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Ministry of Electronics
and Information Technology
Government of India

E-Waste Awareness for Manufacturers

Manual for Training of Trainers

(2016)

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The Project entitled "Awareness Programme on Environmental Hazards of Electronic Waste through Digital India Initiative" is funded by Ministry of Electronics and Information Technology (MeitY)/Government of India.

Contents

1. About the Project

The Ministry of Electronics and Information Technology (MeitY) has initiated the project "Awareness Programme on Environmental Hazards of Electronic waste" on March 31, 2015. This project is under the 'Digital India' initiative of the Government of India. The project is expected to have far reaching and significant impact on the growth of the country as it focuses on reuse and recycling of e-waste, which has the potential to conserve natural resources. The project has three components viz., Content Development, Inventory Assessment and Awareness Generation amongst different stakeholders. The project will help in effective implementation of E-waste (Management) Rules, 2016.

The primary focus of the project is to create awareness among different stakeholders in order to reduce the adverse impact on environment and health due to improper disposal of e-waste. MeitY has played a key role in dissemination of knowledge on e-waste rules in the past and wishes to engage all key stakeholders during this exercise. During the project duration of 5 years, a city in each of the 10 identified states viz. Madhya Pradesh, Uttar Pradesh, Jharkhand, Orissa, Goa, Bihar, Pondicherry, West Bengal, Assam and Manipur will be covered. The activities will include organising awareness workshops for RWAs/Localities, Schools, Colleges, Bulk Consumers (including corporate & Govt. sectors), Informal Sector, Dealers, Refurbishers, Manufacturers, etc. so as to build capacities of the target groups to channelize e-waste in a manner that the rules are effectively implemented. Suitable course curriculum would also be framed for schools/colleges. Effort would be made to prepare the content in local language.

This project will also stress on adopting best practices for e-waste recycling available globally, so that the unorganised sector can generate jobs as well as viable business prospects thereby mitigating the impact of improper recycling on the environment. Recycling of e-waste will help in creating jobs and recovery of valuable components and materials through dismantling. The valuable metals recycled from old electronic items can also be used in manufacturing of new products. As a result, this will save energy, reduce pollution, mitigate greenhouse gas emissions, and reduce extraction of finite natural resources through mining. The project will also emphasize on the responsibilities of the producers and convey the message that they must inculcate the principle of Extended Producer Responsibility (EPR) and follow the mechanism for channelisation of e-waste from 'end of life' products to registered dismantlers or recyclers.

The tools and dissemination material for creating awareness are developed by MAIT to create awareness among various stakeholders in the value chain. The awareness workshops will help to present the current situation on e-waste disposal and practices thereby creating awareness on the issue; its recycling as well as the legal provisions and the responsibilities of the stakeholders.

The program also aims to enhance its reach to more cities across each state during the course of 5 years of its implementation. This will help to inculcate better disposal practices amongst all stakeholders thereby reducing the environmental impacts of improper handling and recycling of e-waste.

2. Framework of the Manual

The objectives of the manual are the following:

To act as a tool for enhancing the understanding of the trainers who would be involved in conducting the training of representatives of manufacturers on the subject of e-waste.

To serve as a ready reference for trainers to design and organize trainings on the subject of e-waste for manufacturers.

To serve as a compilation of information on the following issues related to the subject of e-waste:
• What are the categories of e-waste?
• What is the generation of E-waste globally and in India?
• What are the hazardous substances in E-waste?
• What are labelling mechanisms in electronics?
• The E-waste (Management) Rules, 2016 and the challenges of implementing the Rules.
• What are the responsibilities of the manufacturers within the e-waste management rules, 2016 (s)
• What are the building blocks to an internal policy on e-waste management.
• Guidelines for setting up of collection centres of e-waste.
• How do you set up of a PRO for collecting e-waste
• How can you do awareness on e-waste with all stakeholders
• How can you work with the informal sector for e-waste collection
• How to make EPR plans
• How do you finance EPR in the Indian context?

To serve as a guide for implementing initiatives by manufacturers that contribute to safe e-waste management in India.

Objectives of the training of trainers:

The training of trainers has been designed with the objective to enhance the understanding on the subject of e-waste amongst manufacturers. This will be achieved by a training of trainers on the subject of e-waste and providing them with adequate tools to organize trainings for manufacturers.

The training of trainers will be followed by trainings for manufacturers so that they can contribute to effective handling and management of e-waste.

The training provided will increase knowledge amongst manufacturers about the generation of e-waste, hazardous substances in e-waste, present status of generation and disposal in India, regulation on management and handling of e-waste in India, role of manufacturers as producers and efforts like setting up of e-waste collection centres that can be undertaken by them. In addition they will be introduced to responsibilities under the e-waste management rules, 2016, guidelines for setting up of PRO and collection mechanisms and how to meet the challenges in implementing the e-waste management rules, 2016.

The manual uses different methods to achieve the change objective including the Donna E. Walker's 'Learning Cycle' that has five steps including Mind Jog, Personal Connection, Information Exchange, Information Application and Real World Connection. This method

takes into account that different learners have different learning abilities and at least one of the steps of the cycle would be able to transfer the learning effectively.

The manual provides essential information and situations that form cases that can be discussed with the manufacturers by the trainer.

How to use the manual:

This manual has 2 major components to it with of the objective of providing experiential learning to its users.

Component 1 is on the learning cycle which has been adopted from the finest techniques available for experiential learning today. The sessions help to unpack the subject at hand and enable to gain a better understanding of solutions in order to solve the problem. It also ensures that engagement is built with participants so that the training sessions are not just monologues from the trainer to the participants but allows the space for dialogue in order to enhance understanding of the subject of implementing the e-waste management rules, 2016.

Component 2 includes references which have been extensively researched from material available through secondary sources. This includes work which has been done in India as well as around the world and has been published in renowned journals and publications. The links to the material have also been provided so that interested readers can enhance their understanding.

In order to use the manual, the trainer has to go through the reference material in order to read in detail about the different issues that are discussed. For each session as elaborated, the trainers will discuss the subject at length in the time provided in order to ensure that their understanding is enhanced and they can pass the message to the relevant stakeholders during training workshops and activities that they are a part of during the course of the project.

3. References:

a) What are the categories of e-waste?

Waste Electrical and Electronic Equipment (WEEE) also referred to as UEEE (Used Electrical and Electronic Equipment), e-waste, or e-scrap is a generic term used to cover all items of electrical and electronic equipment (EEE) and its parts that have been discarded by its owner as waste without the intend of reuse. more or less precise definitions can be found throughout the world. For instance, according to the WEEE Directive 2012/19/EC (European Union) WEEE are defined as a category of waste, consisting of equipment at the end-of-life, powered by electricity or through electro-magnetic fields and designed for use in a voltage typically not exceeding the !)))V AC and 1500V AC. They are presently divided into the ten following categories;

1. Large household appliances
2. Small household appliances
3. Information technology and telecommunications equipment
4. Consumer equipment
5. Lighting equipment
6. Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
7. Toys, leisure and sports equipment
8. Medical devices (with the exception of all implanted and infected products)
9. Monitoring and control instruments
10. Automatic dispensers

However, these ten categories will be regrouped into the six following categories by 2018;

1. Temperature exchange equipment (refrigerators, freezers, air conditioning equipment, etc)
2. Screens, monitors and equipment containing screen having a surface greater that 100 cm^2 (screens, televisions, LCD, photo frames, monitors, laptops, notebooks)
3. Lamps (fluorescent lamps, sodium lamps, LED, etc)
4. Large equipment, that is, any external dimension more than 50 cm (washing machines, dish washing, cookers, copying equipment, photo voltaic panels, etc)
5. Small equipment, that is, no external dimesnsion more than 50 cm (vaccum cleaners, caper sweepers, Hi-fi equipment, musical equipment, etc)
6. Small information technology and telecommunication equipment (mobile phones, GPS, project calculators, routers, personal computers, printers, telephones)

Composition of e-waste:

The composition of e-waste is very diverse and contains products across different categories. A typical electronic and electrical item consists of more than 1000 different substances which can fall under hazardous and non-hazardous categories. The major

constituents are ferrous and non-ferrous metals, plastics, glass and plywood, printed circuit boards, concrete and ceramics, rubber and other items. Iron and steel constitutes about 50% of the WEEE followed by plastics (21%), non-ferrous metals (13%) and other constituents. Non-ferrous metals consist of metals like copper, aluminium and precious metals like silver, gold, platinum, palladium etc.

Pollutant/ Element	Occurrence
Arsenic	Semiconductors, diodes, microwaves, LEDs (light emitting diodes), solar cells
Barium	Electron tubes, filler for plastic and rubber, lubricant additives
Brominated flame –proofing agent	Casing, circuit boards (plastic), cables and PVC cables
Cadmium	Batteries, pigments solder, alloys, circuit boards, computer batteries, monitor cathode ray tubes (CRTs)
Chrome	Dyes/pigments, switches, solar
Cobalt	Insulators
Copper	Conducted in cables, copper ribbons, coils, circuitry, pigment
Lead	Lead rechargeable batteries, solar, transistors, lithium batteries PVC(polyvinyl chloride) Stabilizers, lasers, LEDs, thermoelectric elements, circuit boards
Liquid crystal	Displays
Lithium	Mobile telephones, photographic equipment, video equipment (batteries)
Mercury	Components in copper machines and steam irons; batteries in clocks and pocket calculators, switches, LCDs
Nickel	Alloys, batteries, relays, semiconductors, pigments
PCBs (Polychlorinated biphenyls)	Transformers, capacitors, softening agent for paint, glue plastic
Selenium	Photoelectric cells, pigments, photocopiers, fax machine
Silver	Capacitors, switches (contacts), batteries, resistors
Zinc	Steel, brass, alloys, disposable and rechargeable batteries, luminous substances.

Table 1: Pollutants and their occurrence in e-waste
Source: RajyaSabha Secretariat, 2011

Table 2: Possible Hazardous substances in e-waste components (CPCB, 2008)

Hazardous Substance	Danger
Lead	A neurotoxin that affects the kidneys and the reproductive system, high quantities can be fatal. It affects mental development in children. Mechanical breaking of CRTs (cathode ray tubes) and removing solder form microchips release lead as powder and fumes.
Plastic	Found in circuit boards, cabinets and cables, they contain carcinogens. BFRs or Brominated flame retardants give out carcinogenic Brominated dioxins and furans Dioxins can harm reproductive and immune systems. Burning PVC, a component of plastics, also produces dioxins BFR can leach into landfills Even the dust on computer cabinets contains BFR.

Chromium	Used to protect metal housings and plates in a computer from corrosion, inhaling Hexavalent chromium or chromium 6 can damage liver and kidney and cause bronchial maladies including asthmatic bronchitis and lung cancer.
Mercury	Affect the central nervous system, kidneys and immune system. It impairs foetus growth and harms infants through mother's milk. It is released while breaking and burning of circuit boards and switches mercury in water bodies can form methylated mercury through microbial activity. Methylated mercury is toxic and can enter the human food chain through aquatic.
Beryllium	Found in switch boards and printed circuit boards. It is carcinogenic and causes lung diseases.
Cadmium	A carcinogen. Long-term exposure causes Itai-Itai disease, which causes severe pain in the joints and spine. It affects the kidneys and softens bones. Cadmium is released into the environment as powder while crushing and milling of plastics, CRTs and circuit boards. Cadmium may be released with dust, entering surface water and groundwater.
Acid	Sulphuric and hydrochloric acids are used to separate metals from circuit board's furnes contain chlorine and sulphur dioxide, which cause respiratory problems. They are corrosive to the eye and skin.
PBB	Polyhalogenated derivatives which can cause pre and post natal complications and can lead girls to menarche at an early age. They can also cause acne.
PBDE	Leads to restriction in development of kids between the age of 1 and 6 years.

E-Waste Source	E-Waste Component	Environmental Hazard	Effects on Human
CRTs (used in TVs, Monitors, ATM, Video Camera, etc), Batteries, PVC cables, Paints	Lead, barium & other heavy metals	These metals leaching g into the ground water and release of toxic phosphor	Anemia, Renal Toxicity, Insominia
Batteries, Housing & Medical equipment	Mercury	Air emissions as well as discharge into rivers of glass dust	Renal Toxicity, Muscle Tumors, Mental retardation cerebral palsy
Plastics from printers, keyboards, monitors etc	Plasticizer bisephenol-A(or BPA) as well DEHP and DBP Plastic compound known as phthalates	Chlorinated plastic release harmful chemicals into the surrounding soil, which seep into ground water or other surrounding water sources which cause serious harm to the species that drink this water.	Risk in developing heart problems, obesity reproductive disease
PVC & Polymer, Paints, Printing inks, electrical transformers & Capacitors	Polychlorinated Biphenyls (PCBs)	Include extreme pollution from production, toxic chemical exposure during use, hazards form fires	Suppression of immune system damage to the liver nervous and reproductive systems

Table 3: Possible hazardous substances in WEEE/E-waste components

Table 4:Component and possible hazardous content

Component	Possible Hazardous Content
Metal	
Motor/compressor	
Cooling	Ozone Depleting Substances (ODS)
Plastic	Phthalate plasticize, BFR
Insulation	Insulation ODS in foam, Asbestos, refractory ceramic fiber
Glass	
CRT	Lead, antimony, mercury, phosphors
LCD	Mercury
Rubber	Phthalate plasticizer, BFR
Winning/electrical	Phthalate plasticizer, lead , BFR
Concrete	
Transformer	
Circuit Board	Lead Beryllium , antimony, BFR
Fluorescent Lamp	Mercury, Phosphorus, Flame retardants
Incandescent Lamp	
Healing element	
Thermostat	Mercury
BFR – containing plastic	BFRs
Batteries	Lead, lithium, Cadmium, Mercury
CFC, HCFC , HFC , HC	Ozone depleting substances
External electric cables	BFRs, plasticizers
Electrolyte capacitors (over L/D 25mm)	Glycol, other unknown substances

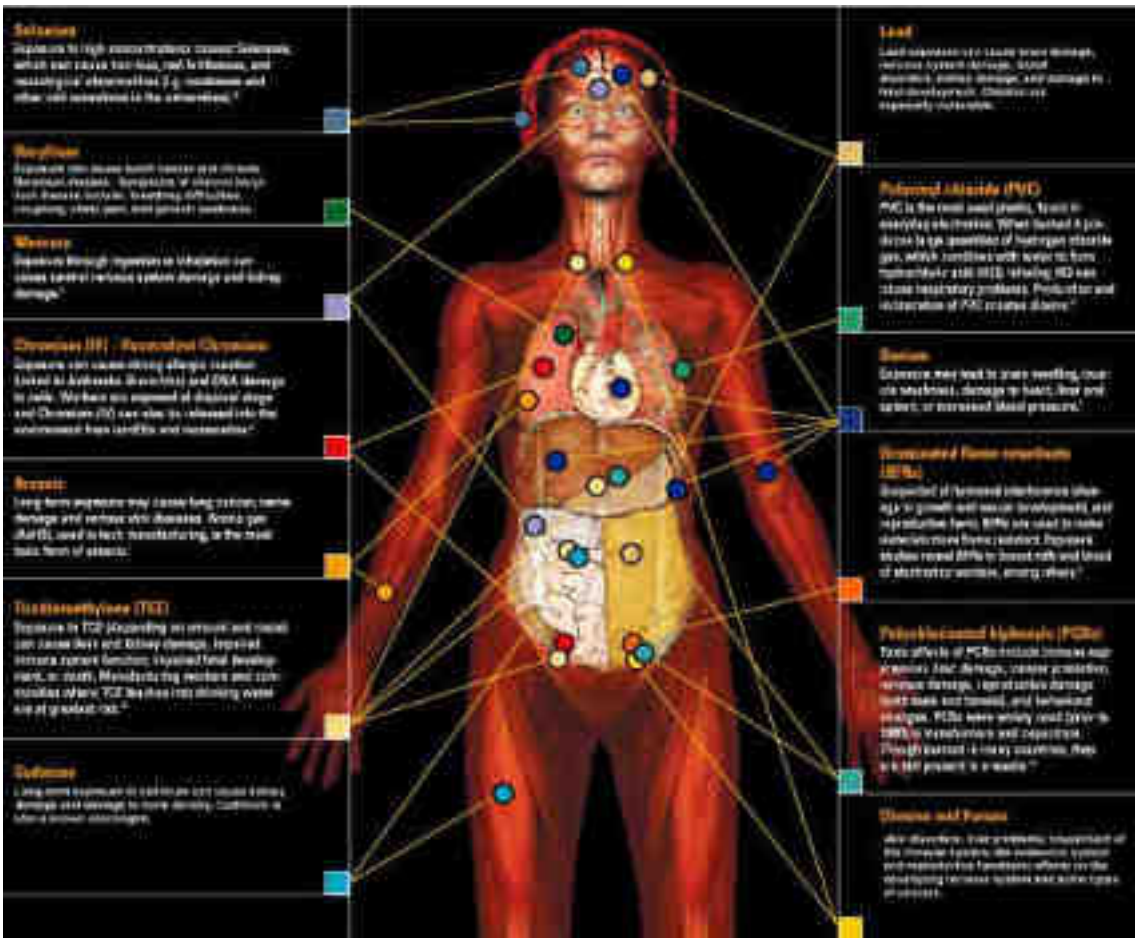


Figure 1: Adverse Impact of e-waste

Source:
http://www.capeewaste.co.za/why_recycle_ewaste.html

Exposure to e-waste may lead to changes in thyroid function, changes in cellular expression and function, adverse neonatal outcomes, changes in temperament and behaviour, and decreased lung function. Boys aged 8–9 years living in an e-waste recycling town had a lower forced vital capacity than did those living in a control town. Significant negative correlations between blood chromium concentrations and forced vital capacity in children aged 11 and 13 years were also reported. Findings from most studies showed increases in spontaneous abortions, stillbirths, and premature births, and reduced birthweights and birth lengths associated with exposure to e-waste. People living in e-waste recycling towns or working in e-waste recycling had evidence of greater DNA damage than did those living in control towns.

b)What is the generation of e-waste in India and globally

WEEE belongs to the fastest growing waste stream in the world, with an increase from 33.8 million metric tonnes (Mt) in 2010 to 41.8 Mt in 2014 and an expected amount of about 50 Mt by 2018. The main driving forces of such a trend are explained by,

- The increase of the world population 9from July 2010 to July 2015, the world population has increased from 6.92 billion to 7.32 billion, with a possible extrapolation at 10.8 billion by 2100)
- The rapid socio-economic development including reinforced urbanization with facilitated access to modern technologies (in 2014 the WEEE generated per capita ranged from 0.2 kg per inhabitant in low income countries such as Burundi, Democratic Republic of Congo, etc up to 28.3 kg per inhabitant in Norway
- The change in consumer patterns 9eg, in March 2014 there was still nearly twice the percentage of desktop only internet users as mobile only users in USA, while the number of mobile only internet users in March 2015 exceeded that of desktop only internet users)
- The rapid technological advancement 9most US consumers used to upgrade their mobile phones after about 2 years)

Various correlations can be plotted between the total amount of WEEE generated worldwide and parameters representative of the society's evolution.

From the aforementioned considerations, it is clear that the world WEEE stream is expected to significantly increase in the next few decades. Considering that the WEEE contains an average about 2.2% (by weight) of Printed Circuit Boards (PCBs), 4.6% of mineral fraction, 9.2% of residues from grinding, 44.7% of ferrous metals, 7.5% of non-ferrous metals, 18.3% of plastics, 12.2% of glass and 1.3% of other type of materials, there are three main reasons for their processing; environmental concerns 9the total WEEE generated in 2014 is the equivalent of about 5700 Eiffel towers (in weight) and contains hazardous chemicals), energy savings and resource efficiency via recycling of valuable materials (the intrinsic material value of global e-waste was estimated to be 48 billion euro in 2014). Thus it is of - particular importance to organize/optimize the management of the end-of-life of EEE. For this goal a circular economy is being progressively developed worldwide to reduce as much as possible the volume of ultimate waste, to prevent any environmental concern (landfilling is still a common practice in some countries) and to contribute to material resources recycling. Basically, a typical circular economy scheme should include end-of-life EEE/collection, WEEE treatment and material recycling, resale of recycled materials on the market, manufacturing/eco-conception, and commercialization of new EEE or other devices.

In reality the circular economy scheme is theoretical in nature as the situations are so much contrasted around the world. Indeed, official take back legislation is organised in a limited number of countries (mostly European countries) and covers only about 4 billion people (about 575 of the world population) so that only 6.5 Mt of the 41.8 Mt of WEEE generated in 2014 were documented and recycled with the highest standards.

The global efficiency of the circular economy value chain is not purely technical in nature. The societal aspects are also important.

E-waste releases pollutants in air, water and soil that have very adverse impacts on environment and health. For instance, heavy metals are released through dust generated during mechanical treatment, for example, the dismantling and crushing of e-waste. In addition metals are released during vaporization wherein metals are released from compounds in an acid bath. Dioxins and furans are released in flue gases during thermal treatment like incineration. The combustion of cable insulation containing PVC in order to recycle copper wiring and the incineration of epoxy resin containing flame retardant from

circuit boards in order to recycle the metal they contain also released dioxins and furans. Acids are released in the form of vapour when metals are released from compounds. Acids may also get distributed throughout the surrounding area in the following ways factory air and dust being blown into the vicinity, leaching through waste water and seepage and release of flue gas into the atmosphere as a result of open incineration of furnace combustion. Therefore, environmentally sound management of e-waste can have several benefits for health of human beings as well as improve the environmental quality in cities where informal recycling takes place.

c)What is e-waste

Electronic waste or e-waste:

'e-waste' means waste electrical and electronic equipment whole or in part or rejects from their manufacturing, refurbishment and repair process which are intended to be discarded as waste.

