References and additional resources

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WEEELABEX
http://www.weee-forum.org/weeelabexproject

WEEE Forum ReP tool
http://www.weee-forum.org/services/weee-forum-reporting-tool-wfreptool

R2 Standard
http://www.epa.gov/wastes/conserve/materials/ecycling/certification.htm & http://www.r2solutions.org/

e-stewards
http://e-stewards.org/

UNEP/IETC E-waste Manuals
http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/EWasteManual_Vol1.pdf
http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/EWasteManual_Vol2.pdf

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Ministry of the Environment

3R Policy Indicators Factsheets Series

Standards for Collection, Storage, Transport, Recovery, Treatment and Disposal to Ensure Environmentally Sound Management of E-waste

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01 Outline of indicator

Global sales of electrical and electronic equipment (EEE) have been rising significantly over the last few years. The rapid uptake of information technology around the world, coupled with frequent design and technology updates in the EEE manufacturing sector is causing the early obsolescence of many of these EEEs, resulting in a rise in electrical and electronic waste (e-waste). The annual amount of global waste generated is estimated at 20–50 million tonnes, most of which derives from Asia. There are thus growing concerns that most of the e-waste generated in developed countries ends up in economically-challenged developing countries that lack the infrastructure for dealing with it properly. Specifically, the absence of environmentally sound management (ESM) of e-waste in such countries results in adverse socio-economic, public health and environmental impacts from the toxins in e-waste. E-waste contains a number of toxic metals as well as valuable and scarce resources, thus must be handled in specific ways in order to avoid possible public health and environmental concerns. High quality end-of-life (EoL) standards incorporating collection, storage, transport, recovery, treatment and disposal of e-waste could contribute significantly towards ESM of e-waste, thereby protecting the environment and the health and safety of populations, as well as saving valuable EEE resources.

02 Type of indicator

Qualitative Indicator, Response Indicator

Factsheets Series on 3R Policy Indicators
This project is conducted by the Asia Resource Circulation Policy Research Group, a collaborative research group focused on policy research on 3R promotion in Asia; coordinated by IGES with input from researchers from IGES, IDE-JETRO, NIES, University of Malaya, Asia Institute of Technology, Bandung Institute of Technology, Tokyo Institute of Technology and UNCRD.

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03 Policy goals to be monitored by this indicator

This indicator enables monitoring of the environmental performance of the entire EoL chain of e-waste and the policy gaps in technological, infrastructural, institutional, legislative, social and political aspects related to EoL management of e-waste. In particular, it could monitor operations related to the emerging informal e-waste recycling sector in a number of developing countries. This indicator is strongly related to the following Goal 14 of the draft Ha Noi 3R Declaration on Sustainable 3R Goals for Asia for 2013-2023:

"Ensure **environmentally sound management of e-waste** at all stages, including collection, storage, transportation, recovery, treatment and disposal, with appropriate considerations on **health and safety aspects** of those involved"

04 Basic principles

Utility of standards as policy tools

ISO 17000 defines standards as a formalised set of requirements applied to manufacturing processes, products, services and procedures, both technical and managerial. While technical standards specify the technical properties of a product, the management standards relate to organisation and maintenance of certain procedures in order to achieve a specific objective, such as reducing the environmental impact of a product. The standards for collection, storage, transport, recovery, treatment and disposal of e-waste can be classified as management standards as well as technical standards, as they may specify managerial as well as technical requirements. However, in the context of developing countries, it could be argued that managerial standards are more critical given the circumstances mentioned above. Standards are less binding than legislation, although they can compliment it. For example, standards can be used to operationalise the targets required by legislation. Although the standards can set clear requirements for EoL management of e-waste, they should not prescribe specific technologies or practices, in order to stimulate innovation. One key precondition for a successful e-waste standard is to achieve a balance between effectiveness and efficiency of EoL operations in seeking to achieve high environmental performance at an acceptable cost.

