# Waste Stream

## Name

Electronic and electronic waste (E-waste). ([[1]](#endnote-2))

## Waste description

E-waste consists of electrical and electronic equipment that is no longer suitable for use or that the last owner has discarded with the view of its disposal i.e. recycling, recovery or disposal not leading to recovery.

E-Waste may contain hazardous substances such as lead, cadmium, mercury, POPs, asbestos and CFCs that pose risks to human health and the environment when improperly disposed of or recycled and that require specific attention as to their environmentally sound waste management. ([[2]](#endnote-5))

## Information on waste / non-waste classification

National provisions concerning the definition of waste may differ and, therefore, the same material may be regarded as waste in one country but as non-waste in another country. Determining whether a substance or object is or not a waste may not always be straightforward; however, it is ultimately the mandate of the national competent authority on waste to decide when an item is to be defined as waste or non-waste. Further work on clarifying this matter under the Basel Convention is in progress ([[3]](#endnote-6)).

To determine if used equipment is waste it may be necessary to examine the history of an item and its proposed fate on a case-by-case basis. However, there are characteristics of the used equipment that are likely to indicate whether it is waste or not.

As a general rule, if the equipment is defined as, or considered to be waste by local regulations, the equipment should be considered to be waste; and if the equipment still is fully functional and can be directly reused, the equipment should not be considered to be waste ([[4]](#endnote-7)). According to the Basel Convention, used equipment should normally be considered waste if: either the equipment is not complete with essential parts missing; or if it shows a defect that materially affects its functionality and fails relevant functionality tests; or if it shows physical damage that impairs its functionality; or if the protection against damage during transport, loading and unloading operations is inappropriate (e.g. the packaging or stacking of the load is insufficient); or if the appearance is particularly worn or damaged; or if the item has among its constituent part(s) hazardous components that are required to be discarded or are prohibited to be exported or used in such equipment under national legislation; or if the equipment is destined for disposal or recycling instead of reuse or its fate is uncertain; or if there is no regular market for the equipment; it is destined for cannibalization; or if the price paid for the items is significantly lower than would be expected from fully functional equipment intended for reuse.

## Classification under the Basel Convention (Annexes I, II, III, VIII and/or IX)

E-Waste is included in Annex VIII to the Convention with the following entry for hazardous wastes:

* “A1180 Waste electrical and electronic assemblies or scrap ([[5]](#endnote-9)) containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB capacitors, or contaminated with Annex I constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex III (note the related entry on list B, B1110).” ([[6]](#endnote-10))

E-Waste is also included in Annex IX to the Convention with the following entry for non-hazardous wastes:

* “B1110 Electrical and electronic assemblies:
	+ Electronic assemblies consisting only of metals or alloys;
	+ Waste electrical and electronic assemblies or scrap ([[7]](#endnote-11)) (including printed circuit boards) not containing components such as accumulators and other batteries included on list A, mercury-switches, glass from cathode-ray tubes and other activated glass and PCB-capacitors, or not contaminated with Annex I constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex III (note the related entry on list A A1180);
	+ Electrical and electronic assemblies (including printed circuit boards, electronic components and wires) destined for direct reuse ([[8]](#endnote-12)), and not for recycling or final disposal.” ([[9]](#endnote-13))
* Equipment will often contain hazardous components, examples of which are indicated in entry A1180 of Annex VIII. E-Waste should therefore be presumed to be hazardous waste unless it can be shown that it does not contain such components and in particular. ([[10]](#endnote-14))
	+ Lead-containing glass from cathode ray tubes (CRTs) and imaging lenses, which are assigned to Annex VIII entries A1180 or A2010 “glass from cathode ray tubes and other activated glass”. This waste also belongs to category Y31 in Annex I, “Lead; lead compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13 included in Annex III;
	+ Nickel-cadmium batteries and batteries containing mercury, which are assigned to Annex VIII entry A1170 “unsorted waste batteries…”. This waste also belongs to category Y26 in Annex I, “Cadmium; cadmium compounds” or Y29 “Mercury, mercury compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;
	+ Selenium drums, which are assigned to Annex VIII entry A1020 “selenium; selenium compounds”. This waste also belongs to category Y25 in Annex I, “Selenium; selenium compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;
	+ Printed circuit boards, which are assigned to Annex VIII entry A1180 “waste electronic and electrical assemblies……”, and entry A1020 “antimony; antimony compounds” and “beryllium; beryllium compounds”. These assemblies contain brominated compounds and antimony oxides as flame retardants, lead in solder and beryllium in copper alloy connectors. They also belong in Annex I, to categories Y31, “Lead; lead compounds”, Y20, “Beryllium, beryllium compounds” and Y27 “Antimony, antimony compounds” and Y45, organohalogen compounds other than substances referred to elsewhere in Annex I. They are likely to possess hazard characteristics H6.1, H11, H12 and H13;
	+ Fluorescent tubes and backlight lamps from liquid crystal displays (LCD), which contain mercury and are assigned to Annex VIII entry A1030 “Mercury; mercury compounds”. This waste also belongs to category Y29 in Annex 1, “Mercury; mercury compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;
	+ Plastic components containing brominated flame retardants (BFRs), in particular BFRs that are persistent organic pollutants according to the Stockholm Convention, which can be assigned to Annex VIII entry A3180 “Wastes, substances and articles containing, consisting of or contaminated with polychlorinated biphenyl (PCB), polychlorinated terphenyl (PCT), polychlorinated naphthalene (PCN) or polybrominated biphenyl (PBB), or any other polybrominated analogues of these compounds, at a concentration of 50 mg/kg or more.” This waste also belongs to category Y45 in Annex I, organohalogen compounds other than substances referred to elsewhere in Annex I and to category Y27 “Antimony, antimony compounds” and is likely to possess hazard characteristics H6.1, H11, H12 and H13;
	+ Other components containing or contaminated with mercury, such as mercury switches, contacts and thermometers, which are assigned to Annex VIII entry A1010, A1030 or A1180. This waste also belongs to category Y29 in Annex I,” Mercury; mercury compounds” and is likely to possess hazard characteristics H6.1, /H11, H12 and H13;
	+ Waste oils/liquids, which are assigned to annex VIII entry A4060 “Waste oil/water, hydrocarbons/water mixtures, emulsions”. The waste belongs to category Y8 in Annex I, “Waste mineral oils unfit for their originally intended use” or Y9 in Annex I, “Waste oil/water, hydrocarbons/water mixtures, emulsions”, and is likely to possess hazardous characteristics H3, H11, H12and H13;
	+ Components containing asbestos, such as in wires, cooking stoves and heaters, which are assigned to annex VIII entry A 2050. The waste belongs to category Y 36 in Annex I, “Asbestos (dust and fibers)” and is likely to possess hazardous characteristic H11.

## Basel Convention guidelines and other guidelines/instruments

General guidelines:

* Draft Technical Guidelines on Transboundary Movements of E-Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-waste under the Basel Convention (2013) – Available at http://www.basel.int/Portals/4/download.aspx?d=TGs-eWaste-Draft-20131223.doc
* E-waste Inspection and Enforcement Manual Developed in the framework of the SBC E-waste Africa project – Available at http://www.basel.int/Implementation/Ewaste/EwasteinAfrica/Overview/ToolkitonEwasteInspectionandEnforcement/tabid/3160/Default.aspx
* United Nations Environment Programme (UNEP)- International Environmental Technology Centre Osaka (IETC): (a) E-Waste Vol. 1: Inventory Assessment Manual (Dec 2007); (b) E-Waste Vol. 2: E-Waste Management Manual (Dec 2007); (c) E-Waste Volume III - WEEE/E-Waste “Take back system” (August 2013) – Available at http://www.unep.org/ietc/InformationResources/Publications/tabid/56265/Default.aspx#WastePubTop
* International Labour Organization (ILO) The global impact of E-Waste: Addressing the challenge. Geneva (2012) – Available at http://www.ilo.org/wcmsp5/groups/public/---ed\_dialogue/---sector/documents/publication/wcms\_196105.pdf

Waste-specific guidelines:

* Organization for Economic Co-operation and Development. Environment Directorate. Environment Policy Committee. Working Group On Waste Prevention And Recycling. Technical Guidance for The Environmentally Sound Management Of Specific Waste Streams: Used And Scrap Personal Computers. ENV/EPOC/WGWPR(2001)3/FINAL (2003) – Available at <http://ban.org/library/OECDGuidelineWEEE.pdf>
* Basel Convention Mobile Phone Partnership Initiative (MPPI). Guidance document on the environmentally sound management of used and end-of-life mobile phones (2012) – Available at http://www.basel.int/Portals/4/download.aspx?d=UNEP-CHW-EWASTE-GUID-PUB-MobilePhones-201302.English.pdf
* Basel Convention Partnership for Action on Computing Equipment (PACE), Partnership for Action on Computing Equipment Revised guidance document on the environmentally sound management of used and end-of-life computing equipment (2013) – Available at [file:///C:/Users/jrihm/Downloads/UNEP-CHW.11-6-Add.1-Rev.1.English%20(1).pdf](file:///C%3A/Users/jrihm/Downloads/UNEP-CHW.11-6-Add.1-Rev.1.English%20%281%29.pdf)

# Waste Management

## General handling

Appropriate personal protective equipment (PPE) should be worn and Materials Safety Data Sheet (MSDS) should be readily available to all workers who seek additional information about potential hazards and the appropriate corrective action in the event of an accident.

E-Waste should be stored, handled and transported in accordance with national legislation, where there is no adequate legislation; the Basel Convention Technical Guidelines should be consulted.

## Dismantling and Segregation / Separation

Dismantling and segregation of E-Waste are the first steps towards recycling of these types of wastes. Specifically, dismantling of E-Waste may be carried out manually or mechanically depending upon the scale of operations and the E-Waste being handled. Manual Dismantling should only involve the used electronic and electrical equipment where there is no likelihood for being in contact with hazardous substances.

For instance, the Directive 2012/19/EU of the European Parliament of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE) the member states of the European Union (EU) should make sure that the Categories of EEE of the Annex I (see section 5) covered is collected and treated separately.

E-waste segregation involves separation of equipment according to its level of difficulty to dismantle, and its hazardousness. Segregation can be done either before the equipment is dismantled or after.

## Collection

The collection of E-Waste shall be carried out in a way, which optimizes reuse and recycling of those components or whole appliances capable of being reused or recycled.

There are many approaches through which some countries may undertake an organized/coordinated approach to collection of E-Waste. In some countries, the responsibility for collection of E-Waste and/or other types of waste is left entirely at the hands of local/state/regional authorities. In some countries/regions/states/municipalities, specific schemes for collection of E-Waste by producers or manufacturers is an important element of E-Waste collection and subsequent reuse, recycling, and/.or disposal.

Typically, there are three primary channels for E-Waste collection, all of which address “business to consumer” (B2C) and “business to business” (B2B) E-Waste collection. These channels are municipal sites, in-store retailer take-back schemes and producer take-back schemes.

Generally, municipal collection sites are available for households to use to an unlimited extent free of charge, while take-back through retailers is usually free of charge, but may be dependent upon the purchase of a new product (both B2C and B2B).

The direct producer take-back system may apply to larger commercial equipment and operates on a “new for old” basis (B2B).Such schemes are referred to as Extended Producer Responsibility whereby a producer or manufacturer is responsible for his products he may be involved in the establishment of collected during the take back system programs for end of use electronic and electrical equipment. In other countries, producers/manufacturers may be responsible for partially funding such collection efforts which are undertaken by public authorities, the private sector, or other entities.

## Storage

The following measures should be adopted: (a) the storage areas (specially before treatment) are likely to need weatherproof covering to prevent contamination of water run-off; (b) impermeable surfaces should be providing for appropriate areas, including spillage collection systems (if there is a possibility of leakage of some component), for instance, impermeable pavement and sealed drainage system could be used as the primary means of containment; (c) it is advisable to have on site spill kits.

## Packaging and labelling

Appropriate containers should be used for storing different E-Waste items separately, considering hazardous characteristics (if applies), compatibility and further treatment, and therefore should be no mixing of different types of E-Waste.