Source:
Indian Ministry of Environment and Forests & Climate Change 2015. E-waste (Management) Rules, 2015.
http://www.indiaenvironmentportal.org.in/files/file/notified%20ewaste%20rule%202015.pdf

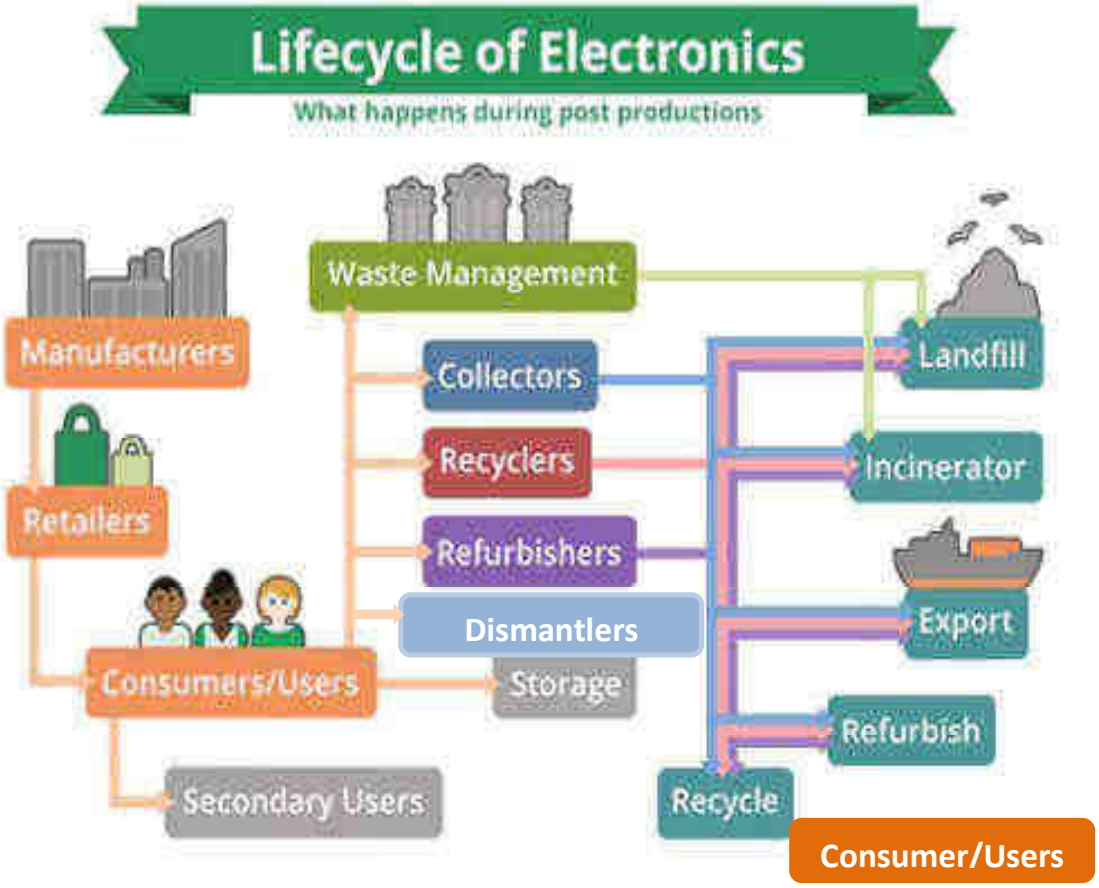


Figure 2: Lifecycle of electronics

Source:
http://greatforest.com/sustainability101/uncategorized/e-waste-recycled-video/)

Around 1.7 million tonnes of e-waste is generated in India per year (Baldé, (2015)).The main sources of electronic waste in India are the government, public and private (industrial) sectors, which account for almost 70 per cent of total waste generation. The contribution of individual households is relatively small at about 15 per cent; the rest being contributed by manufacturers. Though individual households are not large contributors to waste generated by computers, they consume large quantities of consumer durables and are, therefore, potential creators of waste. An Indian market Research Bureau (IMRB) survey of 'E-waste generation at Source' in 2009 found that out of the total e-waste volume in India, televisions and desktops including servers comprised 68 per cent and 27 per cent respectively. Imports and mobile phones comprised of 2 per cent and 1 per cent respectively (RajyaSabha Secretariat 2011). In countries like China and India, though annual generation per capita is less than 1 kg, it is growing at an exponential pace. The increasing "market penetration" in developing countries, "replacement market" in developed countries and "high obsolescence rate" make WEEE/E-waste one of the fastest waste streams. Main contributors of e-waste includes It includes computer and its accessories, monitors, printers, keyboards, central processing units; typewriters, mobile phones and chargers, remotes, compact discs, headphones, batteries, LCD/Plasma TVs, air conditioners, refrigerators and other household appliances (RajyaSabha Secretariat 2011).

Source:

Baldé, C.P., Wang, F., Kuehr, R., Huisman, J. (2015), The global e-waste monitor – 2014, United Nations University, IAS – SCYCLE, Bonn, Germany, http://i.unu.edu/media/ias.unu.edu-en/news/7916/Global-E-waste-Monitor-2014-small.pdf

WEEE Recycle & CSE. E-Waste Training Course for Policymakers and Regulators – Facilitator's Manual, http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62968/WEEERecycleCSEmanual.pdf

RajyaSabha Secretariat 2011: E-waste in India. New Delhi. http://rajyasabha.nic.in/rsnew/publication_electronic/E-Waste_in_india.pdf

Amount of e-waste and recycling

The increased use of electrical and electronic equipment (EEE) and their high rate of obsolescence is leading to around 41.8 million tons of e-waste generation globally that is growing at an annual growth rate of 4 to 5 per cent per year (Baldé, (2015):24-25). From the developed countries around 75% to 80% of e-waste is shipped to countries in Asia and Africa for "recycling" and disposal where majority of imported e-waste is managed through informal unsafe recycling channels (Perkins et al., (2014): 287).

Around 1.7 million tonnes of e-waste is generated in India (Baldé, (2015):42)). According to Central Pollution Control Board (CPCB) (2015) list of registered e-waste dismantler/recycler in the country as on 27-11-2014 the total recycling capacity is 349154.6 MTA, this is only 20% of the estimated e-waste generation in India and therefore non-compliance to the rules is expected.

For example, around 170,000 tons of electronic waste is generated from scrapped television alone in India every year. If each ton has a value of INR 10,000 then the recycling industry turnover would be INR 170 Crores. The total market is worth INR 1700 Crores despite considering a conservative value of e-waste.

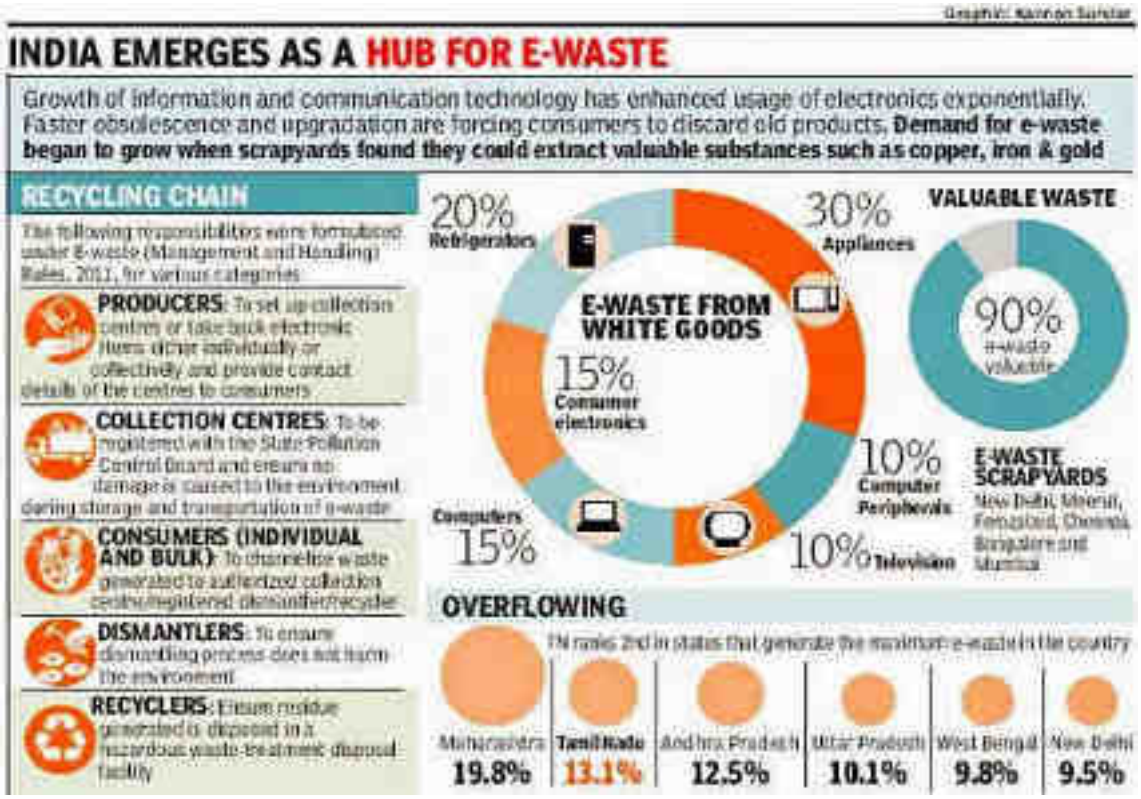


Figure 3: e-waste generation in India

The e-waste recycling sector revenue in 2015 was estimated at Euro 2.5 billion and is expected to grow to 3.5 billion by 2020 (Cucchiella et al., (2015)).

Source:

Central Pollution Control Board (CPCB) (2015), List of e-waste recyclers in India, http://cpcb.nic.in/Ewaste_Registration_List.pdf

Cucchiella, Federica, D'Adamo, Idiano, Koh, S.C. Lenny, Rosa, Paolo, (2015), Recycling of WEEEs: An economic assessment of present and future e-waste streams, Renewable and Sustainable Energy Reviews, Volume 51, November 2015, Pages. 263-272.

Figure 4: e-waste generation across the world

d)What are the resources embedded in e-waste

Resources embedded in e-waste:

The composition of e-waste is very diverse and contains products across different categories. A typical electronic and electrical item consists of more than 1000 different substances which can fall under hazardous and non-hazardous categories. The major constituents are ferrous and non-ferrous metals, plastics, glass and plywood, printed circuit boards, concrete and ceramics, rubber and other items. Iron and steel constitutes about 50% of the WEEE followed by plastics (21%), non-ferrous metals (13%) and other constituents. Non-ferrous metals consist of metals like copper, aluminium and precious metals like silver, gold, platinum, palladium etc.

e)How can you organize a collection drive for e-waste in your RWA/ locality? Which agencies can support you in organizing such a collection and awareness drive?

A collection drive for e-waste can be organized by contacting manufacturer or dealers who would then refer to the authorized collector, dismantler and recycler of e-waste. A record of each item collected in the drive should be maintained and provided to the collector, dismantler and recycler. The local pollution control board officer can be informed about the drive and the e-waste collected during the drive so that they can audit if safe recycling of the collected e-waste has been conducted.

All manufacturers, dealers and government's environment department could support collection and awareness drive. In addition national, international and local environmental NGOs can be partners for such a drive.

f)What is a carbon footprint?

Carbon Footprint

The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide (CO_2). In other words: When you drive a car, the engine burns fuel which creates a certain amount of CO_2, depending on its fuel consumption and the driving distance. (CO_2 is the chemical symbol for carbon dioxide). When you heat your house with oil, gas or coal, then you also generate CO_2. Even if you heat your house with electricity, the generation of the electrical power may also have emitted a certain amount of CO_2. When you buy food and goods, the production of the food and goods also emitted some quantities of CO_2 (TFC (2016)).

Source:

Time for Change (TFC), (2016), Definition of Carbon Footprint,
http://timeforchange.org/what-is-a-carbon-footprint-definition

Fee Online Tool to calculate Carbon Footprint:
http://www.nature.org/greenliving/carboncalculator/

g)What are the policies for e-waste management in our country?

As per the E-Waste (Management) Rules 2016 all e-waste should be recycled by authorized recyclers and dismantlers. In line with the principle of 'Extended Producer Responsibility' (EPR) the producers have to set up a scheme for collection of used/waste Electrical and Electronic Equipment from the Electrical and Electronic Equipment placed on the market earlier through dealers. In addition collection centres, Producer Responsibility Organisation, buy-back arrangement, exchange scheme, Deposit Refund Scheme, etc. should be implemented whether directly or through any authorised agency for channelising the items so collected to authorised recyclers. Consumers or bulk consumers of electrical and electronic equipment listed in Schedule I of the E-waste rules 2016[1] shall ensure that e-waste generated by them is channelised through collection centre or dealer of authorised producer or dismantler or recycler or through the designated take back service provider of the producer to authorised dismantler or recycler; (2) bulk consumers of electrical and electronic equipment listed in Schedule I shall maintain records of e-waste generated by them in Form-2 and make such records available for scrutiny by the concerned State Pollution Control Board; As responsible consumers we are expected to deposit the e-waste at authorized collection centres.

Environmentally sound E-waste treatment technologies are used at three levels as described below:

- 1st level treatment
- 2nd level treatment
- 3rd level treatment

[1] 'bulk consumer' means bulk users of electrical and electronic equipment such as Central Government or State Government Departments, public sector undertakings, banks, educational institutions, multinational organisations, international agencies, partnership and public or private companies that are registered under the Factories Act, 1948 (63 of 1948) and the Companies Act, 2013 (18 of 2013) and health care facilities which have turnover of more than one crore or have more than twenty employees;

All the three levels of e-waste treatment are based on material flow. Each level treatment consists of unit operations, where e-waste is treated and output of 1st level treatment serves as input to 2nd level treatment. After the third level treatment, the residues are disposed of either in TSDF (Treatment, Storage, and Disposal Facility) or incinerated. The efficiency of operations at first and second level determines the quantity of residues going to TSDF or incineration. The simplified version of all the three treatments is shown below.

For non CRT E-waste, the major e-waste treatment facilities in India use the following technologies.

1. Dismantling 2. Pulverization/ Hammering 3. Shredding 4. Density separation using water

Figure 5: Treatment of e-waste

Source:
WEEE Recycle & CSE. E-Waste Training Course for Policymakers and Regulators – Facilitator's Manual
http://www.igep.in/live/hrdpmp/hrdpmaster/igep/content/e54413/e54441/e62968/WEEERecycleCSEmanual.pdf

Indian Ministry of Environment and Forests & Climate Change 2016. E-waste (Management) Rules, 2016.
http://www.moef.gov.in/sites/default/files/EWM%20Rules%202016%20english%2023.03.2016.pdf

E-waste Management Rules and its requirement for e-waste disposal and recycling

The E-waste Management Rules ask for 'environmentally sound management of e-waste' that means taking all steps required to ensure that e-waste is managed in a manner which shall protect health and environment against any adverse effects, which may result from

hazardous substances contained in such waste. The rules are applicable on producers, manufacturers, dealers, consumer, bulk-consumer, refurbishers and recyclers. It includes the following provisions to help ensure proper recycling and disposal of e-waste:

Implementation of Extended Producer Responsibility' (EPR) that puts responsibility on any producer of electrical or electronic equipment, for their products beyond manufacturing until environmentally sound management of their end-of-life products. 'Extended Producer Responsibility' means responsibility of any producer of electrical or electronic equipment, for channelisation of e-waste to ensure environmentally sound management of such waste. Extended Producer Responsibility may comprise of implementing take back system or setting up of collection centres or both and having agreed arrangements with authorised dismantler or recycler either individually or collectively through a Producer Responsibility Organisation recognised by producer or producers in their Extended Producer Responsibility - Authorisation;

Setting up 'Producer Responsibility Organisation' has been mandated that is a professional organisation authorised or financed collectively or individually by producers, which can take the responsibility for collection and channelisation of e-waste generated from the 'end-of-life' of their products to ensure environmentally sound management of such e-waste;

Implementation of Deposit Refund Scheme whereby the producer charges an additional amount as a deposit at the time of sale of the electrical and electronic equipment and returns it to the consumer along with interest when the end-of life electrical and electronic equipment is returned;

Every producer of electrical and electronic equipment and their components or consumables or parts or spares shall ensure that, new Electrical and Electronic Equipment and their components or consumables or parts or spares do not contain Lead, Mercury, Cadmium, Hexavalent Chromium, polybrominated biphenyls and polybrominateddiphenyl ethers beyond a maximum concentration value of 0.1% by weight in homogenous materials for lead, mercury, hexavalent chromium, polybrominated biphenyls and polybrominateddiphenyl ethers and of 0.01% by weight in homogenous materials for cadmium.

Overall the rules ask for record keeping by all stakeholders except individual consumers who are expected to ensure that e-waste generated by them is channelized through safe recycling and disposal system as set up according to the rules.

Source:

Indian Ministry of Environment and Forests & Climate Change 2016. E-waste (Management) Rules, 2016.
http://www.moef.gov.in/sites/default/files/EWM%20Rules%202016%20english%2023.03.2016.pdf

h) Who can support the setting up of collection points for low-value e-waste?

Setting up a collection center for e-waste:

As per the e-waste management rules to set up a collection center there is a need to apply for authorization from the State Pollution Control Board or Pollution Control Committee as per FORM – 1(a). There is a need to have agreements with producers who are willing to get the e-waste covered under their EPR collected at your center as well as with dismantlers

and recyclers who will be taking the e-waste from the collection center for further processing. It should be ensured that systems for record keeping and training for safe handling and storage of e-waste is provided to the people who will be managing the collection center.

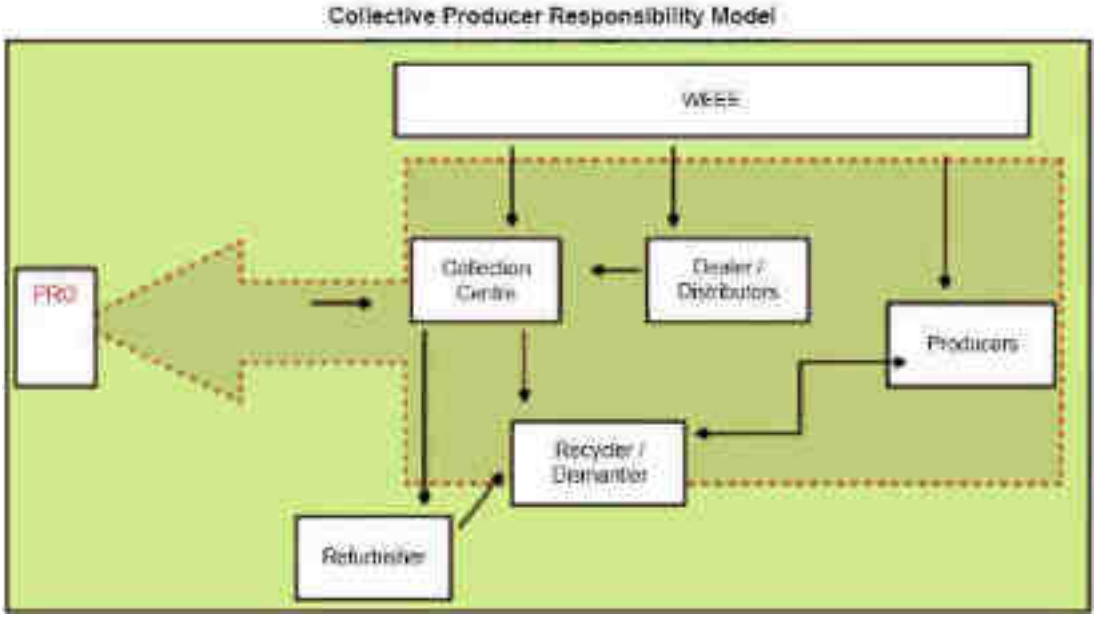


Figure 6: Collective Producer Responsibility Model representation with role of collection center

Responsibilities of Collection Centers include:

(1) Ensure that the facilities are in accordance with the standards or guidelines prescribed by the Central Pollution Control Board from time to time;

(2) The e-waste collected by them is stored in a secured manner till it is sent to registered dismantler or recycler as the case may be;

(3) Ensure that no damage is caused to the environment during storage and transportation of e-waste;

(4) Maintain records of the e-waste handled in Form 2 and make such records available for scrutiny by the State Pollution Control Board or the Pollution Control Committee concerned.

Precautions for setting up and managing such collection points

As precaution for setting up and managing collection points it is crucial to have Personal Protective Equipment (PPE) and Standard Operating Procedures (SOPs) for people handling e-waste. Record of the type of waste collected and time of collection should be maintained as per the E-waste management rules. Contract with recyclers and manufacturers should be in place to ensure that e-waste is managed safely after reaching the collection point.

How and where can you get information on the locally available collection services for e-waste

All manufacturers, producers and dealers should provide information about locally available collection, dismantling and recycling services through their web platforms, outlets. The information should also be available at the SPCB web platforms. Regular awareness campaigns and advertisements should be organized for providing information about locally available collection, dismantling and recycling services.

i)Resource consumption and Lifestyles of Health and Sustainability (LOHAS)

Resource Consumption:

It is an umbrella term for the many different ways and rates that humans consume the products of the natural world. Some resources are finite, meaning that once they are used there are none left, such as fossil fuels and land. Other resources are renewable, such as wind and solar energy.

Resource can be categorized into renewable and non-renewable, Renewable materials are not finite in availability as they can be replenished in a short duration for example agricultural products, livestock etc. While non-renewable resources are those that cannot be replenished or made again in short duration and may take billions of years to be made again for example fossil fuels that provide energy, metal ores used in the manufacture of cars and computers etc (FOE, 2005).

