non-OECD countries, others have been certified only in OECD countries but have the potential to further develop (e-Stewards, AS/NZS 5377), while some are currently limited to the EU, although they could also expand geographically (WEEELABEX, European standards). To the extreme, one option may potentially apply in any country (ex-post audit), while another is restricted in that it varies provincially (RQP);
- Some policy options include strong export control and traceability requirements (e-Stewards, RQP, AS/NZS 5377 and WEEELABEX), while others have milder requirements (R2/RIOS) or none at all (European standards). In the case of an ex-post audit, export control and traceability will have to be assessed by the auditor, but not within a specific system;
- WEEE falling under the WEEE Directive is not encompassed fully within each policy option. Thus, if the material scope of the policy option is equivalent to that of the Directive for the ex-post audit, WEEELABEX, the European standards and AS/NZS 5377, it is narrower for R2/RIOS, e-Stewards and RQP;
- While some policy options would cover all WEEE treatment stages, i.e. both treatment of WEEE and the recovery of materials coming from the treatment (ex-post audit – albeit with a certain subjectivity in case of a lack of specific standards to assess –, European standards, and AS/NZS 5377), others cover only the treatment of WEEE (WEEELABEX, R2/RIOS, e-Stewards, RQP). In the WEEE Directive there are no specific requirements mentioned for the recovery of materials removed from WEEE or coming from the treatment of WEEE.

Such requirements appear to be beyond the scope of the recycling targets addressed in Article 11(2) of the new WEEE Directive. The treatment requirements, which are the basis for this study in order to propose equivalent options, are described in Article 8 and Annexes VII and VIII of the Directive;

- If all policy options must take into account ESM of waste, albeit indirectly (European standards) or because of the direct application of international law (ex-post audit), only a few require specific ESM based on recognised standards such as ISO 14001 and OHSAS 18001 (in the case of R2/RIOS, e-Stewards, RQP). Others specifically require the implementation of an environmental management system (EMS) (and some cases EH&S) without explicitly referring to existing standards (WEEELABEX, and to a lesser extent AS/NZS 5377);
- Equivalent treatment requirements as those under the WEEE Directive (Article 8 of Directive, and Annexes VII and VIII thereof) are provided in WEEELABEX, European standards, AS/NZS 5377, R2/RIOS, e-Stewards and RQP. In the case of an ex-post audit, the auditor would have to determine equivalent conditions on the basis of the requirements of the WEEE Directive;
- Conformity assessments are, for most of the options, third-party evaluations, but they may be either a verification (WEEELABEX, RQP, ex-post audit), or a certification (R2/RIOS, e-Stewards). However, they can also be one or the other, or even first or second-party assessment (European Standards, AS/NZS 5377, and for a transitional period second-party verification for WEEELABEX). Certification may be limited to a specific aspect, such as for the EMS (e.g., RQP);
- Auditors are usually fully trained to each standard against which they will have to assess compliance. However, in the case of the ex-post audit it may be more difficult as there would be no precise standards/guidelines against which the auditor will assess compliance: it would depend on who the auditor/independent verifier is and his/her level of experience ;
- It is not always clear who pays the auditor. Independence is best guaranteed where auditors are paid by the CB (R2/RIOS, e-Stewards). In some cases, the verification body is linked either directly or indirectly to the industry (WEEELABEX, RQP). There could also be some conflict of interest where the auditor can be paid by a party with a specific interest in the positive outcome of the conformity assessment, such as a producer or the recycler himself (e.g., ex-post audit, European standards, AS/NZS 5377); and
- Cost estimates are not available for all policy options, and estimates provided by stakeholders do not necessarily cover similar aspects: some mention costs only for the audit itself, while others cover the cost of the audit as well as all internal costs generated by daily compliance with a specific standard (e.g., e-Stewards, European standards). Thus, impacts on SMEs for example are unclear given the current information available.

5.2 Recommendations

Out of the seven policy options that have been analysed, the project team would recommend excluding one of them from being considered sufficient to prove 'equivalent conditions', at least as it currently stands, while the remaining six could be retained but subject to certain conditions, which are necessary to ensure that all relevant requirements of the WEEE Directive are fully covered and, consequently, to ensure a level playing field.

5.2.1 Recommendations as to the exclusion of certain options

The analyses carried out lead the project team to suggest that RQP is not to be retained, with regard to the benefits vs. shortcomings analysis.

As highlighted in section 4.2.2.6 above, and in the preceding conclusions, RQP has some very interesting aspects, in terms notably of the export control and traceability systems, as well as the treatment requirements.