Containers should be clearly labelled to identify their contents and must be secure so that liquids, including rainwater. For specific types of E-Waste, such as used and scrap CRTs and CRT glass should be packaged in a way that minimizes breakage during normal shipping conditions. In addition, the packaging should minimize releases to the environment if unintentional breakage does occur during transport. For example, if CRTs are shrink wrapped onto a pallet in such a way that broken pieces might not be contained; the entire shrink-wrapped pallet should be placed in a container outside package that will minimize releases. CRTs with broken glass, glass pieces and glass cullet should be packaged in sift proof containers that prevent particles from being released from the package and whose effectiveness will not be reduced during normal shipping conditions. Shredded circuit boards, not containing batteries, should be packaged in containers that prevent particles from being released from the package and whose effectiveness will not be reduced during normal shipping conditions.

## Transportation

Regarding transportation, the vehicles should be properly marked with placards identifying the fact that hazardous products could be transported (depending the type of EW-Waste). Transport vehicles should be outfitted with the equipment necessary to neutralize any simple spillage or leakage problems, and the transport personnel trained on how to use it. All releases should be immediately contained.

Emergency response information—Emergency Response Intervention Cards (ERICards) ([[11]](#endnote-15)), Emergency Response Guides ([[12]](#endnote-16))—should accompany shipments of hazardous waste to provide guidance on initial actions in response to a transport accident.

# Disposal Operations (Annex IV, Sections A and B)

The major approach to treat E-waste is to first reduce the concentration of the hazardous chemicals and elements through decontamination/ dismantling, recycling and recovery of items of economic value and finally dispose E-waste fractions through either incineration or landfilling or a combination of both.

E-Waste contains valuable materials that can be recovered for recycling including iron, aluminum, copper, gold, silver, platinum, palladium, indium, gallium and rare earth metals, thus contributing to sustainable resource management. The extraction of all of these metals from the Earth has a significant environmental impact. The use of such materials as raw materials after they have become waste can increase the efficiency of their use and lead to conservation of energy and reduction in greenhouse gas emissions when adequate technologies and methods are applied.

The techniques used by the informal recovery sector are not only damaging human health and the environment, often they also perform poorly in recovering valuable resources, squandering precious resources such as critical metals for future use. Even management of non-hazardous wastes can cause significant harm to human health and the environment if not undertaken in an environmentally sound manner. ([[13]](#endnote-19))

The removal prior to any further treatment is indispensable if at least one of the following conditions applies:

* Hazardous substances or components cannot be controlled in subsequent treatment processes;
* These substances or components otherwise disturb treatment processes of E-Waste, fractions or materials thereof in operations of the initial or downstream operators thus compromising the quality of the recycled materials;
* These substances or components otherwise end up in incineration or on landfill sites, which are not equipped to accept them;
* These substances or components otherwise end up in incineration or on landfill sites, even though recycling would be the environmentally better option.

Regarding reuse and refurbishment: A used personal computer can be used by another person, without change. This is the most common first disposition of a personal computer. Another alternative is the Refurbishment and Reuse: A personal computer can be refurbished or upgraded. Component Reuse: A personal computer can be disassembled for recovery of working electronic components.

The necessary measures for assuring environmentally sound recycling of used personal computers are, to a large degree, facility-specific. This is because the potential for adverse impacts on worker health and the environment is basically dependent upon the nature of the refurbishment, dismantling or materials recycling activities that are used at a particular facility. Similarly, the appropriate degree of governmental control and oversight is dependent upon which of these activities are engaged in, as well as the magnitude of the operations.

The risks posed to workers and the environment at refurbishment facilities (depending on local definitions could be a waste management facility) are generally quite small. This is because used PCs are manually repaired or upgraded with great care, i.e., destructive means are not used which would make used PC components unusable and could result in the release of hazardous constituents to the workplace or surrounding environment. The principal environmental issues posed by refurbishment facilities relate to the adequacy of storage of PC components on site and the adequacy of off-site destinations for unusable components.

Large refurbishment facilities may be inspected on a regular basis by the competent authority for compliance with the conditions of the facility authorization.

These facilities should maintain a financial instrument that will assure that, in the case of (1) gross mismanagement of used PCs or components or (2) closure of the facility, the facility will be properly cleaned up.