Due to the finite nature of fossil fuels and metals it is likely that we will runout of these resources in future as highlighted in the chart below:

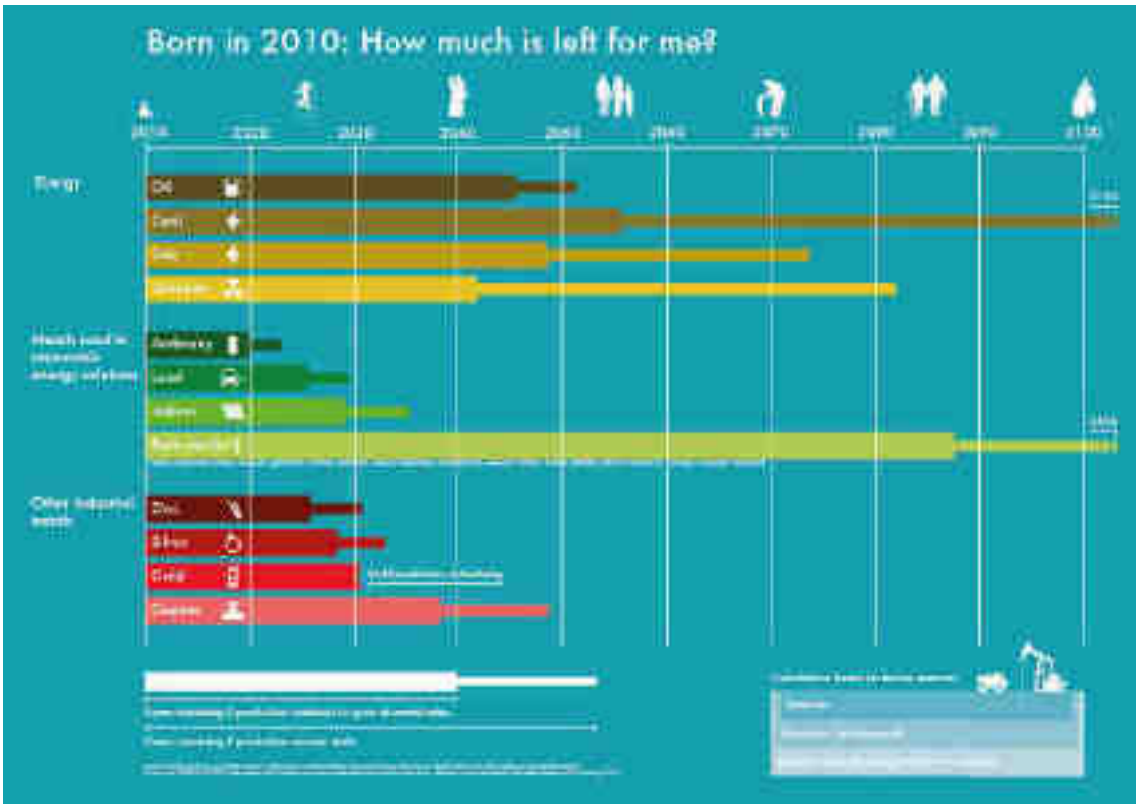


Figure 7: Resource consumption over the years

Overconsumption due to lifestyle changes, higher income levels and increased rate of obsolesce of electrical and electronics goods is leading to overconsumption of resources. Therefore it is necessary to reduce overconsumption and recycle so that we don't run out of resources.

Figure 8: Resource consumption across the ages

Source:

Govt. of Australia, (20011), Background Paper: Resource Consumption, Draft Planning Strategy.
http://www.planning.act.gov.au/__data/assets/pdf_file/0007/25684/Planning_Background11_Resource.pdf

Overconsumption: Our use of the world's natural resources.
https://www.foe.co.uk/sites/default/files/downloads/overconsumption.pdf

Forecast when we will run out of each metal
http://www.visualcapitalist.com/forecast-when-well-run-out-of-each-metal/

Secondary resources:

A secondary resource is something created by the process or consumer of products at their end-of-life for further processing, obviously if it is economically viable to do so. It really is the economic value of secondary resources that drives the recycling system, and the basis of the circular economy. Thus treating secondary resources is principally a matter of considering the economic value that it contains and also the form in which this value is present i.e. the mineralogy, the combinations of materials, linkages etc. The figure below gives a succinct overview of a circular economy

Source:
EC Brussels, 2.7.2014 COM(2014)

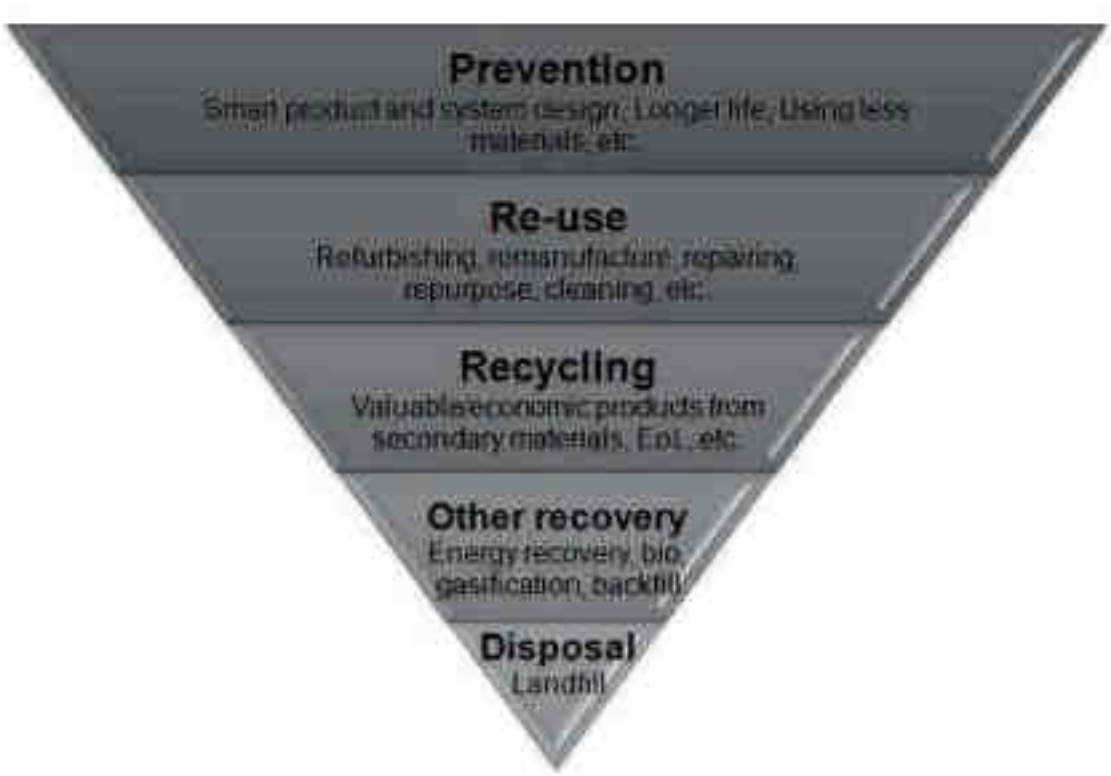


Figure 9: Steps towards a circular economy

The figure very clearly highlights through the “Raw Materials” and “Recycling” sections that process metallurgy is a key aspect in the realization of a closed-loop society. It really is the economic value of secondary resources that drives the recycling system, and the basis of the circular economy.

On the other hand primary resources are mostly extracted through mining operations leading to high economic, social and environmental costs. Use of secondary resources that use waste as a source of materials for building useful products leads to reduction in mining and prevents harmful environmental and social impacts.

Companies have already begun to transform themselves as participants of circular economy by design products that can more readily be recycled and reused. For example, Dell has introduced first computer made with plastics from recycled old electronics.

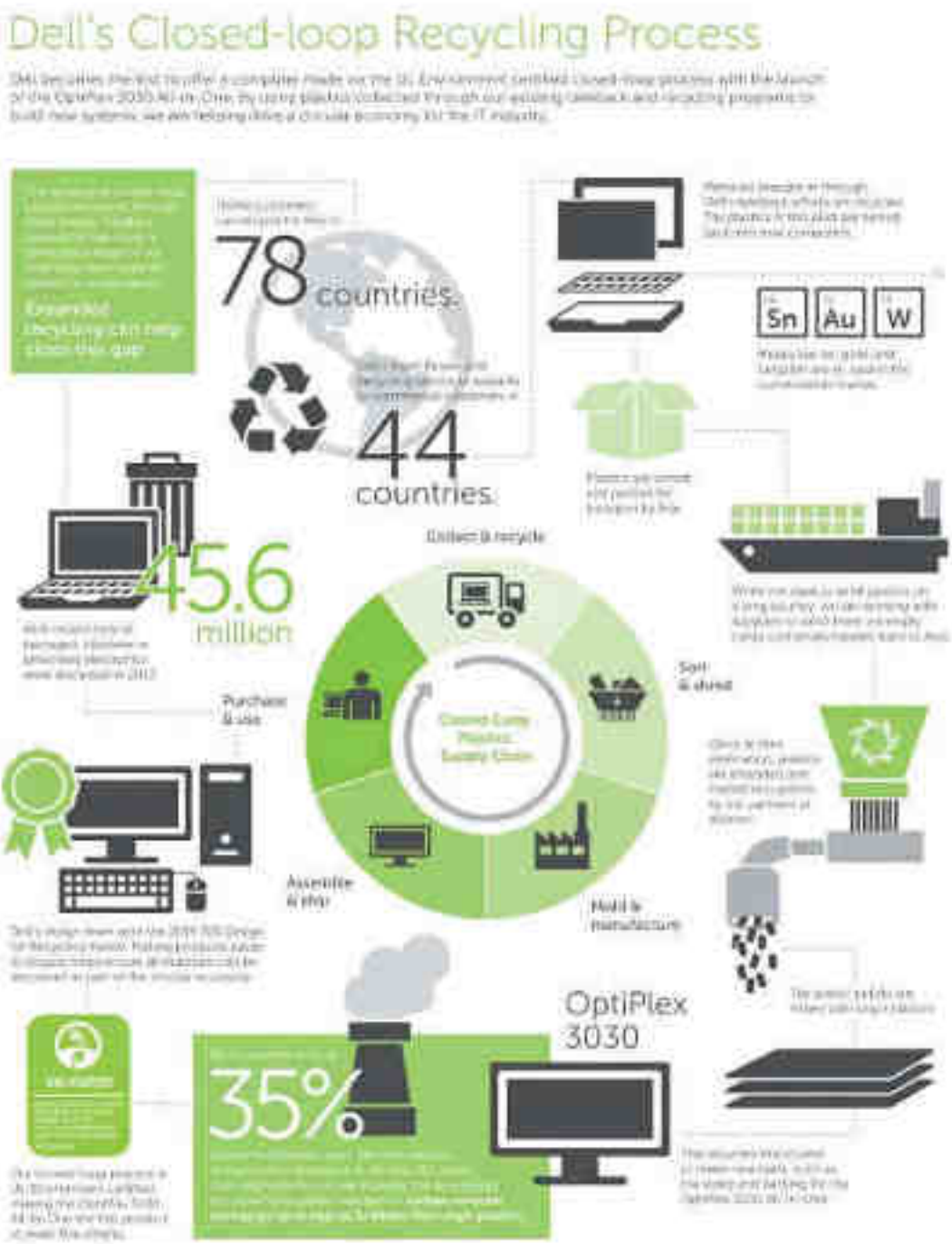


Figure 10: Closed loop recycling process

Source:

USING SECONDARY RESOURCES – TOWARDS SYSTEM INTEGRATED METAL PRODUCTION (SIMP), 30/01/2015, by: Markus Reuter

http://www.outotec.com/en/About-us/Blogs/Experts-thinking-ahead/Metal-and-material-recycling/Dates/2015/1/Using-secondary-resources--towards-System-Integrated-Metal-Production-SIMP/

Dell, (2014), Dell has introduced first computer made with plastics from recycled old electronics. http://www.electronicstakeback.com/2014/06/12/dell-introduces-first-computer-made-with-plastics-from-recycled-electronics/

LOHAS:

LOHAS is acronym for Lifestyles of Health and Sustainability and is based on the work of US sociologist Paul H. Ray. LOHAS consumers' lifestyle and purchasing decisions are informed by their values regarding personal, family and community health, environmental sustainability and social justice. These values and attitudes are driving the markets for products as diverse as renewable energy, solar hot water, organic foods, recycled and sustainable homewares, domestic rainwater tanks, sustainable timbers, natural cleaning products, alternative medicine, yoga and eco-tourism.

Source:
LOHAS, (2016), Introduction,
http://www.lohas.com.au/what-lohas

Personal Action Plan of LOHAS:

According to the Ellen Macarthur Foundation, today's linear 'take, make, dispose' economic model is reaching its physical limits or is unsustainable. Therefore there is a need to adopt a circular economy that is an attractive and viable alternative as it is restorative and regenerative by design, and aims to keep products, components, and materials at their highest utility and value at all times. As envisioned by the originators, a circular economy is a continuous positive development cycle that preserves and enhances natural capital, optimises resource yields, and minimises system risks by managing finite stocks and renewable flows. It works effectively at every scale.

LOHAS contributes to the concept of circular economy by ensuring that products are used keeping in mind the aim of reducing the adverse environmental and social impacts.LOHAS aims at moving consumers from being purchasers to participants for making a difference in terms of environmental and social impact of the product.

Personal action plan should start with finding and knowing more about the environmental and social impact of the product during manufacturing, use and end of life. For example if we use a television we can find what all metals, minerals and other substances were used to manufacture it and what was the environmental and social impact of the product.

LOHAS consumers actively seek green and sustainable products, support the principle of reduce, reuse and recycle in their day to day life and purchase decisions. Therefore, after the product's impact is know the person should compare the impact of this product with that of similar products available in the market. He or she should actively ask questions about the environmental management system and recycling program of the company. After comparison the consumer adopting LOHAS should opt for the most eco-friendly and recyclable product even if it costs slightly higher. For example, given a choice that you can buy a computer with 50% less harmful materials and made out of recycled plastic, you should buy it even if it is costing more than the computer with high percentage of harmful material and on use of recycled plastics.

For tackling e-waste challenge LOHAS consumers should demand from manufacturers that products should be made with minimum amount of harmful substances and they should ensure that e-waste is collected and managed in an environmentally and socially responsible manner. This will motivate the companies to change their manufacturing process to more sustainable options and implement recycling programs.

Source:

Natural Marketing Institute, (2007), Understand the LOHAS Consumer.
http://www.lohas.se/wp-content/uploads/2015/07/Understanding-the-LOHAS-Consumer-11_LOHAS_Whole_Foods_Version.pdf

Ellen Macarthur Foundation, (2015), Concept of circular economy,
http://www.ellenmacarthurfoundation.org/circular-economy/overview/concept

Occupational Health and Safety (OHS) issues around improper handling of e-waste

e-waste contains a wide range of hazardous compounds that may be released during improper handling thereby becoming a threat to humans and the environment. In addition, in some processes used, new hazardous compounds, such as dioxins, may be formed as the original e-waste components are degraded. Most risks arise during the uncontrolled e-waste recycling activities using rudimentary methods. These include manual disassembly and sorting; heating and acid leaching of printed circuit boards (PC-boards); shredding, melting and extrusion of plastics; open burning of plastic coated wires and other components; and sweeping and collection of toners from toner cartridges. These activities are mostly carried out directly on the ground in open air or in poorly ventilated workshops, and involve minimal emission control systems and personal protection for the workers.

Humans and the environment in the areas where this is carried out may therefore be highly exposed to the emissions generated. The recycling workers and the local residents are particularly exposed via dust generated during dismantling and shredding processes, and fumes and smoke generated during acid digestion processes and various high temperature processes, such as open burning and heating, melting, and extrusion processes. The environment is mainly contaminated from the open burning processes and through leakage from dumped residue of various recycling activities, e.g. stripped cathode ray tubes (CRTs) and PC-boards, spent acids from the digestion processes and residual ashes. On the whole, lead seems to be particularly problematic among the metals, and dioxins (chlorinated and brominated) and polybrominateddiphenyl ethers (PBDEs) among the organic compounds. These compounds are all very toxic and may potentially be emitted in large amounts during rudimentary e-waste recycling activities. Lead and PBDEs because they both are highly abundant in e-waste, and dioxins because the formation conditions many times are ideal in the processes used. As a consequence, extremely high levels (in some cases the highest ever measured) of these compounds have been measured in environmental as well as human samples collected in areas where uncontrolled e-waste recycling is taking place. Risks also arise when e-waste is treated as general municipal solid waste. During incineration, a wide variety of hazardous compounds may be emitted to the atmosphere via the smoke and exhaust gases, both in gaseous form and bound to particles.

The compounds emitted may be those that were present in the original waste, but probably more important are those compounds that may be formed during the incineration processes,

e.g. PCDD/Fs and PBDD/Fs. This is because the e-waste, being a complex fuel, may function as precursors for many different compounds in thermal processes. In fact, the conditions for dioxin formation are many times ideal when e-waste is incinerated, which is partly due to the presence of PVC-plastics and BFRs as dioxin precursors and partly due to the presence of copper and antimony as very potent catalysts in the transformation reactions. In modern incineration facilities the emission of these and other compounds may be minimized by process optimization and flue gas treatment systems. However during landfilling, hazardous compounds may leak to the surrounding environments, including nearby surface water and groundwater reservoirs, and also evaporate to the atmosphere. Leakage may occur for most compounds in the waste due to the long time span involved, but of particular concern are the leakage of lead and various other metals, as well as PBDEs and phthalate plasticizers. Evaporation mainly occurs for volatile compounds, of which mercury and its methylated derivatives are of most concern. The extent of leakage and evaporation from a landfill depends on the properties of the contaminants in question, but also on the design of the landfill (i.e. if it is open or sealed), the properties of the material being stored (e.g. type of waste, if it has been pre-treated in some way etc.), and on various environmental factors such as the ambient temperature and pH and humic content in the infiltrating water (SEPA, (2011)).

Source:

Swedish Environmental Protection Agency, (2011), Recycling and disposal of electronic waste Health hazards and environmental impacts, Report 6417.

4. Labeling Mechanisms in Electronics:

Bar Coding for Electronic Manufacturing

Manufacturers know that time to market, customer satisfaction,and cost control is critical to competing in a global economy. Maximizingproductivity, efficiency, tracking and process improvementsare key to success.

Labeling and bar code systems are widely employed to automateaccurate and versatile identification systems.

Bar coding provides accurate and productive ways to:

- Track inventory, production, work -in-process and customer orders in real-time.
- Track warehouse and stock-room operations and cut the time needed for cycle counting and inventory validation.
- Prevent employee mistakes such as picking the wrong materials.
- Automate data capture in shipping and receiving.
- Collect tracking and traceability records to meet customer, industry standard and US Government mandates.
- Increase responsiveness, improve customer service, and enhance productivity.

Bar coding was adopted throughout the electronic manufacturingand assembly industry as part of an effort to capture data before,during and after production.This data stays with the components or units and becomes animportant link in the production and supply chain process.Labels designed for electronic assembly and PC Board identificationmust last the life of the product and keep the data intact. Thisrequires durable labels designed to withstand harsh environmentprocessing including contact with chemicals, aqueous washes, extremehigh temperatures, wave flow soldering, or reducing ESD.

High Density Bar Codes for Electronics

Because of shrinking real estate on the electroniccomponents, two-dimensional (2D) symbologies have gainedpopularity. 2D bar codes offer greater data storage capacityusing high-density identification and error correction features, 2Dsymbologies are commonly used to store data needed to trackparts, WIP, provide traceability and more.

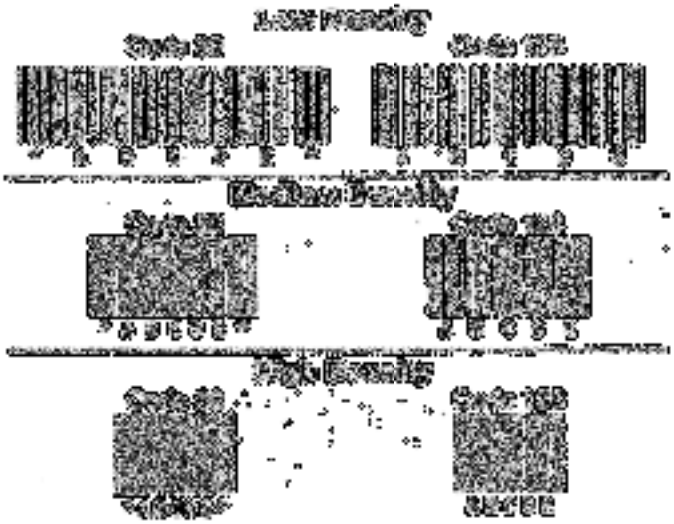


Figure 11: High Density of Bar Codes

Source: http://www.barcodehq.com/primer.html

What Is The Data Matrix Code?

The Data Matrix code is a two-dimensional matrixsymbology containing dark and light square data modulesmaking up a larger square or rectangular shaped symbol.It has a finder pattern of two solid lines and two alternating darkand light lines on the perimeter of the symbol.

A two dimensional imaging device is necessary to scan thesymbology - this is different from linear bar code scanners usedtoday. Data Matrix is designed with a fixed level of error correctioncapability. Data Matrix is used for item marking applicationsusing a wide variety of printing andmarking technologies.