Definition of e-waste and management approach

What is e-waste? There is considerable debate over the precise definition as it not only consists of information and communication technology appliances (computers, mobile phones) but also white goods (air conditioners, cooling devices), hence the need for a clear definition. Furthermore, since e-waste is generated from various types of EEEs, different means for collection and treatment are required. Related standards thus need to clearly specify the type of e-waste covered. In addition to defining e-waste, the standards should identify the roles of each stakeholder involved in the EoL management of specific types of e-waste.

Consider recycling chains and stakeholders

ESM of e-waste requires the strict cooperation of all EoL operators and the optimisation of the entire EoL chain. For example, high quality recycling may fail if the upstream collection operations are performed improperly and e-waste is damaged during collection, storage and transport. Hence standards are required for all operators involved in the EoL chain, which includes collection, transport, storage, preparation for re-use and treatment and disposal of non-recyclable fractions. A systems approach is the key when setting the requirements for the standards. While each requirement should help improve the performance of the EoL operators in each stage of e-waste management—collection,

07 Examples of ongoing global initiatives related to environmentally sound management of e-waste

Basel Convention Mobile Phone Partnership Initiative (MPPI)
http://archive.basel.int/industry/mppi.html
Basel Convention Partnership for Action in Computing Equipment (PACE)
http://archive.basel.int/industry/compartnership/index.html
Solving the E-waste Problem Initiative (StEP)
http://www.step-initiative.org/

08 Related indicators

The following are some additional indicators that could be used to monitor ESM of e-waste in developing countries:

- Well-defined regulatory procedures adequate to control illegal exports of e-waste and to ensure their environmentally sound management
- Improved ability to gather data and inventory on e-waste generation, including transboundary movements
- Access to appropriate and cost effective technologies to manage e-waste within national boundaries
- Establishment of proper intuitional infrastructures for collection, storage, transportation, recovery, treatment and disposal of e-waste at national levels
- Number of state-of-the-art recycling facilities
- Collection rate of e-waste
- Amount of e-waste treated in ESM facilities
- Development of scientific resources such as experts and laboratories to conduct environmental and human health impacts of e-waste
- Improving the working conditions and minimisation of work related to toxic exposure at e-waste collection, processing, recovery and disposal facilities
- Awareness-raising programmes and activities on issues related to health and safety aspects of e-waste to prompt better management practices
- Increased public-private-community partnerships to encourage establishment of formal e-waste recycling and disposal enterprises
- Address obstacles related to implementing EPR and mandate producers, importers, retailers to absorb costs of collecting, recycling and disposal of e-waste
- Require countries exporting used EEE to developing countries to formally test equipment prior to export
- Prohibit import of e-waste if receiving country lacks adequate capacity to manage such wastes in an environmentally sound manner
- Promote reduction and reuse of EEE
- Training of customs and enforcement officers, as necessary, to control or verify export or import of e-waste and work on identifying e-waste in the Harmonised System of the World Customs Organisation

storage, transport and treatment—it should also maximise the environmental and economic performance of other operators in the entire EoL chain.

Review

EoL standards for e-waste should be reviewed periodically to mirror the latest in scientific research and technological advances. EoL standards therefore need to stipulate practical review periods (four or five years).

05 Requirements

Requirements for EoL management standards can be broadly classified into general requirements and specific requirements, as shown below:

General Requirements
Legal compliance; Handling of e-waste; Environmental, health and safety management systems; Financial liabilities and insurance; Labour and social requirements

Specific Requirements
Collection, storage, handling and transport of e-waste; Treatment of e-waste

General Requirements

As a general requirement, all EoL operators should **comply with local, national and international legislation** applicable to their operations. They should have a thorough knowledge of applicable legislation and have the ability to track changes and to obtain information on new and upcoming legislation.