Dismantling: The degree of hazard posed to workers and the environment also varies greatly and is dependent upon the specifics of individual facility operation. Dismantling facilities, in general, require closer control than is described above for refurbishment facilities. The facility authorization (license or permit) should describe the capacity of the operation, particularly the amount of hazardous wastes that are allowed to be kept on site. This will assure that the capacity of storage areas is not exceeded and hazards to human health and the environment during operation or, in the case of unexpected facility closure, are minimized. Facilities should manage all materials to minimize adverse exposures to workers and releases to the environment. Dismantling operations, as well as storage of any components that contain hazardous substances, should be conducted indoors, with impervious floors. Storage areas should be adequate to hold all processed and unprocessed inventory.

Raw Material Recovery: Facilities that engage in raw material recovery, e.g., smelting, will require a higher degree of governmental environmental oversight, commensurate with the environmental concerns that arise from their activities. Raw material recovery often involves the generation of emissions or residues that require careful control in order to avoid adverse impacts on worker health, as well as human health generally, and the environment.

Incineration: Advantage of incineration of E-Waste is the reduction of waste volume and the utilization of the energy content of combustible materials. Some plants remove iron from the slag for recycling. By incineration some environmentally hazardous organic substances are converted into less hazardous compounds.

Preferably, combustible fractions should be burned for energy recovery, as this method is higher in the waste management hierarchy than burning without energy recovery or landfilling. The incinerator or other combustion unit (with or without energy recovery) should be operated to minimize the formation of furans and dioxins, as well as be equipped with state-of-the-art flue gas cleaning systems. Combustion ash, as well as materials from the processing of used PCs that cannot be recycled, should be disposed of in an environmentally sound and appropriately authorized landfill.

It´s important to highlight that many countries do not have, until this moment, the technical capacity to develop, implement and manage the facilities that will guarantee the high security level to prevent the generation of POPs during the incineration process.

Final Disposal: It is possible that some components of used PCs cannot be recycled. These components, likely to principally be plastics or resins with halogenated flame retardants, will need to be landfilled in an environmentally sound manner (although some countries may prohibit landfilling of such wastes while others may prohibit the burning of such wastes in favor of landfilling).

# Sustainable Materials Management (SMM)

Sustainable Materials Management (SMM) is increasingly recognized as a policy approach that can make a key contribution to green growth and the challenges that are posed by sustained global economic and demographic growth. One of the key challenges of the SMM approach is to effectively address the environmental impacts that can occur along the life-cycle of materials, which frequently extends across borders and involves a multitude of different economic actors. ([[14]](#endnote-21))

## Extended Producer Responsibility (EPR)

Extended Producer Responsibility (EPR) is a policy principle that aims to reduce the environmental impacts of a product by extending the responsibility of manufacturers to stages of the product’s life cycle that were traditionally not included.

In general, the collection part of the EPR consists of three steps: 1) collection from consumers, 2) sorting of the collected products, and 3) transportation of the collected products to the recycling plants. Then, once the used products are collected from private households, producers are responsible for the arrangement of all or part of the transportation. Allocation of financial responsibility with regard to the collection more or less corresponds to the allocation of physical responsibility of the producers, and the physical management and information management that is conducted by the respective (Producer Responsibility Organizations (PROs).

## Reduction of the Hazardous Substances (RoHS) in the Electronic & Electrical Equipment

There is an increasing trend in the reduction in the use of hazardous substances such as lead, cadmium, mercury, polychlorinated biphenyls (PCBs) and other toxic and hazardous substances for which safe substitutes have been found.

Many countries (and local companies) have adopted the RoHS regulations in the manufacture of electrical and electronic equipment through local regulations (see section 5, and international agreements, such POPs Convention and Minamata Convention). For instance The Restricting the Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive (2002/95/EC) has been in force since 2003. Its purpose is to restrict the use of hazardous substances in electrical and electronic equipment and contribute to the protection of human health and the environmentally sound recovery and disposal of E-Waste.