The DataMatrix symbol looks like this:

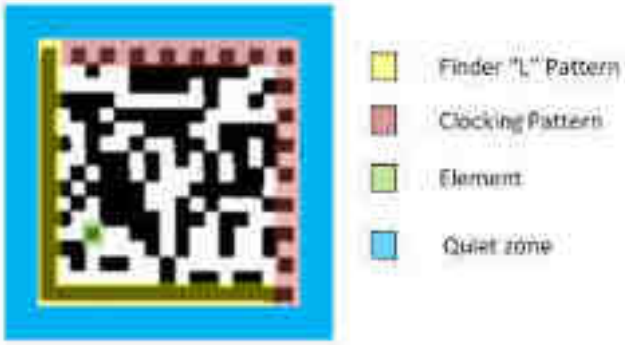


Figure 12: Anatomy of a Datamatrix Code

Source: http://cross-automation.com/blog/advantages-utilizing-2-dimensional-datamatrix-barcodes

The Data Matrix code was designedto withstand a fair amount ofdestruction and have the encodeddata remain readable. Meaning awhole section of the code can be scratched or completelygone and the mark will still read.The other feature of the Data Matrix code is the ability to be readfrom different angles. This makes it easier and far more efficientto scan marked objects without the worryor effort to align them in one direction.

Standard Mark and labeling requirements under BIS Compulsory Registration Scheme for Electronic and IT Products:

To simplify the labelling requirements Bureau of India Standard (BIS) has notified the 'Standard Mark' for the Registration Scheme on 01 December 2015.

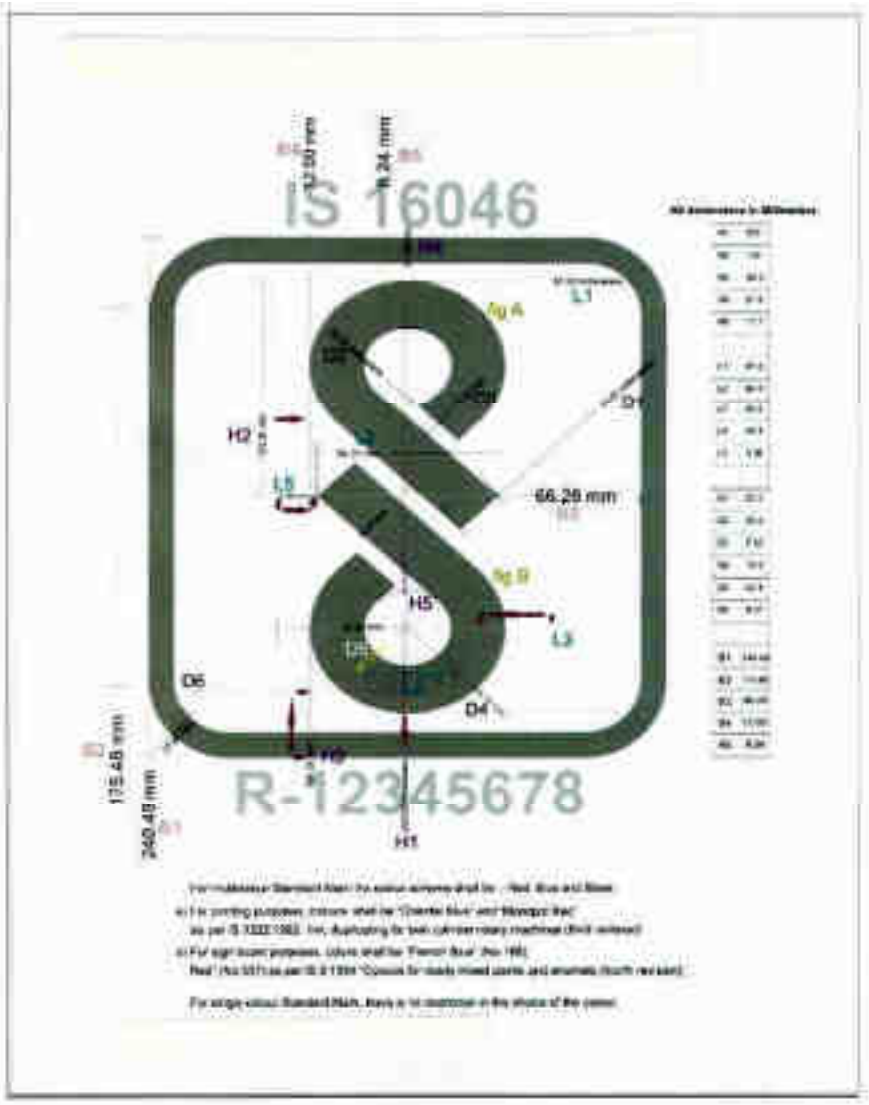
The guidelines for use of Standard Mark for the Compulsory Registration Scheme of BISare given below:

i. The monogram of the 'Standard Mark' consists of the pictorial representation, drawn in the exact style as indicated in the figure i. Its photographic reduction and enlargement is permitted.

ii. The 'Standard Mark' can be displayed in single colour or multi-colour as per the details given in Annexure I. The colour scheme for the Standard Mark to be used in multi-colour shall be used as indicated in figure II

iii. The registered user shall display the 'Standard Mark' or the words 'Self Declaration-Conforming to IS…….' along with Registration number on the article and/or the packaging, as the case may be, in a manner so as to be easily visible. It shall be legible, indelible and non-removable. Further, the durability of marking shall be as per the provisions of the relevant Indian Standard, wherever applicable. The display of IS number, Registration number and words shall not be less than Arial font size 6.

The registered users now have the option of either using the Standard Mark or use thewords 'Self declaration--Conforming to IS..... ' along with Registration number.



The IS number and registration number given above are examples only. Please also refer Gazette Notification S. O. 3240(E) dated 01 December 2015, for display of IS numbers for each product

Figure 13: Measurement for the 'Standard Mark' for 'Registration'

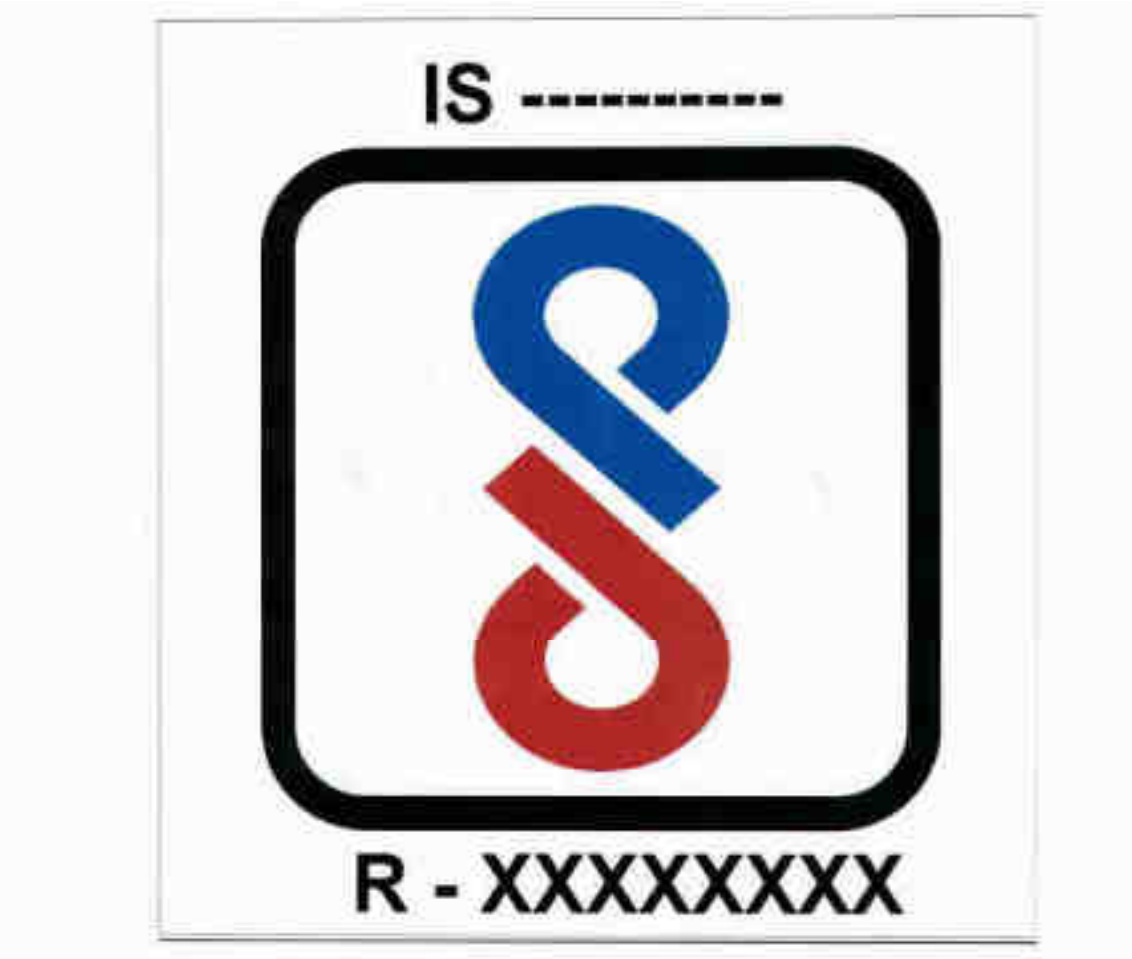


Figure 14: Colour Scheme for the 'Standard Mark' for Registration

5. The E-waste (Management) Rules, 2016 and the challenges of implementing the Rules

E-Waste (Management) Rules, 2016- What's New?

1. To address leakage of e-waste to informal sector at all the stages of channelization, manufacturer, dealer, refurbisher and Producer ResponsibilityOrganization (PRO) have been introduced as additional stakeholdersin the rules.

Figure 15: Stakeholders according to new Rule

Source:http://www.sustainabilityoutlook.in/content/e-waste-management-india-new-rules-old-problems-756361

2. Bulk of e-waste comprises of components, consumables, spares and parts of EEE which were not getting addressed in previous rules entailing to the scope of their channelization to informal sector. The applicability of the rules has been extended to components,consumables, spares and parts of EEE in addition to equipment aslisted in Schedule I.
3. Taking into account the lack of any regulation for management of CFL and other mercury containing lamp, CFL has been included in Schedule I which provide the list of EEE to which this rules is applicable.
4. Exemption continues for micro enterprises; however small enterprises, which have been referred as one of the major source of generation of e-waste, have been included in the rules for responsibility as manufacturer, **without burdening them with EPR responsibility as applicable to Producers.**

5. Collection mechanism based approach has been adopted to includecollection centre, collection point, take back system etc for collectionof e-waste by Producers under Extended Producer Responsibility(EPR). Shift from collection centre to collection mechanism approach and removal of need of separate authorization will ensure effective collection simultaneously ensuring flexibility for Producers for implementation. This will check leakage of flow of e-waste to unauthorised players
6. Option has been given for setting up of PRO, e-waste exchange, e- retailer, Deposit Refund Scheme as additional channel forimplementation of EPR by Producers to ensure efficientchannelization of e-waste.
7. Provision for Pan India EPR Authroization by CPCB has beenintroduced replacing the state wise EPR authorization.
8. Collection and channelisation of e-waste in Extended ProducerResponsibility - Authorisation shall be in line with the targetsprescribed in Schedule III of the Rules. The phase wise CollectionTarget for e-waste, which can be either in number or Weight shall be30% of the quantity of waste generation as indicated in EPR Planduring first two year of implementation of rules followed by 40%during third and fourth years, 50% during fifth and sixth years and70% during seventh year onwards. Target based approach (Minimum) is being used in many countries like Japan (redcycling rate 50% to 60%), South Korea (Recyxcling rate 55% to 70%), UK (Recycling and recocvery rate 50% to 80%) and Netherlands (recycling rates 45% to 75%).
9. Deposit Refund Scheme, an optional financial mechanism for effective implementation of EPR, has been introduced as an additional economicinstrument wherein the producer charges an additional amount as adeposit at the time of sale of the electrical and electronic equipmentand returns it to the consumer along with interest when the end-oflifeelectrical and electronic equipment is returned.
10. The e-waste exchange as an option has been provided in the rules as anindependent market instrument offering assistance or independentelectronic systems offering services for sale and purchase of e-wastegenerated from end-of-life electrical and electronic equipmentbetween agencies or organizations authorised under these rules.
11. The manufacturer is also now responsible to collect e-waste generatedduring the manufacture of any electrical and electronic equipmentand channelise it for recycling or disposal and seek authorizationfrom SPCB.
12. The dealer, if has been given the responsibility of collection on behalf ofthe producer, need to collect the e-waste by providing the consumer abox and channelize it to Producer. This will provide flexibility to producer for channelization and ensure ease of implementation by consumers for depositing the e-waste at end of life.
13. Dealer or retailer or e-retailer shall refund the amount as per take backsystem or Deposit Refund Scheme of the producer to the depositor ofe-waste.
14. To check the leakage in informal sector, refurbisher need collect e-waste generated during the process ofrefurbishing and channelise the waste to authorised dismantler orrecycler through its collection centre and seek one time authorizationfrom SPCB.
15. To bring clarity in respect of definition and to put obligations on bulk consumers who are major generators and whose compliance was non satisfactory due to lack of any concrete obligation on reporting, health care facilities which have

turnover of more than one crore or have more than twenty employees' has been added as Bulk Consumer list. They need to file annual returns.

16. The roles of the State Government has been also introduced in the Rulesin orderto ensure safety, health and skill development of the workersinvolved in the dismantling and recycling operations.
17. Department of Industry in State or any other government agencyauthorised in this regard by the State Government is to ensureearmarking or allocation of industrial space or shed for e-wastedismantling and recycling in the existing and upcoming industrialpark, estate and industrial clusters.
18. Department of Labour in the State or any other government agencyauthorised in this regard by the State Government need to ensurerecognition and registration of workers involved in dismantling andrecycling; assist formation of groups of such workers to facilitatesetting up dismantling facilities; undertake industrial skilldevelopment activities for the workers involved in dismantling andrecycling; and undertake annual monitoring and to ensure safety &health of workers involved in dismantling and recycling.
19. State Government to prepare integrated plan for effectiveimplementation of these provisions, and to submit annual report toMinistry of Environment, Forest and Climate Change.
20. To prevent leakage of e-waste to informal sector during transportation, transportation of e-waste shall be carried out as per the manifestsystem whereby the transporter shall be required to carry adocument (three copies) prepared by the sender, giving the details.
21. Liability for damages caused to the environment or third party due toimproper management of e-waste including provision for levyingfinancial penalty for violation of provisions of the Rules has also beenintroduced.
22. To bring clarity in the rules for effective implementation and prevent leakage to informal sector, urban Local Bodies (Municipal Committee/Council/Corporation) hasbeen assign the duty to collect and channelized the orphan productsto authorized dismantler or recycler.

Challenges of implementing the new Rules

The biggest challenge will come from the fact that a large part of our current e-waste management lies in the informal sector. According to the Associated Chambers of Commerce and Industry, only 1.5 per cent of India's total e-waste is recycled by formal recyclers who are approved by state boards. The regulatory structure has so far been unable to tackle this adequately. With micro enterprises given exemption from the e-waste rules, the rules are still silent on the issue.

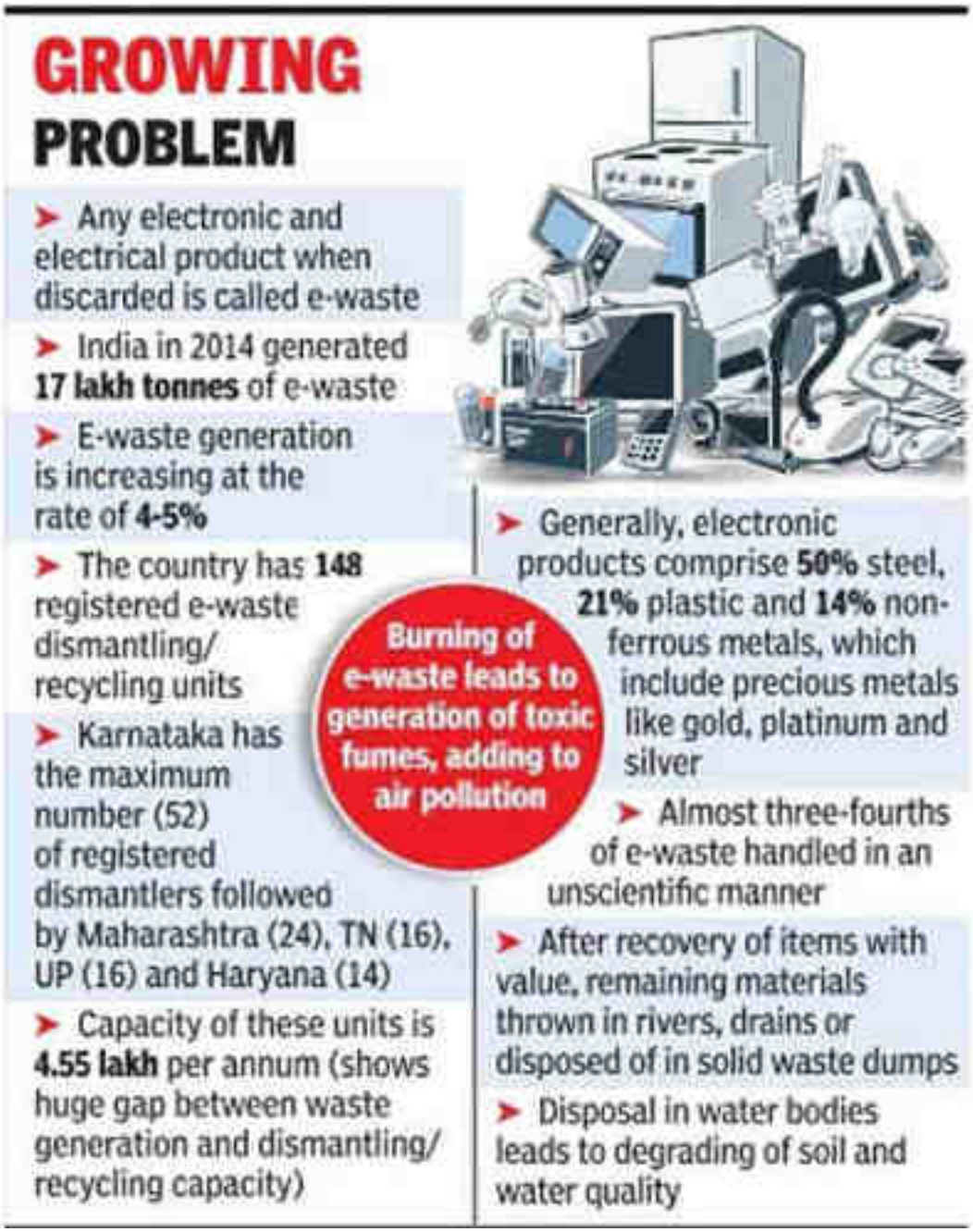


Figure 16: e-Waste the Growing Problem

Source:http://timesofindia.indiatimes.com/home/environment/pollution/Govt-tightens-e-waste-rules-offers-sops-to-consumers/articleshow/51529702.cms

Regulatory architecture is the next big challenge. Both CPCB and SPCBs are understaffed, underfinanced and lack technical capabiliity. A Comptroller and Auditor General (CAG) report has indicted CPCB for inefficient implementation of the e-waste rules, 2011. According to the report, "CPCB did not conduct assessment of quantity of e-waste being generated/processed in the country and effectively coordinate with state agencies for collection and compliance of such data. The Board also failed to implement framework for reduction of use of hazardous substances in electrical and electronic equipment

manufactured and imported in the country." Giving these regulators more responsibility without addressing their human, financial and technical capacity needs would serve little purpose.

Last but not the least, new rules have again failed in making their implementation more consumer-focused. Tools like PRO and DRS can work only when consumers are aware of the hazards of e-waste and are adequately motivated to recycle it through the formal sector.

6. Responsibilities of the manufacturer

Responsibilities of the manufacturer includes–

1) collect e-waste generated during themanufacture of any electrical and electronic equipment and channelise it forrecycling or disposal;
2) apply for an authorisation in Form 1 (a) in accordance with the procedureprescribed under sub-rule (2) of rule 13 from the concerned State Pollution ControlBoard, which shall give the authorisation in accordance with Form 1 (bb);
3) ensure that no damage is caused to the environment during storage andtransportation of e-waste;
4) maintain records of the e-waste generated, handled and disposed in Form-2 andmake such records available for scrutiny by the concerned State Pollution ControlBoard;
5) file annual returns in Form-3, to the concerned State Pollution Control Board on orbefore the 30th day of June following the financial year to which that return relates.

Responsibilities of the producer –
The producer of electrical and electronicequipment listed in Schedule I shall be responsible for -
1) Implementing the Extended Producers Responsibility with the following frameworks, namely:-
(a) collection and channelisation of e-waste generated from the 'end-of-life' of theirproducts or 'end-of-life' products with same electrical and electronic equipmentcode and historical waste available on the date from which these rules come intoforce as per Schedule I in line with the targets prescribed in Schedule III in

Extended Producer Responsibility - Authorisation;
(b) the mechanism used for channelisation of e-waste from 'end-of-life' productsincluding those from their service centres to authorised dismantler or recycler shallbe in accordance with the Extended Producer Responsibility - Authorisation. Incases of fluorescent and other mercury containing lamps, where recyclers are notavailable, channelisation may be from collection centre to Treatment, Storage and

Disposal Facility;
(c) for disposal in Treatment, Storage and Disposal Facility, a pre-treatment isnecessary to immobilise the mercury and reduce the volume of waste to bedisposed off;

(d) Extended Producer Responsibility - Authorisation should comprise of generalscheme for collection of waste Electrical and Electronic Equipment from theElectrical and Electronic Equipment placed on the market earlier, such as throughdealer, collection centres, producer Responsibility Organisation, through buy-backarrangement, exchange scheme, Deposit Refund System, etc. whether directly orthrough any authorised agency and channelising the items so collected toauthorised recyclers;

(e) providing contact details such as address, e-mail address, toll-free telephonenumbers or helpline numbers to consumer(s) or bulk consumer(s) through theirwebsite and product user documentation so as to facilitate return of end-of-lifeelectrical and electronic equipment;

(f) creating awareness through media, publications, advertisements, posters, or byany other means of communication and product user documentationaccompanying the equipment, with regard to -

i. information on address, e-mail address, toll-free telephone numbers or helplinenumbers and web site;

ii. information on hazardous constituents as specified in sub-rule 1 of rule 16 inelectrical and electronic equipment;

iii. information on hazards of improper handling, disposal, accidental breakage,damage or improper recycling of e-waste;

iv. instructions for handling and disposal of the equipment after its use, along withthe Do's and Don'ts;

v. affixing a visible, legible and indelible symbol given below on the products orproduct user documentation to prevent e-waste from being dropped in garbagebins containing waste destined for disposal;

vi. means and mechanism available for their consumers to return e-waste forrecycling including the details of Deposit Refund Scheme, if applicable;

(g) the producer shall opt to implement Extended Producer Responsibility individuallyor collectively. In individual producer responsibility, producer may set up his owncollection centre or implement take back system or both to meet Extended

Producer Responsibility.