Proper handling is essential during collection, storage, transport and treatment of e-waste. All EoL operators should be required to handle e-waste in a way that prevents damage to the equipment that may preclude re-use or proper recycling. EoL operators should therefore be required to demonstrate that they have the necessary trained staff to properly handle e-waste, have the infrastructure in place to enable the careful handling of e-waste and have put in place damage-prevention measures.

A properly maintained and operated environmental, **health and safety management system** (EHSMS) should be required for all e-waste EoL operators. This should allow the operators to identify and realise improvement potentials and to continuously improve their performance. EoL standards should oblige EoL operators to have **relevant insurance covering damage** to third parties, including environmental damage, impacts on the health of workers, neighbours and their properties and to ensure clean site operations.

Specific Requirements

Collection standards should stipulate the need for collectors to ensure that collection facilities are close to consumers and conduct periodical household collections of e-waste. To enable re-use and effective treatment, standards should require operators to collect, store, handle and transport e-waste in a way that prevents damage to e-waste during operations (in order to avoid pollution due to breakage, leakage or corrosion), does not hinder the removal and specific treatment of hazardous materials and components in subsequent down-stream operations, and that supports the sound re-use and recycling of e-waste and proper disposal of materials that cannot be treated otherwise. **Standards for storage and collection** should also stipulate that transport vehicles and containers must be equipped to achieve the above targets and storage sites are equipped to prevent pollution due to damage, leakage and corrosion.

To minimise the environmental impacts of e-waste, **standards should stipulate the priority for 3R practices such as prevention, preparation for re-use and re-use and recycling**. Re-use of EEE offers significant environmental and social benefits. However, **EoL standards for re-use** should consider setting limits or targets for minimum energy efficiencies of equipment for re-use. Standards should also require operators to avoid incineration and disposal of recyclable fractions of e-waste. Since e-waste containing hazardous materials requires specific treatment, EoL standards should clearly **define such hazardous materials** and **specify that they be handled by state-of-the-art recycling facilities.**

Traceability of trading partners, analytical capacity of materials in recyclables, introduction of mass balance tools, sound management of residues and acceptance of recyclables based on technical and managerial capacity are strong indicators of good recyclers.

Transboundary shipments and illegal exports of e-waste present a significant challenge to any attempt to regulate and monitor e-waste. Therefore, EoL standards should set **specific stipulations that prevent illegal transboundary shipments of e-waste**. As a minimum it should stipulate compliance with the Basel Convention. EoL standards should stipulate further measures to be undertaken by the operators to prove the legality of import and export of e-waste.

In this sense, a **data system for input/output management** would be a useful approach for e-waste management. Good recyclers tend to introduce certain mass balance tools. For example, the WEEE forum has developed a tool called "WF_RepTool", which defines a structure for calculating the recycling and recovery rates achieved on the basis of the same data structure and an agreed classification of treatment technologies and reports the treatment results to the authorities in a uniform manner.

06 Examples of existing e-waste management standards

Responsible Recycling (R2)

EPA in the US encourages all electronics recyclers to become certified by demonstrating to an accredited, independent third-party auditor that they meet specific standards to safely recycle and manage electronics. The purpose of the above certification programme is to share common elements that ensure responsible recycling of used electronics. These programmes advance best management practices and offer a way to assess the environmental, worker health, and security practices in managing used electronics.

e-Stewards

e-Stewards Certification is rapidly emerging as the leading global programme designed to enable individuals and organisations disposing of old electronic equipment to easily identify recyclers that adhere to the highest standards of environmental responsibility and worker protection. e-Stewards Certification, initiated by Basel Action Network (BAN), is open to electronics recyclers, refurbishers and processors in all developed countries

WEELABEX

WEEELABEX (acronym of 'WEEE LABel of EXcellence') is a project run by the WEEE Forum in co-operation with stakeholders from the producers' community and processing industry. The project aspires to design both a set of European standards with respect to the collection, sorting, storage, transportation, preparation for re-use, treatment, processing and disposal of all kinds of e-waste, and a harmonised set of rules and procedures that will provide for conformity verification.