# Legislation

There are several examples of dedicated legislation for the proper management of E-Waste, at national, regional and international level, for instance:

Europe: The EU WEEE Directive, 2012/19/EU ([[15]](#endnote-24)) establish that a producer takes responsibility for the end-of-life management of his/her own products (individual responsibility), or producers of the same product group together fulfil their responsibility for the end-of-life management of their products regardless of the brand (collective responsibility) ([[16]](#endnote-25)).The Directive’s scope covers 10 categories of electrical and electronic equipment (EEE) as defined in Annex IA: Large household appliances; Small household appliances; IT and telecommunications equipment; Consumer equipment and photovoltaic panels; Lighting equipment; Electrical and electronic tools (with the exception of large-scale stationary industrial tools); Toys, leisure and sports equipment; Medical devices -with the exception of all implanted and infected products-; Monitoring and control instruments; and Automatic dispensers. From 15 August 2018 all EEE shall be classified within the categories set out in Annex III- six categories. ([[17]](#endnote-26))

Japan: The Specified Home Appliance Recycling Law (2001) establish regard to the four specified post-consumer use home appliances, namely air conditioners, television sets, refrigerators and washing machines, this law stipulates the rolls of each player; the collection from consumers by retailers, recycling by manufacturers or importers as well as payment of fees for collection, transportation and recycling by consumers when they discard those appliances. Under the law, manufacturers or importers are required to meet the target of recycle rate (50-60%) in recycling post-consumer use home appliances, in addition to recovering CFCs from air conditioners and refrigerators. The role of the government is stipulated to provide necessary information on recycling or imposing recommendation, order and penalty on the business entities that make improper claims. In order to ensure that the post-consumer use specified kinds of home appliances are delivered from consumers to manufacturers via retail stores, a manifest system is established. This is a system in which consumers can check up that the waste they discharged has been correctly transported and disposed of. ([[18]](#endnote-27))

United States of America: There is no Federal Law mandating the recycling of E-Waste. The U.S. State regulatory requirements for E-Waste can be more stringent than the Federal requirements and vary from state to state. 25 of the 50 U.S. states have passed legislation mandating statewide E-Waste recycling. For instance some states have developed or are in the process of developing Universal Waste exemptions for CRTs, which also streamlines management of CRTs bound for recycling.

# Capacity and Feasibility

Ideally, a government should identify the resources needed to build up a national network of disposal facilities for e-waste that could operate in the same network of industrial hazardous and non-hazardous waste, considering the different of types of E-Waste.

It is essential to ensure an environmentally sound management (ESM) in the whole management process; for instance in any disposal facility appropriate personal protective equipment (PPE) should be worn, and Materials Safety Data Sheet (MSDS) should be readily available for employees to seek additional information about potential hazards and the appropriate corrective action in the event of an accident.

Information on disposal and recovery facilities authorized, permitted or registered to operate in the territories of the Parties to the Basel Convention, is provided in the Online Reporting Database of the Basel Convention, which contains data transmitted by Parties pursuant to Article 13 (3) of the Convention. The database is accessible through the Basel Convention website on: http://www.basel.int/Countries/NationalReporting/ReportingDatabase/tabid/1494/Default.aspx.

# Permitting

Waste facilities should be licensed/authorized/permitted. If there is no licensed smelter and the scrap exporter is the conduit for effective recovery, then the exporter should not only be licensed and achieve high standards of environmental protection in any storage facility, but also should present a detailed set of operating procedures describing its activities and those of its partners in other countries in order to facilitate governmental actions in the regional scenario.

# Enforcement

The ESM of wastes requires a regulatory and enforcement infrastructure that ensures compliance with legal instruments and standards. Consideration should be given to a national (and sometimes a regional) policy that includes provisions to allow prompt, adequate and effective enforcement actions to be undertaken, including sanctions and penalties that will serve as a deterrent to non-compliance.

Many nations either lack adequate regulations applying to this relatively new waste stream, or lack effective enforcement of new E-Waste regulations ) ([[19]](#endnote-28)). Insufficient enforcement and illegal activities are common problems. Furthermore, regulations should be designed in conjunction with the establishment of formal recycling infrastructure. In addition, the global character of the E-Waste trade creates complexities for law enforcement. International cooperation in law enforcement requires a range of responses including regulatory harmonization, physical inspection of transports, and dissemination of information on offending export companies.