In collective system, producers may tie-up as a memberwith a Producer Responsibility Organisation or with e-waste exchange or both. Itshall be mandatory upon on the individual producer in every case to seek

Extended Producer Responsibility –
Authorisation from Central Pollution Control
Board in accordance with the Form-1 and the procedure laid down in sub-rule (1)
of rule 13;

(2) to provide information on the implementation of Deposit Refund Scheme to ensurecollection of end-of-life products and their channelisation to authorised dismantlersor recyclers, if such scheme is included in the Extended Producer ResponsibilityPlan. Provided that the producer shall refund the deposit amount that has been takenfrom the consumer or bulk consumer at the time of sale, along with interest at theprevalent rate for the period of the deposit at the time of take back of the end-oflifeproduct;

(3) the import of electrical and electronic equipment shall be allowed only to producers having Extended Producer Responsibility authorisation;

(4) maintaining records in Form-2 of the e-waste handled and make such records available for scrutiny by the Central Pollution Control Board or the concerned State Pollution Control Board;

(5) filing annual returns in Form-3, to the Central Pollution Control Board on or before the 30th day of June following the financial year to which that return relates. In case of the Producer with multiple offices in a State, one annual return combining information from all the offices shall be filed;

(6) the Producer shall apply to the Central Pollution Control Board for authorisation in Form 1, which shall thereafter grant the Extended Producer Responsibility -Authorisation in Form 1(aa).

(7) Operation without Extended Producer Responsibility-Authorisation by any producer, as defined in this rule, shall be considered as causing damage to the environment.

Reduction in the use of hazardous substances in the manufacture of electrical and electronic equipment and their components or consumables or parts or spares. – Every producer of electrical and electronic equipment and their components or consumables or parts or spares listed in Schedule I shall ensure that, new Electrical and Electronic Equipment and their components or consumables or parts or spares do not contain Lead, Mercury, Cadmium, Hexavalent Chromium, polybrominated biphenyls and polybrominateddiphenyl ethers beyond a maximum concentration value of 0.1% by weight in homogenous materials for lead, mercury,hexavalent chromium, polybrominated biphenyls and polybrominateddiphenyl ethersand of 0.01% by weight in homogenous materials for cadmium.

SCHEDULE I

[See rules 2, 3(j), 3(y), 3(aa) and 3(ff); 5; 9; 11(10); 13 (1) (i), 13 (1) (vii) and 16(1), 16(11)]

Categories of electrical and electronic equipment including their components, consumables, parts and spares covered under the rules

Sr. No.	Categories of electrical and electronic equipment	Electrical and electronic equipment code
I.	**Information technology and telecommunication equipment :**	
	Centralised data processing: Mainframes, Minicomputers	ITEW1
	Personal Computing: Personal Computers (Central Processing Unit with input and output devices)	ITEW2
	Personal Computing: Laptop Computers(Central Processing Unit with input and output devices)	ITEW3
	Personal Computing: Notebook Computers	ITEW4
	Personal Computing: Notepad Computers	ITEW5
	Printers including cartridges	ITEW6
	Copying equipment	ITEW7
	Electrical and electronic typewriters	ITEW8
	User terminals and systems	ITEW9
	Facsimile	ITEW10
	Telex	ITEW11
	Telephones	ITEW12
	Pay telephones	ITEW13
	Cordless telephones	ITEW14
	Cellular telephones	ITEW15
	Answering systems	ITEW16
II.	**Consumer electrical and electronics:**	
	Television sets (including sets based on (Liquid Crystal Display and Light Emitting Diode technology)	CEEW1
	Refrigerator	CEEW2
	Washing Machine	CEEW3
	Air-conditioners excluding centralised air conditioning plants	CEEW4
	Fluorescent and other Mercury containing lamps	CEEW5

Table 5: Categories of electrical and electronic equipment with their code as defined in New Rule 2016

FORM-1

[See Rules 5(1) (g), 13(1) (i), 13(1) (vi)]

Applicable to producers seeking Extended Producer Responsibility - Authorisation

The application form should contain the following information:

1.	Name and full address along with telephone numbers, e-mail and other contact details of Producer (It should be the place from where sale in entire country is being managed)	:	
2.	Name of the Authorised Person and full address with e-mail, telephone and fax number	:	
3.	Name, address and contact details of Producer Responsibility Organisation, if any with full address, e-mail, telephone and fax number, if engaged for implementing the Extended Producer Responsibility	:	
4.	Details of electrical and electronic equipment placed on market year-wise during previous 10 years in the form of Table 1 as given below:	:	

Table 1: Details of Electrical and Electronic Equipment placed on the market in previous years - Code wise

Sr. No.	Electrical and Electronic Equipment Item	Electrical and Electronic Equipment Code	Quantity, number and weight placed on market (year-wise)									
A	**Information technology and telecommunication equipment:**											
1	Centralised data processing: Mainframes, Minicomputers	ITEW1										
2	Personal Computing: Personal Computers (Central Processing Unit with input and output devices)	ITEW2										
3	Personal Computing: Laptop Computers(Central Processing Unit with input and	ITEW3										

	output devices)												
4	Personal Computing: Notebook Computers	ITEW4											
5	Personal Computing: Notepad Computers	ITEW5											
6	Printers including cartridges	ITEW6											
7	Copying equipment	ITEW7											
8	Electrical and electronic typewriters	ITEW8											
9	User terminals and systems	ITEW9											
10	Facsimile	ITEW10											
11	Telex	ITEW11											
12	Telephones	ITEW12											
13	Pay telephones	ITEW13											
14	Cordless telephones	ITEW14											
15	Cellular telephones	ITEW15											
16	Answering systems	ITEW16											
B	**Consumer electrical and electronics:**												
17	Television sets (including sets based on (Liquid Crystal Display and Light Emitting Diode technology)	CEEW1											
18	Refrigerator	CEEW2											
19	Washing Machine	CEEW3											
20	Air-conditioners excluding centralised air conditioning plants	CEEW4											
21	Fluorescent and other Mercury containing lamps	CEEW5											

5. Estimated generation of Electrical and Electronic Equipment waste item-wise and estimated collection target for the forthcoming year in the form of Table 2 including those being generated from their service centres, as given below:

Table 2: Estimated generation of Electrical and Electronic Equipment waste item-wise and estimated collection target for the forthcoming year

Sr. No.	Item	Estimated waste electrical and electronic equipment generation Number and weight	Targeted collection Number and weight

6. Extended Producer Responsibility Plans:

(a) Please provide details of your overall scheme to fulfil Extended Producer Responsibility obligations including targets. This should comprise of general scheme of collection of used/waste Electrical and Electronic Equipment from the Electrical and Electronic Equipment placed on the market earlier such as through dealers and collection centres, Producer Responsibility Organisation, through buy-back arrangement, exchange scheme, Deposit Refund Scheme, etc. whether directly or through any authorised agency and channelising the items so collected to authorised recyclers.

(b) Provide the list with addresses along with agreement copies with dealers, collection centres, recyclers, Treatment, Storage and Disposal Facility, etc. under your scheme.

7. Estimated budget for Extended Producer Responsibility and allied initiatives to create consumer awareness.

8. Details of proposed awareness programmes.

9. Details for Reduction of Hazardous Substances compliance (to be filled if applicable):

(a) Whether the Electrical and Electronic Equipment placed on market complies with the rule 16 (1) limits with respect to lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominateddiphenyl ethers;

(b)Provide the technical documents (Supplier declarations, Materials declarations/Analytical reports) as evidence that the Reduction of Hazardous Substances (RoHS) provisions are complied by the product based on standard EN 50581 of EU;

(c) Documents required:

i. Extended Producer Responsibility plan;
ii. Copy of the permission from the relevant Ministry/Department for selling their product.

FORM 1(bb)

[See rules 4(2), 8(2)(a), 13(2) (iii) and 13(4)(ii)]

FORMAT FOR GRANTING AUTHORISATION FOR GENERATION OR STORAGE OR TREATMENT OR REFURBISHING OR DISPOSAL OF E-WASTE BY MANUFACTURER OR REFURBISHER

Ref: Your application for Grant of Authorisation

1. (a) Authorisation no. ..... and (b) date of issue .....

2. .....of.....is hereby granted an authorisation for generation, storage, treatment, disposal of e-waste on the premises situated at..... for the following:
   a. quantity of e-waste;
   b. nature of e-waste.

3. The authorisation shall be valid for a period from ..... to .....

4. The e-waste mentioned above shall be treated/ disposed off in a manner ..... at .....

5. The authorisation is subject to the conditions stated below and such conditions as may be specified in the rules for the time being in force under the Environment (Protection) Act, 1986.

Signature ----------
Designation ---------- Date: ----------

Terms and conditions of authorisation

1. The authorisation shall comply with the provisions of the Environment (Protection) Act, 1986, and the rules made thereunder.
2. The authorisation or its renewal shall be produced for inspection at the request of an officer authorized by the concerned State Pollution Control Board.
3. Any unauthorised change in personnel, equipment as working conditions as mentioned in the application by the person authorized shall constitute a breach of his authorisation.
4. It is the duty of the authorised person to take prior permission of the concerned State Pollution Control Board to close down the operations.
5. An application for the renewal of an authorisation shall be made as laid down in sub-rule (vi) of rule 13(2).

FORM-2

[See rules 4(4), 5(4), 6(5), 9(7), 9(2), 10(7), 11(8), 13 (1) (xi), 13(2)(v), 13(3)(vii) a 13 (4)(v)]

FORM FOR MAINTAINING RECORDS OF E-WASTE HANDLED OR GENERAT

Generated Quantity in Metric Tonnes (MT) per year

1.	Name & Address: Producer or Manufacturer or Refurbisher or Dismantler or Recycler or Bulk Consumer*		
2.	Date of issue of Extended Producer Responsibility Authorisation*/ Authorisation*		
3.	Validity of Extended Producer Responsibility Authorisation*/ Authorisation*		
4.	Types & Quantity of e-waste handled or generated**	Category Item Description	Quantity
5.	Types & Quantity of e-waste stored	Category Item Description	Quantity
6.	Types & Quantity of e-waste sent to collection centre authorised by producer/ dismantler/recycler / refurbisher or authorised dismantler/recycler or refurbisher**	Category Item Description	Quantity
7.	Types & Quantity of e-waste transported*	Category Quantity	Quantity
	Name, address and contact details of the destination		
8.	Types & Quantity of e-waste refurbished*	Category Item Description	Quantity
	Name, address and contact details of the destination of refurbished materials		
9.	Types & Quantity of e-waste dismantled*	Category Item Description	Quantity
	Name, address and contact details of the destination		

10.	Types & Quantity of e-waste recycled*	Category	Quantity
	Types & Quantity of materials recovered	Item Description	
		Quantity	
	Name, address and contact details of the destination		
11.	Types & Quantity of e-waste sent to recyclers by dismantlers	Category	Quantity
		Item Description	
	Name, address and contact details of the destination		
12.	Types & Quantity of other waste sent to respective recyclers by dismantlers/recyclers of e-waste	Category	Quantity
		Item Description	
	Name, address and contact details of the destination		
13.	Types & Quantity of e-waste treated & disposed	Category	Quantity
		Item Description	
	Name, address and contact details of the destination		

Note:-

(1) * Strike off whichever is not applicable

(2) Provide any other information as stipulated in the conditions to the authoriser

(3) ** For producers this information has to be provided state-wise

FORM-3

[See rules 4(5), 5(5), 8(6), 9(4), 10(8), 11(9), 13 (1) (xi), 13(2)(v), 13(3)(vii) and 13(4)(v)]

FORM FOR FILING ANNUAL RETURNS

[To be submitted by producer or manufacturer or refurbisher or dismantler or recycler by 30th day of June following the financial year to which that return relates]

Quantity in Metric Tonnes (MT) and numbers

1	Name and address of the producer or manufacturer or refurbisher or dismantler or recycler			
2	Name of the authorised person and complete address with telephone and fax numbers and e-mail address			
3	Total quantity of e-waste collected or channelised to recyclers or dismantlers for processing during the year for each category of electrical and electronic equipment listed in the Schedule I (Attach list) by PRODUCERS			
	Details of the above	TYPE	QUANTITY	No.
3(A)*	BULK CONSUMERS: Quantity of e-waste			
3(B)*	REFURBISHERS: Quantity of e-waste:			
3(C)*	DISMANTLERS: i Quantity of e-waste processed (Code wise); ii. Details of materials or components recovered and sold; iii. Quantity of e-waste sent to recycler; iv. Residual quantity of e-waste sent to Treatment, Storage and Disposal Facility.			
3(D)*	RECYCLERS: i. Quantity of e-waste processed (Code wise); ii. Details of materials recovered and sold in the market; iii. Details of residue sent to Treatment, Storage and Disposal Facility.			
4	Name and full address of the destination with respect to 3(A)-3(D) above			
5	Type and quantity of materials segregated or recovered from e-waste of different codes as applicable to 3(A)-3(D)	Type	Quantity	

✔ Enclose the list of recyclers to whom e-waste have been sent for recycling.

Place_____

7. Building blocks to an internal policy on e-waste management

To comply with the India e-waste rule 2016, companies need to work on their only policy framework to ensure the compliance of its products to these new initiatives and directives. Companies need to prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominateddiphenyl ethers in concentrations exceeding 0.1 weight % and 0.01 weight % for cadmium, except for the exemptions set in Schedule 2 of the Rule. Along with the manufacturing, policy should address the collection and return of End of Life products.

The elements of a framework are

- Policy
- Implementation
- Monitoring
- Reporting

Policy:

It should address the following

- Are we consistent with the rules and regulations of the land?
- Does the organization currently have an e-waste disposal policy?
- Does the disposal policy take environmental considerations into account?
- Can we do more than only fulfilling legal objectives?

Implementing the policy
While implementing the policy we should consider the following

- Do we have structures in place for implementing the policy?
- How do we organize collection, storage and disposal?
- Are the service provider recognized and contracts signed?

Monitoring
How do we monitor the progress of our implementation process?
Is there a monitoring system in place?

What are the elements of a monitoring system?
Indicators and Targets?

An Example: UBA

UBA Facts

- Founded in 1974, the UBA is Germany's central federal authority on environmental matters. Its key statutory mandates are:
    - To provide scientific support to the Federal Government (e.g.. the Federal Ministries for Environment; Health; Research; Transport, Building and Urban Affairs);
    - Implementation of environmental laws (e.g. emissions trading, authorisation of chemicals, pharmaceuticals, and plant protection agents)
- Total staff of around 1,400
- Some 900 of UBA's total staff work in the UBA headquarter in Dessau-Roßlau
- Altogether the staff is dispersed over 13 sites
- Eco-Management and Audit Scheme (EMAS) certification conducted at 5 sites representing more than 85 percent of total staff
- Annual inspection of EMAS certified sites by independent consultant

UBA Environmental Guidelines

In the Federal Environment Agency mission statement its staff's objectives are to:

- protect and maintain natural resources,
- promote sustainable development and
- to firmly root environmental protection as a matter of course in everyone's thinking and actions.

UBA pursue these goals especially within their Agency and resolutely practice what they recommend to others for the promotion of long-term, environmentally compatible development. They implement an environmental management system which heir environmental guidelines provide the basis for.

How they see ourselves

- It is especially in the fulfillment of its professional tasks that the Federal Environment Agency contributes to environmental protection. They adhere to the environmental protection legislation in force and commit ourselves beyond that to continuous improvement of environmental protection in our own activities by setting concrete environmental targets, and we regularly check our performance. When doing so, they take the possibly undesired environmental impacts of our products and services into consideration.
- The Agency promotes a sense of responsibility and the active involvement of all its staff in efforts to protect the environment and health.

To reduce negative environmental impacts

- In procurement, UBA prefer the most environmentally compatible products in light of their manufacture, use, and disposal.
- UBA use energy, water, materials, and space efficiently and in an environmentally compatible fashion.

- They make efforts to avoid waste and where waste is unavoidable, It is recycled or disposed of in an environmentally compatible way.
- Their business trips are conducted in as an environmentally compatible manner as possible. They recommend their visitors to use public transport.
- UBA involve their contractors in their activities to protect the environment and health.

To promote transparency they regularly conduct in-house environmental checks, make their results public, and the derived measures are stated in an environmental impact report which then exposes us to public discussion.

UBA E-Waste Practices

- Compliance with e-waste legislation (ElektroG)
- Central collection of e-waste at each site
- Contracts with local recyclers for the recycling of e-waste (e.g. Remondis, Recycling firm of the city of Dessau)
- Annual pickup of e-waste by authorized recycler or delivery to recyler
- Some EEE is sold (e.g. to Vebeg) for reuse purposes
- Environmental audits of internal e-waste streams by Environmental Protection Officer

Partner Organizations

Recyler, e.g. Remondis

- Remondis is the largest German recyling company
- Remondis recycles the WEEE according to the applying legal requirements (ElektroG)

Reuse Seller – VEBEG

- VEBEG is a Trust Company of the Federal Republic of Germany, was established in 1951 by the Federal Ministry of Finance
- VEBEG sells equipment from boots to aircraft and from vehicles to old EEE
- Annually VEBEG sells some 30,000 lots through tenders

UBA Annual Environmental Reports

Report contains data on e-waste quantities at site in Dessau

Tabelle 5: Entwicklung des Aufkommens an Abfällen im Dienstgebäude Dessau-Roßlau

Abfallbezeichnung	ASN	2006	2007	2008	2009
Fettabscheider (Kantine) (in m³)	020204	-	12	12	12
Gemischte Verpackungen (DSD, in m³)	150106	13	11,88	85,8	85,8
Papier und Pappe/Karton (in m³)	200101	120	197	36 + 28,6 t	301 + 25 t
Altglas (in m³)	150107	40	40	85,8	85,8
Disketten (CD, DVD, in kg)	200139		14	153	18
Bioabfälle (in m³)	200108	6	2,2	14,5	19,4
Haushaltsbatterien (in kg)	200133	Gewicht nicht erfasst			120
Hausmüllähnliche Abfälle (in m³)	200301	400	300	338	336
Sperrmüll (in m³)	200307				3,5
Elektrische Geräte (in kg)	160214	-	1058	307	13 Geräte
Grünschnitt/Laub (in m³)	200201	-	-	0,36	0,24

WEEE in kg (in units for 2009)

Table 6: e-waste quantities at site in Dessau

Report contains data on e-waste quantities at site in Berlin

Tabelle 6: Entwicklung des Aufkommens an nicht gefährlichen Abfällen in Berlin-Bismarckplatz

Abfallbezeichnung	ASN	2005	2006	2007	2008	2009	1. Halbj. 2010
Fettabscheider (Kantine, in m³)	020204	8	8	8	0	0	8
gemischte Verpackungen (DSD, in m³)	150106	63	63	63	121	121	
Papier und Pappe (in m³)	200101	108	72	72	55	72	18
Altglas (in m³)	150107	29	29	29	29	29	
Disketten (CD, DVD, in kg)	200139	15	15	5	101	96	59
Bioabfälle (in m³)	200108	12	12	12		12	
Haushaltsbatterien (in kg)**	200133	0,3 m³		4			
Hausmüllähnliche Abfälle (in m³)	200301		38,1 t	21	343	363	343
Sperrmüll (in kg)	200307	95 m³	17.130	-	3.000		
Gebrauchte elektrische Geräte (in kg)	160214	363	1.667	-	2.244	1.308	
Metall (in kg)	200140					1.500	
Grünschnitt/Laub (in m³)	200201	nicht erfasst (Eigenkompostierung)					

WEEE in kg

Table 7: e-waste quantities at site in Berlin

8. Guidelines for setting up of collection centres of e-waste:

Criteria for setting up Collection centres

1. The collection, transportation, storage and handling of E-Waste in the collection centres as tobe done carefully without breaking the end of life equipment.

2. Collection centers, established under these Rules, need not seek Consent to Establish andConsent to Operate under the Water (Prevention and Control of Pollution) Act, 1974 and theAir (Prevention and Control of Pollution) Act, 1981. Ensure that no damage is caused to the environment during storage andtransportation of e-waste;

3. Producers having large number of distributors/dealers in each of the State and has largewarehouses already in place can use the space if available in these ware house forestablishing collection centre. However, the space used for collection centre has to be clearlydemarcated (by enclosure or partition) from the space meant for new goods.

4. The storage capacity of any collection centre should be commensurate with available area,volume of operations (in weight) and type of E-waste.

5. The collection centre where Refrigerator and Air conditioners are also stored should haveadequate facilities for handling / arresting leakage of compressor oils, CFCs/HCFCs if any.