However, a very limiting issue is the narrow geographical scope of the standard. It is necessary to recall that RQP is so intertwined with Canadian legislation and in particular provincial legislation, as there is no federal oversight, that it is unlikely to be implemented internationally. This also entails that there is no generally accepted definition and categories of WEEE within RQP, as such definition and requirements depend on the specific provincial legislation where the facility to be certified is located.

Consequently, RQP is not deemed an adequate policy option to prove that exported WEEE has been treated under conditions that are equivalent to the requirements of the WEEE Directive.

5.2.2 Recommendations as to policy options that could be retained for proving "equivalent treatment conditions"

The project team considers that each one of the retained policy options can be considered as a suitable option for providing equivalent treatment conditions of WEEE and for this reason recommends to the Commission to include a list of alternatives instead of one preferred option.

Notwithstanding the specific policy options that could be considered as relevant to prove 'equivalent treatment conditions' for WEEE exported out of the EU, they all should share some common aspects, hereafter presented. Specific recommendations for each retained policy option are included in section 5.2.2.1. Recommendations for aspects common to all policy options

The following are aspects that the project team considers important to ensure the greatest efficiency for any policy option that would be adopted to prove the equivalency to the requirements of the WEEE Directive of treatment conditions for exported WEEE:

- All policy options will at a minimum include a statement of compliance (common to all options) with

- (i) the treatment requirements of WEEE Directive 2012/19/EU or with treatment requirements which are equivalent to those of the Directive;
 - (ii) the Regulation (EC) No 1013/2006 on shipments of waste (WSR); and
 - (iii) Regulation (EC) No 1418/2007.
- The application of any one of the proposed policy options should also be accompanied by a statement according to which the facility to which WEEE are exported is authorised to operate under the national legislation or national procedures of the country where the facility is established;
 - Concerning the type of conformity assessment, the project team is not in the position to make an objective recommendation on whether a third-party conformity assessment should be required or whether another type of assessment (e.g. self-declaration with liability statement) can also be sufficient.

It is noted that “third-party assessment” shall mean a conformity assessment performed by a person or body that is independent of the person or organisation that provides the object or service and of user interests in that object or service.⁷⁵ A third-party assessment may be:

- A certification, attesting that an entity complies with the requirements of specific standards, following an evaluation by a certifying body, which is itself accredited by an accreditation body; or
- A verification, using a third-party unaccredited evaluation process.

The conformity assessment could be a mandatory third-party assessment to avoid conflicts of interest since it is obvious that a third-party assessment is the more stringent requirement (which may speak in favour of this option), but can entail very significant administrative costs (which may speak in favour of a lighter system).

In addition to these aspects, the project team provides recommendations specific to each of the retained options, with the purpose to ensure a level playing field.

5.2.2.1 Recommendations specific to each retained policy option

Following the analysis of each option, the project team does not consider that one single policy option would be more relevant than another. The following paragraphs therefore aim at highlighting additional aspects that should be taken into account for each said option, to ensure their adequacy.

⁷⁵ ISO/IEC 17000 standard on conformity assessment – vocabulary and general principles (Step Initiative 2012)

► **Ex-post audit (Certification of compliance with the requirements of Directive 2012/19/EU by an independent verifier following a site inspection)**

An ex-post audit of compliance would ensure a certain degree of flexibility as to where WEEE originating from the EU is shipped for treatment, i.e. this option does not pose any geographical limitation as it can be applied to any country that legally receives WEEE for treatment.

However, such an audit would not necessarily be based on specific and detailed standards but on the sole requirements of the WEEE Directive and related legislation. In this respect, treatment requirements are not necessarily very detailed and, consequently, the assessment of compliance with these requirements could be rather subjective in the absence of any guidance.

Consequently, in order to ensure a level playing field, the project team recommends that the technical specifications to be developed by CENELEC on the treatment of WEEE or technical guidelines under any other proposed applicable option could be used as guidance for the auditors to assess the conformity of treatment conditions.

► **WEEELABEX standard on “Treatment of WEEE”**

Although not a certification scheme but a second or third-party verification, the application of the WEEELABEX standard on “Treatment of WEEE” is a relevant option as the WEEELABEX standard and verification framework is very comprehensive and already in existence.

► **“Responsible Recycling” (R2) standard and the “Recycling Industry Operating Standard” (RIOS) (R2/ RIOS standard) (R2/RIOS standard)**

R2/RIOS has the clear advantage of being applied worldwide. However, this standard has certain shortcomings in the light of the requirements of the WEEE Directive (i.e. it does not cover all WEEE falling within the scope of the WEEE Directive).