In particular of the avoidance of illegal export and dumping, the relation to the quality control, it is essential to monitor and prohibit illegal export, either as second hand products, or components/materials to be recycled. Illegal export threats the environment and health of the people in the importing counties through recycling activities performed under lax environmental and health standard. Adequate penalties and sanctions for illegal traffic should discourage such movements in the future.

# Certification and Auditing Systems

It is recommended that licensed waste management facilities should be subject to annual inspections by the appropriate government agencies and/or audits by a recognized independent auditor. The objective of the inspection and/or auditing procedure would be to: check conformance of the facility with all basic requirements to ensure the ESM of wastes, with relevant environmental regulations, and, if applicable, current EMS systems. Verifying compliance with existing laws and regulations is embodied in the European Community Eco-Management and Audit Scheme (EMAS). Under ISO 14001, a facility is required to know whether or not it is in compliance with applicable laws and regulations; without that knowledge, the facility would be considered out of conformance with that ISO standard. The inspection and/or audit should also assess the performance of the facility with respect to environment, health and safety objectives. ([[20]](#endnote-29))

Quality standards for the treatment of E-Waste are considered as a mean to improve the treatment quality and to create market transparency on quality. Such standards aim at operationalizing legal requirements in order to make the operators’ compliance checkable. ([[21]](#endnote-30))

Internationally, there is no commonly adopted and compulsory method for how to calculate the recovery and recycling rates (percentage of waste recovered). For instance, the calculations may be based on flat rates (most commonly used in Germany), a hard disk drive, for example, which was treated at a pre-processor and then given into a recycling process, is accounted with 80 % recycling and 20 % of energy recovery resulting in 100 % recovery. In the end, each treatment operator may have his own calculation method. The calculation method shall be, however, part of the treatment operators’ certification.

# Transboundary Movements

There is currently a high level of transboundary, often illegal, movement of E-Waste into developing countries for cheaper recycling. It is estimated that up to 80 per cent of all E-Waste sent for recycling in developed countries ends up in informal E-Waste recycling sites in developing countries, primarily in Africa and Asia. ([[22]](#endnote-32))

Governments should put in place legal requirements to implement and enforce the provisions of relevant international and/or regional instruments in relation to the transboundary movement of E-Waste, including the Basel Convention

Notifications received by the Secretariat of the Basel Convention from Parties—pursuant to Article 13 of the Convention—on decisions to prohibit or restrict the import/export of hazardous or other wastes are published on the website of the Secretariat ([[23]](#endnote-33)).

Transboundary movements of recoverable wastes within the OECD area are governed by the revised OECD Council Decision [C(92)39/FINAL] on the control of Transboundary Movements of Wastes Destined for Recovery Operations [C(2001)107/FINAL]. Movement of used PCs and components that are considered Amber wastes by the country of export or import, will need to be notified to the competent authorities of countries concerned. Movements concerning Green wastes or non-wastes, need not be notified and are not subject to controls other than those normally applied to commercial transactions. Some OECD countries have begun to use the OECD Council Decision C(2001)107/FINAL to control transboundary movements of used PCs and other used electronics and electronic wastes.