6. Covered shed/spaces may be used for storage of E-Waste generated from IT andTelecommunication equipments while open spaces can be used for storage of refrigerators /washing machines /air conditioners. In case of storage of e-waste, generated from IT andTelecommunication equipment, in open spaces, containers with lids/covers may be used.Ewaste comprising of IT & TE waste preferably be segregated and stored at collection centrein suitable racks/containers/bins.

7. Containers of appropriate size and shape may be used for segregation of e-waste itemsgenerated from IT and Telecommunication equipments to facilitate effective collection andhandling operations. Containers can be made either of wood or plastic or mild steel or anyappropriate material with sufficient strength and shapes (top open containers, caged boxes,rakes etc.) for holding the e-waste. These containers/racks may be placed in such a way thatthere should be adequate space for movement of workers and material.

8. Producer can assess their individual requirements and design a collection or product takeback systems as they deem appropriate as long as it facilitates channelization of WEEE forenvironmentally sound management.

Legal Requirement of Collection Center

The collection centre has to comply with following legal requirements:

- To obtain an authorization from the concerned SPCBs/PCCs
- To ensure that the e-waste collected by them is sent to registered dismantlers or recyclers in a secured manner.
- Maintain records in Form-2 of the e-waste handled as per the guidelines of Central Pollution Control Board and make such records available for scrutiny by the Central Pollution Control Board or the concerned State Pollution Control Board as and when asked for.
- To file annual returns in Form 3
- To make the records available for scrutiny by the SPCBs/PCCs

Figure 17: Mumbai gets its 1st e-waste collection centre

9. How do you set up of a Producer Responsibility Organization (PRO) for collecting e-waste:

Steps for Setting Up a PRO by GIZ-IGEP:

Define Framework

- Accountability Framework : It will address the elements and processes of the PRO to account for its actions to stakeholders, members, management
- Operational Framework: Detailing the management processes and systems supporting day-to-day activities and the overall accountability framework
- Identify Stakeholders: Identify both external and internal stakeholders for this PRO

A single framework that will eliminate confusion between the components and to easily identify linkages between common accountability and operational elements. This will also communicate roles and responsibilities, design and deliver programmes, establish M& E, MIS and strategies

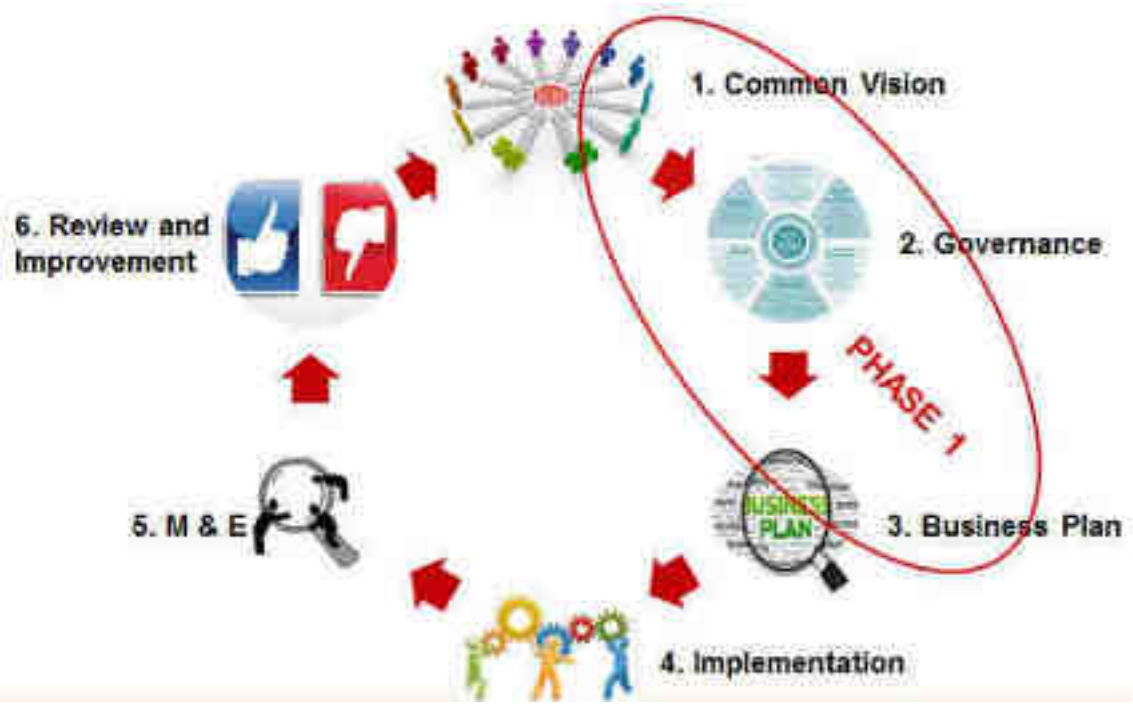


Figure 18: Steps involve in developing the framework

1. Common Vision

Establish Commitment & Common vision

a) Identify stakeholders and establish commitment and common vision
   - through consultation and collaboration
   - define objectives and functions of the PRO
   - Facilitates building trust amongst stakeholders by addressing their issues, concerns, ideas, values and areas of mutual importance.

b) Determine stable and long term revenue stream and financial mechanism linked to the objective.

c) Address issues of trade and competition and degrees of tolerance of free riding.

2. Governance

Facilitate development of the overall governance structure.

1. Establish board of directors (BoD) – representing a variety of skills and perspectives to fulfill the PRO's mandate and meeting its environmental priorities, goals and objectives
2. A regulation or MoU will be drafted defining performance targets, consequences of companies failing to comply, credible monitoring verification systems, legal requirements and potential liability of board members
3. Composition, term of office, roles and responsibilities, policies, code of conduct, conflict of interest, confidentiality and investment policy, meeting schedules of the Board will be defined
4. Support the board to establish committees – SC or Ad hoc Committees like Audit, investment or executive committees.

3. Business Plan

Develop and propose the business plan of the PRO providing day-to-day direction to management and staff :

1. Describing essential components of the business involved in ESM of e-waste
2. Client definition will be elaborated to focus programs and strategies on those clients that the PRO provides services to
3. Develop Procedures and detailed method for environmental and SWOT analysis of the PRO
4. Develop Business strategy in maximising the collection of e-waste and revisit regularly to improve on it and outcomes over short term, medium term and long term shall be elaborated in terms of recycling rates and volumes recycled
5. Development of performance measurement criteria such as SMART targets, timelines, indicators, feedback
6. Resource planning will be an essential step in the Business plan – human, financial, infrastructural, etc.

4. Implementation

Phase 1: A study will be carried out to define governance structure, scope, geographical spread, functional form, legal structure and business model of the proposed PRO

Implementation will take place at 2 levels

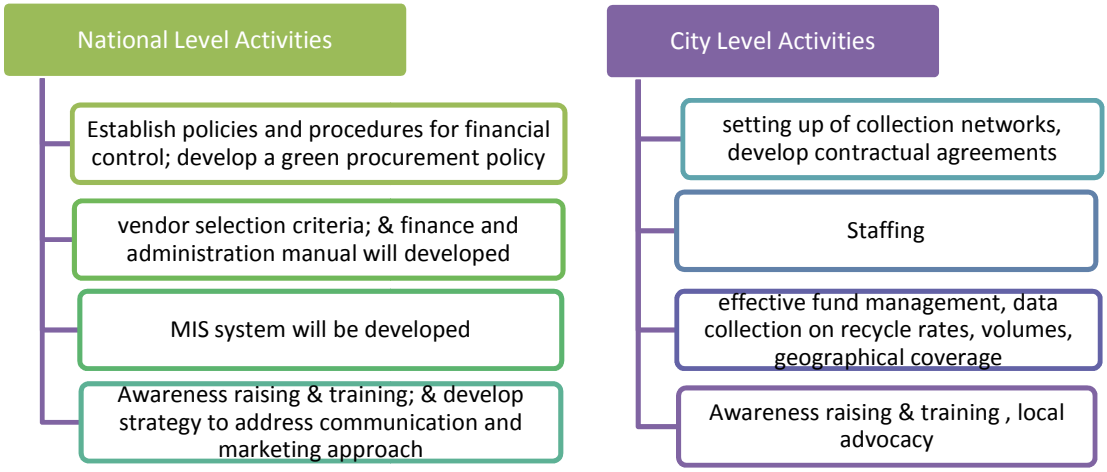


Figure 19: National level and city level activities of a PRO

5. Monitoring & Evaluation

- Frequency of Monitoring will be decided
- Annual reports will be generated as a good business practice to keep stakeholders informed of the PRO's activities
- Independent audit verification of results will be done

6. Review and Improvement

- MIS developed will be referred in order to assess the progress in terms of ESM of e-waste
- Steps to improve the penetration and the strategy will be regularly taken to ensure meeting the objectives of the PRO

Implementation of the PRO

Define Processes

- Process Landscape
- Process Hierarchy
- National level implementation

Process Landscape for PRO Implementation

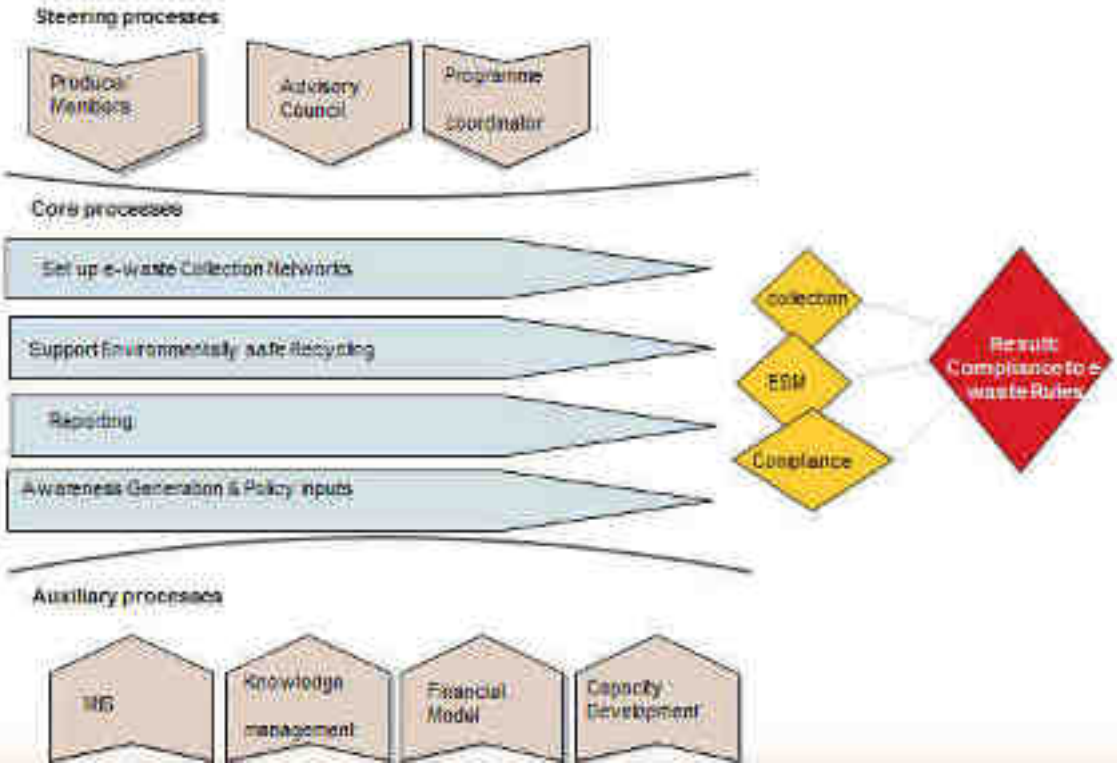


Figure 20: Process landscape for PRO Implementation

Process Hierarchies

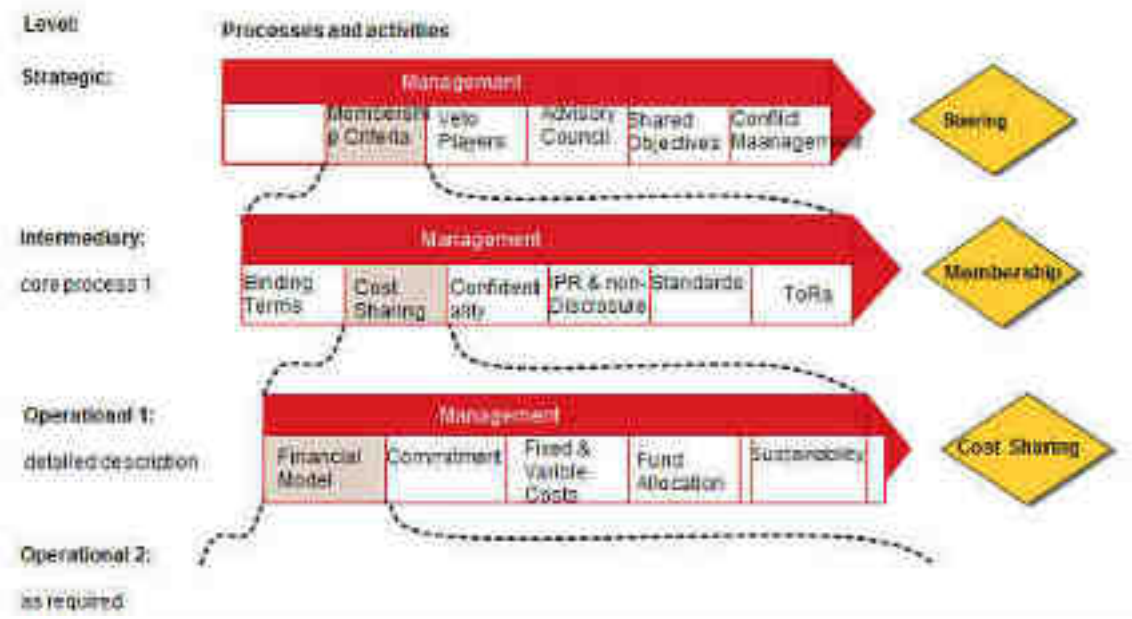


Figure 21: Process Hierarchies for PRO Implementation

National level Implementation: Phase II

- Phase I would cover three steps viz. Visioning, Governance and Business plan;
- In Phase II, the programme would cover steps like developing implementation plan and process landscape, fund allocation, capacity development, project set up in Cities;
- Staffing and vendor selection criteria and finance and administration manual to be developed
- MIS to evaluate effective fund management in a fiscally responsible manner, recycle rates, volumes, geographical coverage

Baseline Study design

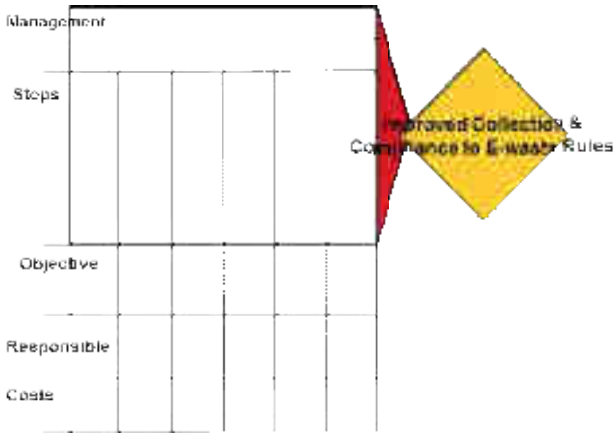


Table 8: Baseline Study design format

Objective: To define governance structure, scope, geographical spread, functional form, legal structure and business model of the proposed PRO

The study shall define steps in establishing Common vision and commitmentBoard of Directors; & roles and responsibilitiesLegal requirements, potential liability and contractual agreements, MIS

developmentVendor selection criteria; collection networks, awareness raising, advocacy, Communication and marketing approach

Develop Architecture of intervention

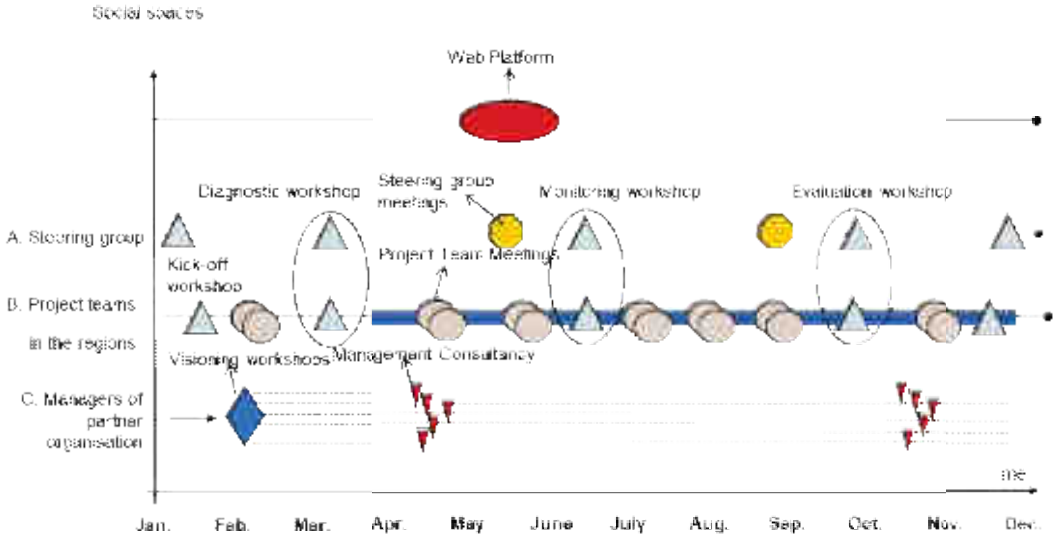


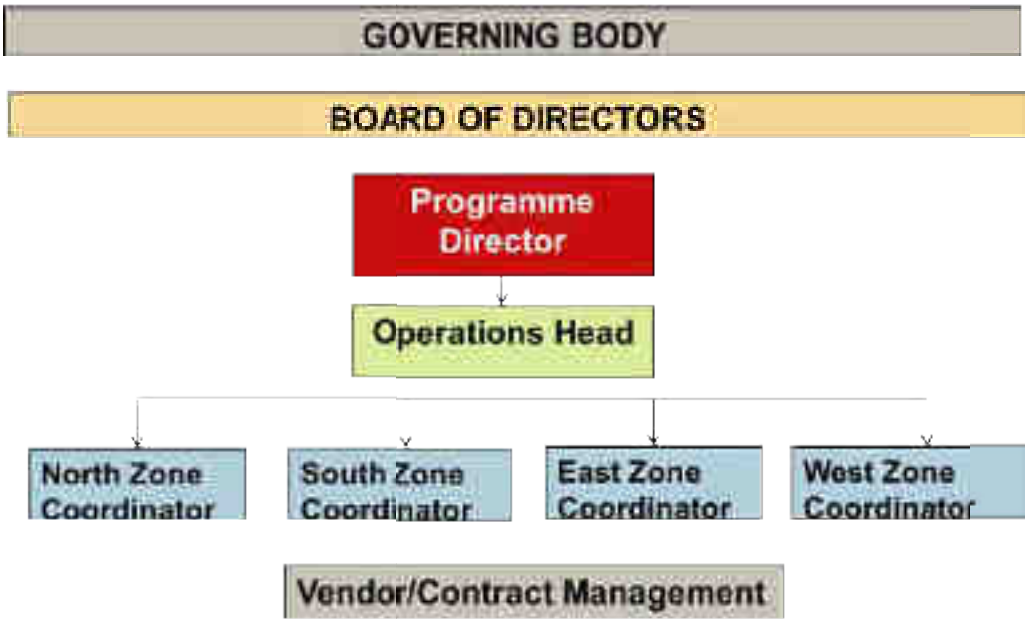
Figure 22: Timeframe PRO Implementation

City Level implementation

Objective:

- Maximize collection of E-waste for compliance to E-waste (M&H) Rules
- Periodic and gradual increase in collection volume over a span of 1 year across the target cities
- Indicators for cities based on their segregation into Tier I and Tier II
- Monitoring and Evaluation
- Review and improvement

Organizational Structure



RESOURCEs/ organizational structure

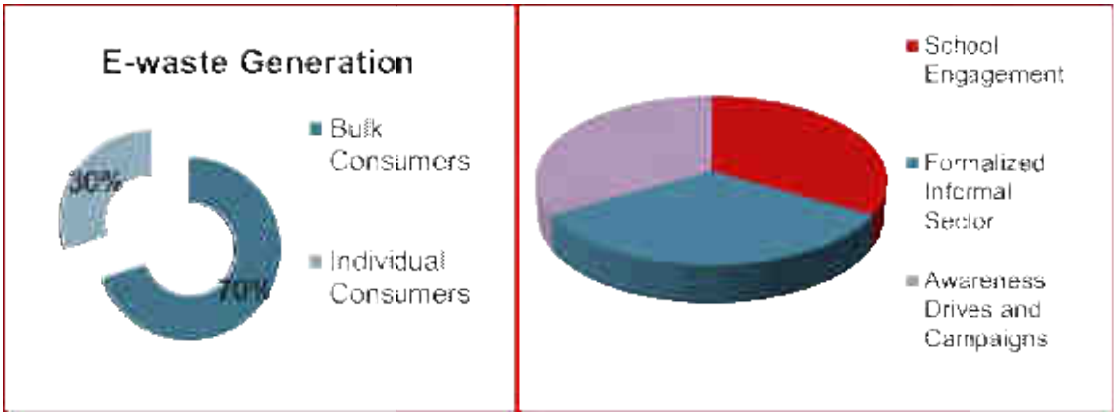
- The PRO would comprise of 1 Programme Director and three Programme Coordinators with a governing body and board of directors at the top level.
- All the cities would be divided into zones i.e. North, South, East and West
- One resource would be exclusively involved in handling he Vendor/Contract Management system for all cities

Resource Person	Costs (figure in INR) per month
Programme Director	2,50,000
Operations Head	1,50,000
Zonal Coordinators (* 4)	75,000 – 1,00,000
Vendor Management System	70,000
Total	68,40,000