The project team therefore recommends to limit the recognition of the equivalency of treatment conditions to WEEE covered by R2/RIOS to WEEE falling under its scope.

► **e-Stewards standard for Responsible Recycling and Reuse of Electronic Equipment**

Similar to R2/RIOS, e-Stewards standard has shortcomings related notably to its material scope. LHAs (and in particular C&F appliances) do not fall within its scope. However, most of the non-hazardous WEEE exported by the EU to non-OECD countries is IT and audio equipment, so e-Stewards remains interesting.

Consequently, the project team recommends to limit the recognition of the equivalency of treatment conditions to WEEE covered by e-Stewards.

► **European standards (EN standards) for the treatment of WEEE**

The CENELEC EN standards can be retained as a stand-alone policy option for exported WEEE, provided that export control and traceability requirements are achieved through the ‘statement of compliance with the requirements on shipments of waste set out in Regulation (EC) No 1013/2006 and Regulation (EC) No 1418/2007’ (which, as mentioned above, is proposed for all the policy options).

The European standards currently being developed by CENELEC will be highly valuable once adopted as they will cover all technical aspects of treatment of WEEE and will have to identify

those requirements that are necessary to comply with the WEEE Directive from informative treatment requirements going beyond the strict requirements of the Directive.

The fact that the CENELEC standards are currently being drafted, and hence cannot be implemented at present, is not in itself problematic as the standards will ultimately be approved and published.

► **Australian/New Zealand standard AS/NZS 5377 on “Collection, storage, transport and treatment of end-of-life electrical and electronic equipment”**

The AS/NZS 5377 standard is relevant as it was inspired notably by the EU WEEE Directive and, consequently, the requirements it contains appear globally equivalent to those of said Directive and even goes beyond the binding treatment requirements of the Directive covering both treatment of WEEE and treatment of materials coming from WEEE.

If it is decided, according to the above-mentioned, that the conformity assessment must be carried out by a third party, this would be an additional recommendation for this policy option.

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Annex: List of stakeholders consulted

The project team contacted a list of 45 stakeholders, of which 22 responded. The following list provides the identity of the stakeholders interviewed, their organisation and the country where they are located.

Organisation	Category	Contact	Country
AGORIA	Producers & Recyclers (trade association)	Patrick Van den Bossche	Belgium
AMDEA – Association of Manufacturers of Domestic Appliances	Producers	Richard Hughes	UK
BOSCH AND SIEMENS HOME APPLIANCES GROUP	Producers	Christian Dworak	Germany
CECED – European Committee of Domestic Equipment Manufacturers	Producers (trade association)	Korrina Hegarty	Belgium
Dataserv	Recyclers	Amit Sardana	India
E Waste Systems Inc	Recyclers	Martin Nielson	USA and UK
EERA – European Electronics Recyclers Association	Recyclers (trade association)	Norbert Zonneveld	The Netherlands
EPRA – Electronic Products Recycling Association	Recyclers (trade association)	Shelagh Kerr	Canada
e-Stewards	Standards	Sarah Westervelt Jim Puckett	USA
EUROMETAUX – European Association of Metals	Producers	Annick Carpentier	Belgium
Lighting Europe	Producers (trade association)	Marc Guiraud, Lighting Europe Klaus Meyer-Pohl, Zumtobel Zoltan Pilter, GE Lighting Andreas Adam, Osram Nigel Harvey, Recolight/LIA	Belgium
Ministry of the Environment of New Zealand	National authority	Helen Bolton	New Zealand
NCER – National Center for Electronics Recycling	Recyclers (association)	Jason Linnell	USA
NERC – Northeast Recycling Council	Recyclers (NGO)	Lynn Rubinstein	USA
ORGALIME – European Engineering Industries Association	Producers (trade association)	Sigrid Linher	Belgium

Organisation	Category	Contact	Country
R2 Solutions	Standards	John Lingelbach	USA
RIOS	Standards	David Wagger	USA
RONA - Recycling Organizations of North America	Recyclers (trade association)	Anne Peters	USA
SAMSUNG Electronics	Producers	David Scuderi	United Kingdom
StEP Initiative – Solving the E-waste Problem	Think tank	Ruediger Kuehr	Germany
Umicore	Producers	Dr. Christian Hageluken	Belgium
WEEE Forum	Standards	Pascal Leroy	Belgium



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