1. For the purpose of this document is no difference with the term WEEE, Waste of Electrical and Electronic Equipment. [↑](#endnote-ref-2)
2. Basel Convention: Draft Technical Guidelines on Transboundary Movements of E-Waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction between Waste and Non-waste under the Basel Convention”. December 2013. [↑](#endnote-ref-5)
3. For further information, refer to the development of “Technical Guidelines on Transboundary Movements of E-waste and Used Electrical and Electronic Equipment, in Particular Regarding the Distinction Between Waste and Non-waste Under the Basel Convention” (http://www.basel.int/Implementation/TechnicalMatters/DevelopmentofTechnicalGuidelines/Ewaste/tabid/2377/Default.aspx), the development of Guidance to Provide Further Legal Clarity in Relation to “Used and End-of-life Goods” (http://www.basel.int/Implementation/LegalMatters/CountryLedInitiative/OutcomeofCOP10/Providingfurtherlegalclarity/tabid/2673/Default.aspx), and the development of a Glossary of Terms to provide additional legal clarity with respect to certain terms used in the Convention (http://www.basel.int/Implementation/LegalMatters/LegalClarity/tabid/3621/Default.aspx). [↑](#endnote-ref-6)
4. For further reference of the ongoing work on the E-Waste guidelines: (a) Swiss Confederation. Federal Office for the Environment (FOEN), Exporting consumer goods – Second-hand articles or waste? 2011; (b) Austria, Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft. Manual Export/Transboundary Shipment of “Used Goods”. 2014 [↑](#endnote-ref-7)
5. This entry does not include scrap assemblies from electric power generation. [↑](#endnote-ref-9)
6. PCB containing capacitors and transformers is a special kind of E-Waste. PCB waste is also covered by the Stockholm Convention. PCBs are at a concentration level of 50 mg/kg or more. [↑](#endnote-ref-10)
7. This entry does not include scrap from electrical power generation. [↑](#endnote-ref-11)
8. Reuse can include repair, refurbishment or upgrading, but not major reassembly. [↑](#endnote-ref-12)
9. In some countries these materials destined for direct reuse are not considered wastes. [↑](#endnote-ref-13)
10. The following list of components or constituents are non-exhaustive examples. [↑](#endnote-ref-14)
11. For further information, refer to http://www.ericards.net/ [↑](#endnote-ref-15)
12. For further information, refer to http://www.tc.gc.ca/eng/canutec/guide-menu-227.htm or http://phmsa.dot.gov/hazmat/library [↑](#endnote-ref-16)
13. GIZ/ SweepNet, ANGed. Analysis of Existing E-Waste Practices in MENA Countries Regional Study The Regional Solid Waste Exchange of Information and Expertise Network in Mashreq and Maghreb Countries (SWEEP-Net). 2014 [↑](#endnote-ref-19)
14. OECD. Sustainable Materials Management Making Better Use of Resources. 2012 [↑](#endnote-ref-21)
15. WEEE Directive 2003 Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on Waste Electrical and Electronic Equipment. Available from <http://eurlex>.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L 0096:EN:NOT.

Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)Waste Directive 2008 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (Waste Framework Directive, replacing Directive 2006/12/EC and Directive 75/442/EEC), Available from http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT [↑](#endnote-ref-24)
16. For further reference of European countries there are summary of regulations available in http://scp.eionet.europa.eu/facts/factsheets\_waste/2011\_edition/legislation [↑](#endnote-ref-25)
17. Article 2b: “from 15 August 2018, subject to paragraphs 3 and 4, to all EEE. All EEE shall be classified within the categories set out in Annex III”: 1. Temperature exchange equipment; 2. Screens, monitors, and equipment containing screens having a surface greater than 100 cm2; 3. Lamps; 4. Large equipment (any external dimension more than 50 cm); 5. Small equipment (no external dimension more than 50 cm); 6. Small IT and telecommunication equipment (no external dimension more than 50 cm). [↑](#endnote-ref-26)
18. Available at http://www.env.go.jp/en/laws/recycle/08.pdf [↑](#endnote-ref-27)
19. Basel Action Network (BAN). 2011. Toxic trade news: “Cochin Port a safe conduit for imported E-Waste”; “Most aspects of E-Waste not regulated in U.S., Va.”\ Available: http://www.ban.org/ [↑](#endnote-ref-28)
20. Organisation for Economic Co-operation and Development (OECD). 2007. Guidance Manual on Environmentally Sound Management of Waste. Available at http://www.oecd.org/env/waste/39559085.pdf [↑](#endnote-ref-29)
21. For further references: WEEELABEX 2011 WEEE Forum: European standards with respect to collection, treatment, recovery and recycling of waste electrical and electronic equipment (WEEE) and monitoring the processing companies. Available form http://www.weeeforum.org/weeelabexproject. [↑](#endnote-ref-30)
22. International Labour Organization (ILO) The global impact of E-Waste: Addressing the challenge. Geneva 2012. [↑](#endnote-ref-32)
23. For further information, refer to http://www.basel.int/Countries/ImportExportRestrictions/tabid/1481/Default.aspx [↑](#endnote-ref-33)