CITY-LEVEL PROCESS

- An eco-system would be built at the city level involving all stake-holders in the value chain. This would be essential for sustainability of the program.
- The city level implementation for each component would be given out to vendors through a bidding process

CHANNELS FOR ENGAGEMENT: COMPONENTS



Vendor Costs Associated with the stated components Per city Per Year would be the following (Figures in INR based on experience from older projects)

School Engagement : 17,00,000

Informal Sector: 13,00,000 - 17,00,000 (the cost may vary depending on prior presence and existing informal sector engagement in the target city)

City Level Awareness Drives (2 in a year): 4,00,000 (Partnering Media Entity and other organizations being partnered with would contribute to this)

Total 38,00,000

SCHOOL & community COMPONENT

- Students and youth are the drivers of consumerism these days and major Consumers of Electronic Waste
- Schools have proven to be good channels for engagement and collection

Informal Sector engagement

- Involving the informal sector will feed into the loop of the PRO and help plug the leakages in the existing chain
- Contracts would be facilitated between the Formalized informal sector and recycler to which a contract has been issued by the PRO
- The formalized informal sector group would be more involved in reaching out to individual consumer segment and smaller companies
- Training to be provided to formalized informal sector groups
- Both Parties to provide data/reports to be fed into MIS system

CITY LEVEL CAMPAIGNS

- The idea would be to mobilize as many people as possible within a city using media and other partners if needed
- Awareness sessions would be conducted across market and public spaces, newspapers, magazines, TV and other forms of media

METHODOLOGY and OUTPUT

- Targeted approach of popular public spaces based on Foot-Fall. Do week long collection drives and connect people to authorized collectors and recyclers
- Organizing a fest around the theme of E-waste after generating publicity and outreach through media
- Tying up with local institutions and Govt. Bodies for support

MIS system

- MIS would take care of the vendors/contracts in individual cities for monitoring and evaluation
- Provide easy access to numbers/volume across different cities
- MIS system makes the tracking of E-waste flow and handling easier. Each transaction/collection by the Recycler and formalized informal sector would have to be input into the system
- The MIS system would generate consolidated reports based on the inputs

Functional Features of PRO:

Collection and Storage

- Facilitate and Operate storage points
- Establish stronger and more efficient take-back systems and collections channels
- Plug leakages in the chain

Reporting & EPR Compliance

- PRO shall aggregate collection and recycling data and prepare reports catering to EPR compliance

Recycling Standards and Audit

- Setting-up of uniform norms and standards for member parties.
- Choosing Recyclers based on Stringent Criteria as decided by constituent members

Functional Features

- With a stronger take-back collection and storage channel, the PRO shall ensure lesser leakages in the system and work more towards a closed loop system
- Facilitate take-back from dealers/retailers
- Considering the economy of scale in operation, pooled in resources shall provide better efficiency
- PRO shall manage historical waste
- It shall ensure EPR Compliance by recycling contracts with Recyclers meeting set standards

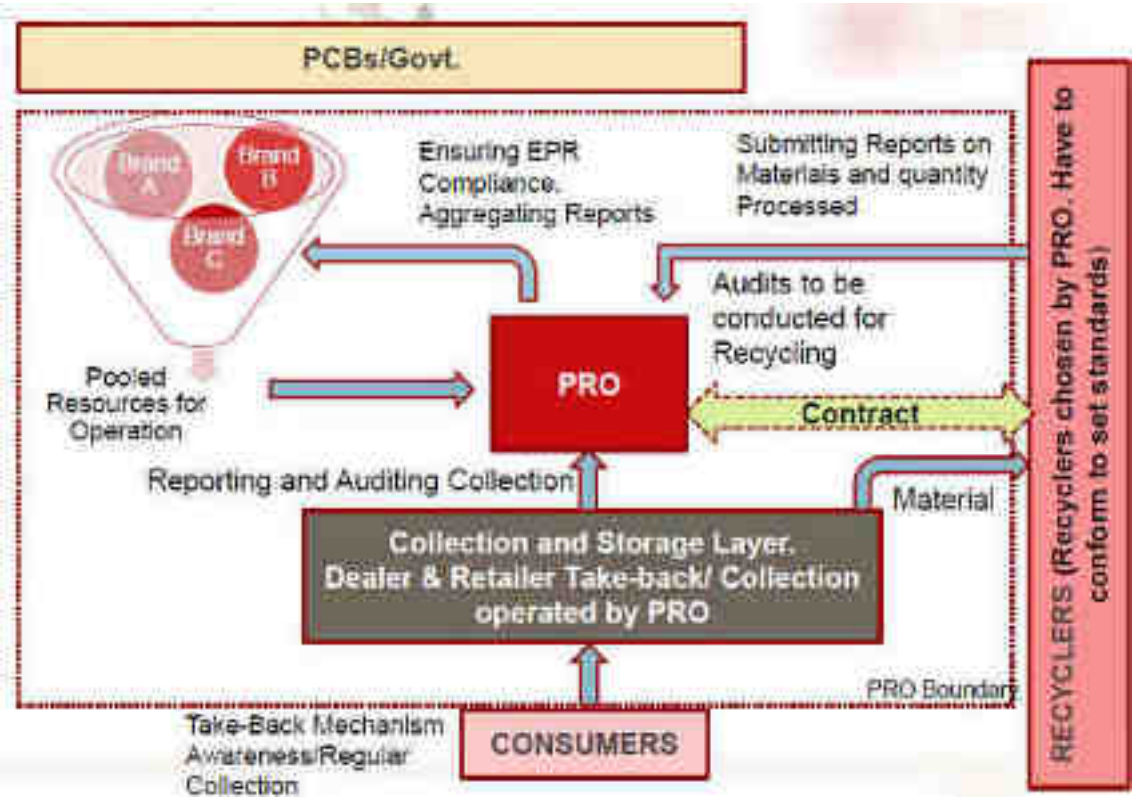


Figure 23: PRO functional diagram
Source: GIZ

KEY AREA	INDIVIDUAL	COLLECTIVE
Collection & Storage	Each producer sets up an individual take back system; ties up with collection agencies and centers Resource Intensive	More Resource Efficient especially in the case ofMulti-Brand retail takeback. Also PRO takescare of and coordinates with all Collection Channels
Reporting & Monitoring	Every producer deals with reports aboutcollection and monitoring individually	PRO takes care of end to end reporting andmonitoring for member Brands andManufacturers and prepares Reports for EPR compliance
Awareness & Capacity Building	Individual Brands approaching same consumer base (e.g. Schools/Colleges) might lead to over-lap and is also less resource efficient	More Resource Efficient. Common awareness and Capacity Building for a consumer base for all brands collectively. Also a common set of personnel and staff dealing with Operations can be trained collectively.
Recycling	Individual Brands deal with their own set of Vendors and Recyclers	Auditing, Rules and Standards based on the bestpractices in the Industry. Recyclers chosen based on best Standards. PRO takes care of auditing and Reporting with the Recyclers

Table 9: PRO collective advantage

Reporting

End to End reporting

- From individual dealers/retailers for takeback
- From storage points handled/operated by the PRO
- The total material from above sources shall then be transported to the Recycler and reported
- Recycler shall send report of both material handled and end amount shipped outside

Consolidated report

- PRO shall aggregate data from all the points above and prepare a consolidated report.

EPR Compliance

- The aggregated report shall cater to EPR compliance

Recycling Contracts

1. PRO shall deliberate upon and decide the recycling standards that have to be met
2. Contracts shall be issued to Recyclers only post auditing and only after ensuring that they comply by and meet the stringent criteria that have been set
3. Recyclers are bound to Comply. Non-compliance shall lead to immediate cancellation of contract

Auditing

- Auditing with regards to the collection will have to be done to ensure no leakages at the collection points
- Auditing of the Recycling facilities to ensure all material handed to the Recycler is processed including the end part shipped outside
- Annual audit of PRO itself by an independent body to check for confidentiality, operational and functional issues

Monitoring and Evaluation

- Developing structured achievable goals in terms of collection and recycling and setting corresponding targets
- Working towards achieving greater efficiency and depth in recycling
- Analyze associated costs and minimize them in a phased manner

Legal Implications

Data Confidentiality

- PROs will be dealing with confidential data from Member parties like the following
- Amount of material collected through take-back
- This is critical and confidential data and any form of leakage has to be avoided.
- The PRO shall be required to sign a confidentiality and non-disclosure agreement (not different from similar contracts signed by the recyclers)

Participation in a Consortium

- Pooling of resources to set up the consortium as well as the infrastructure
- Clear allocation of costs for setting up the infrastructure
- Clear deliverables against a contract to ensure that there is no cross subsidization across members of the PRO

- Can be ensured by maintaining brand specific collection bins which can be managed by the identified vendors of the brand.

Next steps

- Developing a work plan, with budget, for the PRO.
- Identification of implementing partners/ agencies/ individuals
- Launch the pilot activities in select cities (entry point could be the project cities of the EU project)
- Start with awareness activities followed by collection drives
- Review activities after 6 months of implementation

Case Studies PRO Models

Germany

The Federal Environment Agency (Umweltbundesamt, UBA) decided on July 6th, 2005 to grant the stiftung ear sovereign rights stated in the ElektroG. The stiftung ear protects the fair implemantation of the ElektroG, as it performs the following functions:

- **Registration** of producers that place electrical and electronic equipment on the market in Germany
- **Data collection** of the amounts of electrical and electronic equipment placed on the market
- **Coordination of the provision of containers and the take-back** of waste electrical and electronic equipments at the public waste disposal authorities (öffentlich-rechtlicheEntsorgungsträger, örE)
- **Report of the annual flow of amounts** to the Federal Environment Agency
- Ensure, that all registered producers may participate in the internal setting of rules
- **Identification of free-riders** and the report of these to the Federal Environment Agency

Its work is financed by fees and expenses which are determined by the cost regulation by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesumweltministerium, BMU)

Electrical and electronic equipment from private households is collected in containers provided by the public waste disposal authorities. Producers are obliged to pick up the collected and provided waste electrical and electronic equipment immediately upon being ordered by *stiftung ear* to do so.

Source: http://www.stiftung-ear.de/about_us

The overall system responsible organization in Germany which functions as a clearing house is called Elektro-Altgeräteregister (EAR). EAR takes care of the administrative tasks of registering producers, calculating producers' market shares, verifying that all producers have lived up to their EPR, and reporting compliance data to the EU. Germany also requires that all producers, no matter their size, provide an insolvency-proven guarantee for the collection and treatment costs of the EEE they put on the market, again to minimize the free-rider problem.

In Germany, the producers have three options as to how they can comply with their EPR, referred to as take-back schemes. They may set up Individual Brand-Selective Take-back schemes (IBTS), join a Collective Take-back Scheme (CTS) or set up an Individual Non-selective Take-back Schemes (INTS). There is no producer implementing an IBTS scheme as it would be too costly.

Of the two options which do actually exist in Germany, the main distinction is that by choosing an INTS, theproducers must individually make arrangements with a treatment facility, whereas with a CTS, a collectivePRO does this on their behalf. Both of these options involve producers paying according to their marketshare as a proportion of the total WEEE collected and treated. As previously mentioned, all producers inGermany have to pay a financial guarantee for their WEEE arising, no matter if they have joined a PRO ornot (Okopol et al. 2007:52). Most common in Germany, therefore, is the INTS, where producers deal directly with the treatment companies. With this option producers have the freedom to choose a waste treatment facility and set requirements with them directly, which allows them to shop around for the best deal and keep their costs as low as possible.

One disadvantage of dealing directly with the waste treatment companies, though, is the considerable amount of administrative work that brings for a producer, because they are then responsible for handling all of the reporting work which would otherwise be done by a PRO. This has led several smaller producers, who do not have sufficient resources to set up internal systems to handle this task, to join collective PROs.

The German legislation prioritizes promoting competition and thus prohibits a monopoly on the collection and treatment of WEEE. The collective PROs are thus limited in the market share that they may represent for a specific category of WEEE. This limit is somewhat flexible, set according to how cooperation in some industry affects competition, however, the German "Bundeskartellamt" (Federal Cartel Authority) advised a limit of 25% of a specific category.

Source: http://rudar.ruc.dk/bitstream/1800/7209/1/Group%20No.%20764%20project%20-%20The%20WEEE%20Directive%20%26%20Extended%20Producer%20Responsibility.pdf

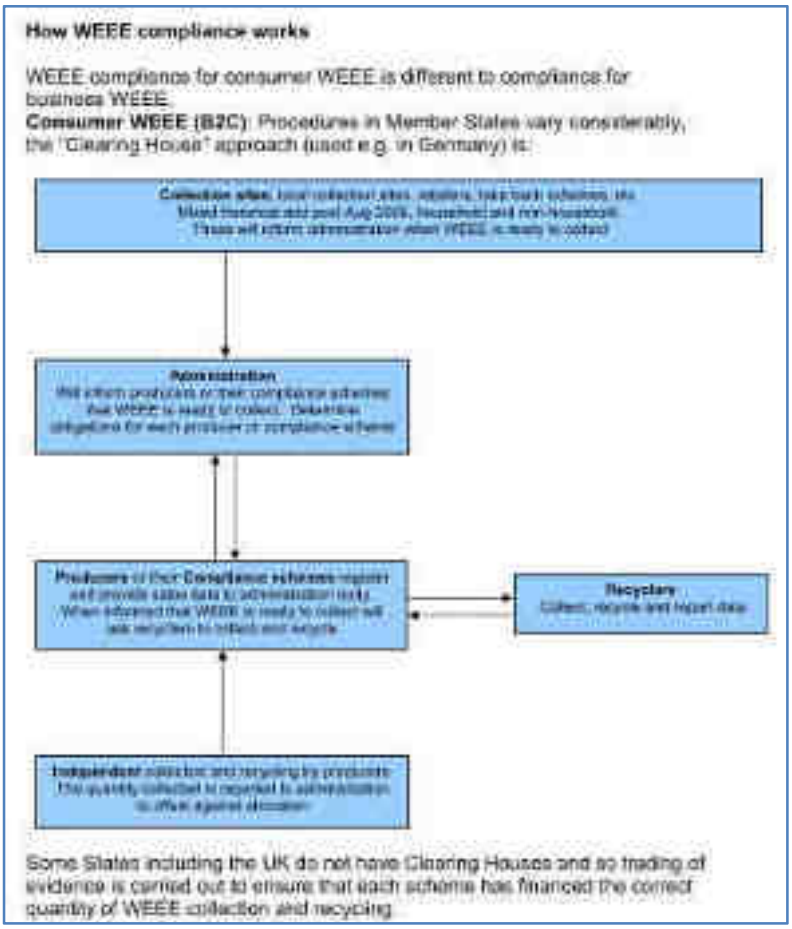


Figure 24: How WEEE compliance works
Source: http://ecsn-uk.org/Legislation/WEEE/2WEEE%20directive%20&%20implementation%20in%20EU%20sept09v2.pdf

France:

Has seven compliance schemes and these register their members on their behalf; there is no registration fee. Manufacturers are required to print the crossed wheelie bin symbol and producers name on products. France is one of the few countries that have a mandatory requirement to show “visible fees” at the point of sale of new B2C products. The visible fee informs the customer of the actual cost of collection, recycling and disposal at end-of-life and is part of the products price. French law requires that the French producer’s name be printed on products. This means that distributors who import equipment should apply labels with their name on each individual piece of equipment. In practice this is not done as it means re-packaging and it has been claimed that this requirement could be illegal as it restricts the free movement of goods within the EU. Producers have to report on weight and number of sales annually.

Source: http://ecsn-uk.org/Legislation/WEEE/2WEEE%20directive%20&%20implementation%20in%20EU%20sept09v2.pdf

Producers must identify annually the quantities of EEE placed on market, the quantities of WEEE collected and recycled and the quantities of components/substances extracted in WEEE treatment. A national register of producers is held by the French Environment Agency, ADEME. Producers of household EEE must either (a) comply individually but seek approval or (b) join an accredited collective scheme. There is a choice of schemes named Eco-Organisms (EOs): Three general schemes (Eco-Systems, Ecologic and ERP) and a further scheme specific for lighting (Recyclum). No household EEE producer is currently complying through an individual route.Producers pay a fee for each product they supply onto the French market to their nominated EO. The fees vary according to both product and EO.Producers are only required to provide a financial guarantee if they are not a member of an EO. The financial guarantee would need to be sufficient to cover their producer obligations for the current year.Each EO contracts with specific municipalities (through OCAD3E) according to their expected level of WEEE required to meet their collection target. Each EO is required to collect freely all the WEEE collected by the distributers.

Source: http://www.bis.gov.uk/assets/biscore/business-sectors/docs/w/12-1007-waste-electrical-and-electronic-weee-regulations-individual-producer-ipr-responsibility

Netherlands:

NVMP and ICT Milieu are the only two collective PROs in the Netherlands responsible for handling WEEE, and so it is relatively straightforward for them to report directly to the Dutch Environmental Assessment Agency. Producers in the Netherlands have only one feasible option as to how they will live up to their EPR: to jointhe collective PRO responsible for their specific WEEE waste stream. For the producers of IT&TE this meansthat they must collaborate with the collective PRO ICT Milieu, which is the only PRO that deals with thisspecific waste stream. In accordance with the Dutch law, producers may introduce their own collectionsystem, however - just as is the case in Germany – this has never happened because the cost of doing so istoo great to make it an economically feasible option. Furthermore, if a producer were to choose to not gothrough a collective PRO, it would then have to pay a financial guarantee which it otherwise would not haveto, which also serves as a disincentive for them to do so. With a monopoly on the IT&TE WEEE treatment market, ICT Milieu faces no pressure to try to keep its costs low. Therefore, treatment costs are significantly higher in the Netherlands than they are in Germany.Non-competitive systems on the other hand, like the Dutch one, are easier to monitor. According to ICT Milieu, this enables them to achieve a higher producer registration compliance rate.

Source: http://rudar.ruc.dk/bitstream/1800/7209/1/Group%20No.%20764%20project%20-%20The%20WEEE%20Directive%20%26%20Extended%20Producer%20Responsibility.pdf

Usage of two economic instruments: Visible Fee & Municipal Waste Tax. Municipal waste tax funds the municipal infrastructure used in WEEE/E-waste management. Producers/ Importers pay NVMP to manage their WEEE/ E-waste responsibilities under Dutch legislation. A fixed fee is paid to NVMP for each product placed on the market. This fee is passed on to the consumer with no mark up. The scheme covers household WEEE/ E-

waste. Households pay a visible fee on the purchase of new EE products. Households pay a local municipal waste tax to fund general waste collection and operation of municipal sites.

Source: http://www.unep.or.jp/IETC/SPC/news-jul11/UNEP_Ewaste_Manual3_TakeBackSystem.pdf

The Dutch Foundation for the Disposal of Metal and Electrical Products (NVMP) set up a collective disposal system for the collection and recycling of discarded equipment covered by the Decree. All producers and importers can affiliate themselves with the foundation. The NVMP is a Producer Responsibility Organisation (PRO) which has more than 1200 producers and importers affiliated with it.160 Participation in the NVMP is free of charge and ensures its members meet all statutory obligations. The ADF is used to finance an environmentally friendly system for collecting and recycling electrical and electronic appliances. The ICT Milieu Foundation covers WEEE category 3 (IT, hardware, paper printing devices and telecom). 275 companies take part in the ICT Takeback system (as at January 2007). In contrast to the waste disposal scheme used for white and brown goods, manufacturers and importers of the ICT themselves pay the environmental costs of recycling and collection. They are charged for the amount of WEEE collected and treated based on their market share.

Source. http://www.envision-nz.com/images/product%20waste%20report.pdf

Sweden

Producers (importers, manufacturers and retailers) are required to register with the Swedish Environmental Protection Agency (Naturvårdsverket).Local Regional Authorities (LRAs), or municipalities, are responsible for collecting and treating household WEEE. Household consumers may return WEEE to one of 650 waste recycling centres paid for by the municipalities free of charge. The municipalities are also responsible for the local monitoring of the collection system, and for informing consumers where they may dispose of their WEEE-products. WEEE is collected in separate bins owned by El-Kretsen

El-Kretsen is a not-for-profit service provider set up in July 2001 to represent producers (manufacturers, importers and retailers) in their agreement with the Local Regional Authorities (LRAs) and to operate a voluntary nationwide take-back system. El-Kretsen is responsible for sorting, treatment and recycling. Waste is sorted into three fractions at the point of collection: electronics, large white goods, and lighting. The transport of the waste from the collection centres to relevant recycling organisation is organised and financed by El-Kretsen, using subcontractors. Treatment and recycling firms are chosen on the basis of technical ability, location and price. El-Kretsen provides 100% coverage of the Swedish Territory and has concluded standardised agreements with all 290 local municipalities to take responsibility for historic waste in return for the maintenance of collection sites.Producers choosing to join El-Kretsen are given the opportunity of being included in El-Kretsen's financial guarantee system. This system ensures there are sufficient funds to finance El Kretsen's operation in the forthcoming year, there is a reserve fund for the following year and that there is an insurance arrangement which would 'kick in' in the event of bankruptcy.

EÅF, launched in 2008, uses its members' shops as collection points for household WEEE. EÅF has an agreement with El-Kretsen as member shops are not located in all municipalities.Members of EÅF use a different financial guarantee system to El-Kretsen members. The financial guarantee used by EÅF members is an insurance system whereby the producer pays an annual insurance premium based on the number of products sold and the recycling costs of the products. The insurance premium goes to a fund that finances the recycling costs for the electric waste of the producer. In case the producer goes into bankruptcy or leaves the market due to other reasons, the insurance company would continue to pay the recycling costs of the producer and thus ensure that the producer will not become a free-rider.Some small companies choose to meet their financial guarantee requirement through setting up a block banked account which is pledged to the Swedish EPA should they go out of business.

Source: http://www.bis.gov.uk/assets/biscore/business-sectors/docs/w/12-1007-waste-electrical-and-electronic-weee-regulations-individual-producer-ipr-responsibility

UK:

All producers must join one of the approved PCS of which there are over 40 in the UK. The PCS registers producers on their behalf and pays the registration fees. Manufacturers should print the crossed wheelie bin symbol and producers name on all products. Quarterly reporting of sales in terms of weight and number is required. Showing the visible fee is optional in the UK but it is not used, mainly as it is strongly disliked by retailers.

Source: http://ecsn-uk.org/Legislation/WEEE/2WEEE%20directive%20&%20implementation%20in%20EU%20sept09v2.pdf

EEE producers, importers and re-branders must join a producer compliance scheme or establish their own. Either way, the scheme needs to be approved by an environment agency. Producers are financially responsible for collecting, treating, recovering and disposing of WEEE (Waste Electrical and Electronic Equipment). The amount they are responsible for is calculated according to the amount of EEE they produce. They must arrange and pay for the dismantling, recovery, reuse and recycling of WEEE in an environmentally sound way. WEEE must only be taken to Approved Authorized Treatment Facilities (AATF).

Source: http://www.envision-nz.com/images/product%20waste%20report.pdf

Korea:

The government sets mandatory take-back and recycling requirements for each product, and producers pay fees to join a PRO that handles all of the collection and recycling obligations. Financial penalties are assessed on producers that do not meet their obligations.In addition to the EPR program, "waste dues" are levied on particular products and the revenues used to pay for local government collection and recycling efforts.

Source: http://www.rff.org/RFF/documents/RFF-DP-06-08.pdf

Switzerland

The Swiss Association for the Information, Communication and Organisational Technologies (SWICO), the Swiss Foundation for Waste Management (S.EN.S), the Swiss Lighting Recycling Foundation (SLRS), and the Lobby for Battery Disposal (INOBAT) are the industry-led organizations that manage e-waste in Switzerland. SWICO covers IT and Consumer Electronics, SNES covers household appliances, SLRS lighting bulbs and equipment and INOBAT batteries.

In 1993, SWICO was established as an industry-led, voluntary system to provide ewastemanagement for IT and office electronics. Retailers are mandated to take back e-waste in the categories they have on sale free of charge, regardless of whether they were the original seller or whether the consumer is purchasing similar product. Producers, manufacturers, and importers are also obligated to have a take-back program. Recycling plants are required to obtain approval from SWICO.

The EU's WEEE Directive requires free take-back for e-waste, coming from private households, but ORDEE (the Swiss legal framework for e-waste) does not distinguish between e-waste from private users or firms. Another difference between the WEEE Directive and ORDEE is that Switzerland uses the advanced recycling fee (ARF) for all existing e-waste, whereas based on the WEEE Directive manufacturers are only responsible for financing e-waste that was in the market after the Directive was implemented. In Switzerland e-waste is collected regardless of brand and time of purchase, which eliminates excess costs for sorting and collection that can be imposed by the WEEE Directive on local collective authorities.

Producers and importers have to pay an advanced recycling fee (ARF) in 'CHF per unit' for every product placed on the Swiss market. These ARF-Funds are managed by SENS. The income from the ARF finances the present collection and treatment of WEEE, similar to a pay-as-you-go pension scheme. Thereby the ARF is a participation of the buyers of new appliances to the current costs.

SWICO system does not hold municipalities obligated for establishing an e-waste take-back program; however, it covers all finances if municipalities choose to participate in take-back programs, and if they take back more than five tonnes per annum, they will be considered one of the SWICO designated collection points.

The ORDEE does not elaborate the implementation of the directive, merely outlines the essential guidelines. Therefore, it doesn't give the PROs the specific mandate for the collection. The companies have the choice of either participating in the PRO or setting up a parallel system. In case of consumer or recycler complaints of monopolistic abuse of power by the PROs, the competition authorities have the power to intervene.

In Switzerland, the producers carry the economic and physical responsibility of their products. By combining the economic and physical responsibilities, it is possible for the producers to control both costs of handling and recycling as well as the volume and quality of recycling. However, instead of setting up individual mechanisms, the manufacturers and importers have assigned their responsibility to the PROs SWICO and SENS. The manufacturers and importers, in turn, to participate in the system, must regularly report their sales figures and ARF to the PROs. The manufacturers have the freedom to organise a

collection of only their products and bring it to the licensed recyclers, even while being a part of the SWICO system.

SWICO and, more recently, SENS adopted an ARF which is based on recycling costs today for products coming into the waste stream in the present.The risk of setting such an intergenerational fee is that it needs accurate estimations of how much waste will be generated and how many new products will be sold, which can be a difficult task. For example 1.75 million mobile phones were sold in Switzerland, but only 250,000 were returned. A mismatch, the other way around, with higher quantities of waste generated as compared to products sold, would jeopardise the stability of the system. SWICO and SENS overcome this drawback by keeping a six months reserve and constantly monitoring the quantities of both waste and ARF collected.

The SWICO Environmental Commission, which comprises of manufacturers from the various industry verticals participating in the system, sets the ARF. SWICO uses a product price index according to which the ARF is calculated. The fee ranges from zero, for products below CHF 50, to CHF 1650 for products above CHF 6000.SENS on the other hand has six distinct fee categories, ranging from CHF 1 to CHF 40, under which all the products are classified. The category under which a product falls depends on the type as well as size of the product.

Source: http://www.e-waste.ch/en/system-design/actors-2.html

Canada / Ontario

In order to develop and implement waste diversion programs, the Ontario Electronic Stewardship (OES), a “producers‟ umbrella organization”, was incorporated in September 2007, and approved by WDO in October of the same year to act as an IFO for e-waste management (OES, 2009). OES is a non-profit organization that is governed by a volunteer Board of Directors that consists of brand owners, first importers, franchisors, and assemblers.
In Ontario, Stewards, including manufacturers, producers, brand owners, firstimporters/assemblers of non-branded products for sale and use in Ontario that result in e-wastehave to register with OES, pay a monthly unit fee, and report the type and quantity of electricaland electronic equipment that they supply into Ontario (OES, 2008). OES in return providesthem with incentives for managing their e-waste. Producers such as Hewlett-Packard, Dell andApple have established their own take-back programs due to the high participation costs imposedby OES.

In Ontario, consumers may get charged for recycling fees upon the drop-off of their e-waste depending on the type of available take-back program that is offered by the collection sites.

Denmark

Main actors of the Danish take-back system include the producers, the municipal waste collection authorities, the private waste treatment companies, the newly-established Danish Producer Responsibility system (DanskProducentAnsvar system, hereafter referred to as

DPA-system) which functioned as a clearing house and four privately-organized collective PROs.

Even though the WEEE directive states that the producers must bear the financial and/or physical responsibility of WEEE collection, in Denmark the municipality continues to operate the physical collection and bear the cost of the collection of WEEE, which means that actually the Danish tax payers are the ones who bear the financial responsibility of collecting WEEE. One significant change since the WEEE directive was transposed in Denmark, though, is that before the municipalities were responsible for coordinating the transport and sale of WEEE to the private treatment facilities, whereas now collective PROs organize this and the clearing house coordinates the work of the PROs.

Whereas the producers are financially responsible for covering the costs of treating WEEE in Denmark, they do not have much at all to do with the physical responsibility of that WEEE treatment. This treatment takes place at one of three licensed WEEE treatment facilities in Denmark which are operated by secondary companies whose revenue comes from the payments they receive from the PROs.

The majority of the producers in Denmark have joined collective PROs to take care of certain administrative and organizational matters regarding EPR on their behalf. These collective PROs are non-profit organizations set up by the producers to provide services on their behalf. These duties include producer registration, annual reporting to DPA-system and the payment of financial security. To fulfill these duties, the collective PROs calculate each of their member producers' market share and charge them for their treatment costs accordingly, manage the coordination and payment between the municipal waste collection points, transport companies, and waste treatment facilities, and report this information to DPA system. There exist only three collective PROs in Denmark - RENE, Elretur, ERP -which deal with the IT&TE waste stream.

However, a few producers have chosen to individually manage their EPR because they have found it cheaper to do so in comparison to the collective PRO alternative. The few producers in Denmark who comply with EPR requirements individually have to pay a financial guarantee up front to ensure that they will actually be able to pay for the treatment of their WEEE arising in case of bankruptcy or insolvency; whereas producers in Denmark who are members of collective PROs do not have to pay this guarantee, since a PRO membership in Denmark works as a guarantee in itself

Source: http://rudar.ruc.dk/bitstream/1800/7209/1/Group%20No.%20764%20project%20-%20The%20WEEE%20Directive%20%26%20Extended%20Producer%20Responsibility.pdf

Austria

Austrian-based Producers, as well as retailers or foreign companies selling to Austria via telesales, must register online at http://edm.umweltbundesamt.at and must report annually the quantity of EEE sold in Austria. According to the Austrian Ordinance on WEEE, producers and importers can either fulfil their future household WEEE obligations individually or by joining a Collection and Recovery Systems (CRS). To date, no Producer has chosen to fulfil the WEEE obligations individually. By joining a CRS, the WEEE obligations and duties

are transferred to the operator of the CRS. There are five CRSs (representing 2,047 producers at the end of 2009)

To ensure fair competition, a coordination body called “the clearing house” was established, controlled by the Ministry of Environment. The clearing house is operated by ElektroaltgeräteKoordinierungsstelle Austria GmbH (EAK). EAK coordinates CRS activities and allocates pickup orders according to the CRS market share. Producers must submit quarterly and annual reports to the clearing house (either directly or via a collective scheme).

Source: http://www.bis.gov.uk/assets/biscore/business-sectors/docs/w/12-1007-waste-electrical-and-electronic-weee-regulations-individual-producer-ipr-responsibility

Japan

Manufacturers have responsibility for recycling their own products. Manufacturers can organise take back themselves or contract another organization, such as The Association for Electric Home Appliances (AEHA), to do it on their behalf. Some manufacturers have built their own recycling plants which means getting enough EEE waste is vital to their efficiency.Retailers must also offer consumers a like-for-like Take Back or Take Back of an old product that they have sold. The Ministry of Environment estimates that 80% of recycled appliances are being collected through retail outlets. Manufacturers must finance the recycling of their own products. This is aided by the consumer collection fees which are given to manufacturers on a monthly basis. As these do not cover all the costs involved, manufacturers must pay the remainder. The AEHA is responsible for orphan products as well as establishing the recycling ticket centre which administers the recycling fees.

Source: http://www.envision-nz.com/images/product%20waste%20report.pdf

10. Create awareness on e-waste with all Stakeholders:

According to the E-Waste (Management) Rules, 2016, it is mandatory to provide Details of proposed awareness programmes and the estimated budget for the same while producers seeking Extended Producer Responsibility –Authorisation through FORM I.

It is the responsibility of the producer for creating awareness through media, publications, advertisements, posters, or by any other means of communication and product user documentation accompanying the equipment, with regard to -

i. information on address, e-mail address, toll-free telephone numbers or helpline numbers and web site;

ii. information on hazardous constituents as specified in sub-rule 1 of rule 16 in electrical and electronic equipment;

iii. information on hazards of improper handling, disposal, accidental breakage, damage or improper recycling of e-waste;

iv. instructions for handling and disposal of the equipment after its use, along with the Do's and Don'ts;

v. affixing a visible, legible and indelible symbol given below on the products or product user documentation to prevent e-waste from being dropped in garbage bins containing waste destined for disposal;

vi. means and mechanism available for their consumers to return e-waste for recycling including the details of Deposit Refund Scheme, if applicable;

Case Study: Samsung's S.T.A.R. Program

Digital technology leader, Samsung India Electronics Pvt. Ltd. On 31st August, 2010 announced the launch of Samsung Takeback And Recycle (STAR) Program in India. The program is aimed at generating awareness and educating consumers on the importance of recycling e waste and is being rolled out nationally in phases. Through the program, Samsung is leading the efforts to create a recycling based society and at the same time it is making contributions to preserving the environment and using resources efficiently. With this

initiative Samsung aim to encourage sustainable practices and induce a behavioral change among the Indian consumer.

As a part of that program, Samsung encourage consumers to recycle Samsung branded consumer electronics sold in India ranging from Televisions, DVD and VHS players, Audio Equipment and Home Theater Systems, Mobile Phones, Cameras, Camcorders, Computer Monitors, Printers, IT Peripherals and Home Appliances absolutely free of cost. Consumers have to dispose portable products at 235 locations in 20 cities across the Samsung service center network. For bigger products, consumers can avail the product collection facility on a nominal payment basis (if the location is outside the municipal limits) or drop the product at any of the Company's 291 collection centers in 21 cities.It has now been extended to national level.

Uniqueness of STAR Program:

- Samsung has entered into contracts directly with CPCB authorized e-waste recyclers for product take back and recycling .
- Second, Samsung's recycling partners has committed to not incinerating, land filling, or exporting toxic waste to developing countries.

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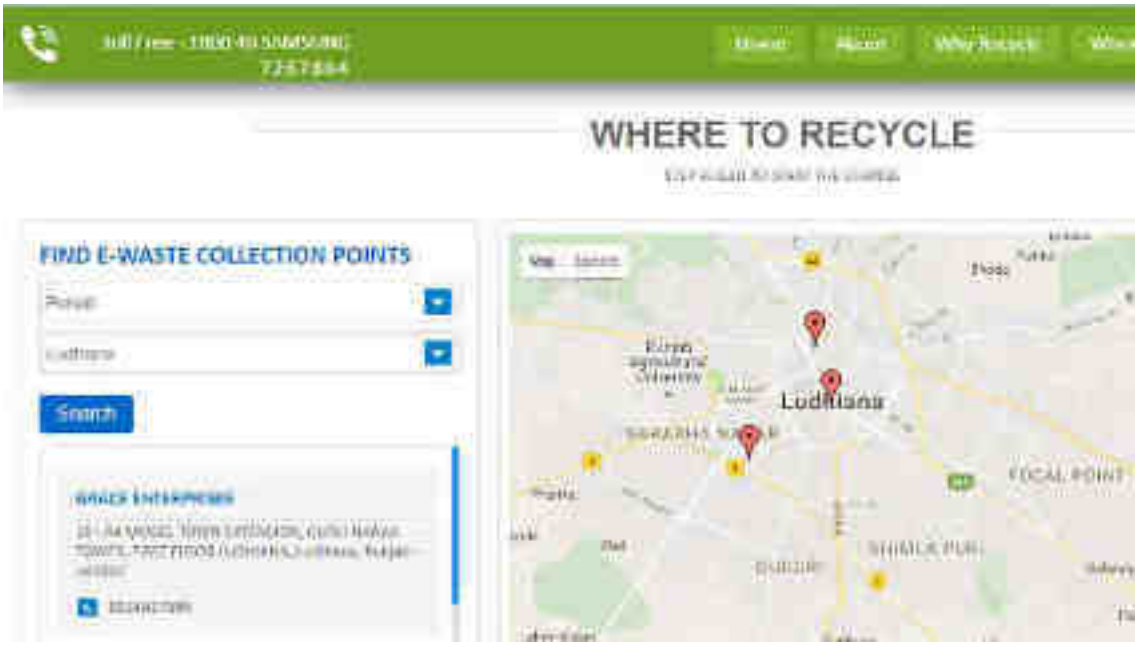

Figure 25: Samsung's e-waste collection point search portal
Source: http://www.samsung.com/in/microsite/takeback-recycling/

11. How can you work with the informal sector for e-waste collection?

"World Environment Day" Study

Electrical and electronic waste (e-waste) is one of the fastest growing waste streams in the world. In a recent study on "World Environment Day" conducted by ASSOCHAM-cKinetics found that India's e-waste growing at 30% per annum and likely to generate 52 lakh metric tonnes (MT) per annum by 2020. As Indians become richer and spend more electronic items and appliances, Computer equipment accounts for almost 70% of e-waste material followed by telecommunication equipment (12%), electrical equipment (8%) and medical equipment (7%). Other equipment, including household e-crap account for the remaining 4%, it said.

The sad part is that a mere 1.5% of India's total e-waste gets recycled due to poor infrastructure, legislation and framework which lead to a waste of diminishing natural resources, irreparable damage of environment and health of the people working in industry. Over 95% of e-waste generated is managed by the unorganised sector and scrap dealers in this market, dismantle the disposed products instead of recycling it.

E-Waste Management: Informal Sector

E-waste recycling in the informal sector provides jobs to thousands of people and supports the formal waste management agencies like municipalities. Though the informal but entrepreneurial SME based infrastructure permits a profitable e-waste management business but at the same time, the informal sector is lacking skills and technologies, and manages hazardous material without any regard to occupational health and safety (OH&S) requirements and in an environmental harmful manner. It is observed that with rising e-waste quantities the recycling scenario is changing, with the formal recyclersincreasingly entering the e-waste recycling sector. There is a widespread expectation that these formal sector recyclers would be able to manage e-waste in an environmentally sound manner by using Best Available Technologies (BAT) leading to better environment management and enhanced resource recovery. However, it is not clear whether the advent of formal recycling would come at the expense of informal sector recyclers or would complement their activities.

Bridging the Gap Between The Informal And Formal Sector

In a paper *E-Waste Recycling In India – Bridging The Gap Between The Informal And Formal Sector* Dr. Lakshmi Raghupathy, MAIT-GTZ , Mrs Christine Krüger, Adelphi, Dr. Ashish Chaturvedi, GTZ-ASEM , Dr. Rachna Arora, GTZ-ASEM, Mr Mikael P. Henzler, Adelphi at http://www.iswa.org/uploads/tx_iswaknowledgebase/Krueger.pdf)the authors discuss the various options for bridging the gap between the formal and informal divide in e-waste management in India. Presented here is a model which allows for the integration of the informal and the formal sectors in India. It also highlights the mutual benefits of increased cooperation between the formal and informal sector because of their competitive advantages. Various aspects of the model have been illustrated with focus on several initiatives implemented in India

The model presented here allows the integration of the informal and the formal sectors in India. The broad building blocks of this model are

i. Federating disparate informal sector workers into collectives;
ii. Capacity building at various stages of the e-waste value chain;
iii. Development of appropriate framework conditions in support of the informal sector;
iv. Elaboration of applicable business structures taking into account the constraints and resources of the informal and formal sectors, and
v. Implementation, monitoring and evaluation of the model in different baseline situations.

The authors show that there are mutual gains to be obtained from an increased cooperation between the formal and informal sector because of their competitive advantages. Social welfare is enhanced through this interaction. It furthermore leads to reduced pollution, better resource management and creation of green jobs in the recycling sector.

The process of integrating the informal sector with the formal sector, however, is a challenging one. On one hand, too little is still being known on the diversity of networking amongst informal recyclers, and their distribution of tasks and financial mechanisms amongst the various stakeholders. On the other hand, the informal sector is very diverse and comprises multiple stakeholders, and hence, requires a multi-level approach to develop a path forward to their inclusion in the formal recycling market.

The following two graphics show a simplified architecture of the existing e-waste recycling system and the distribution of activities between the formal and informal sector.

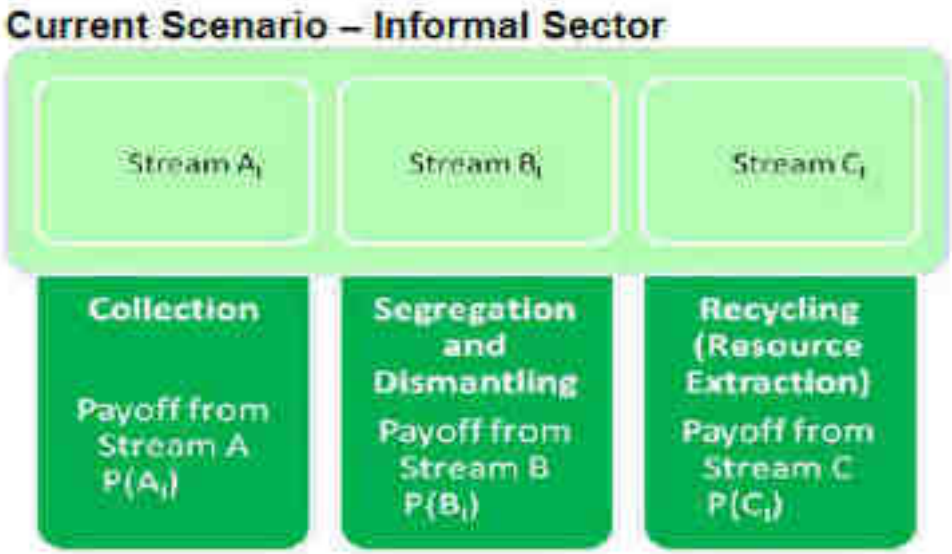

Figure 26: Current scenario – Informal Sector

Figure 27: Current scenario – Formal Sector

The scenario is changing at a faster pace now with the formal recyclers entering the scene and high-end recycling envisaging complete environmental compliance and efficiency in the processing of waste and the recovery of a high quality product. But such units are unable to access the materials due to the informal collectors, scrap dealers and recyclers in the informal sector who are able to reach for the door-to-door collection and are able to pay a good price for the e-waste in comparison to the formal recyclers. The formal recycling units have high investments and high overheads to meet the environmental compliance requirements. As a result they are not able to meet the price demanded by the vendors or the consumers and are thus unable to access e-waste.

A mutual support system that could be provided by the operations in the informal and formal recycling units as reflected is ideal for developing economies. The system will provide a balance between the cheap labour intensive operations in the informal sector and the sophisticated mechanized operations in the formal recycling units. The following two graphics show first, the intervention scenario and second, the proposed future scenario.

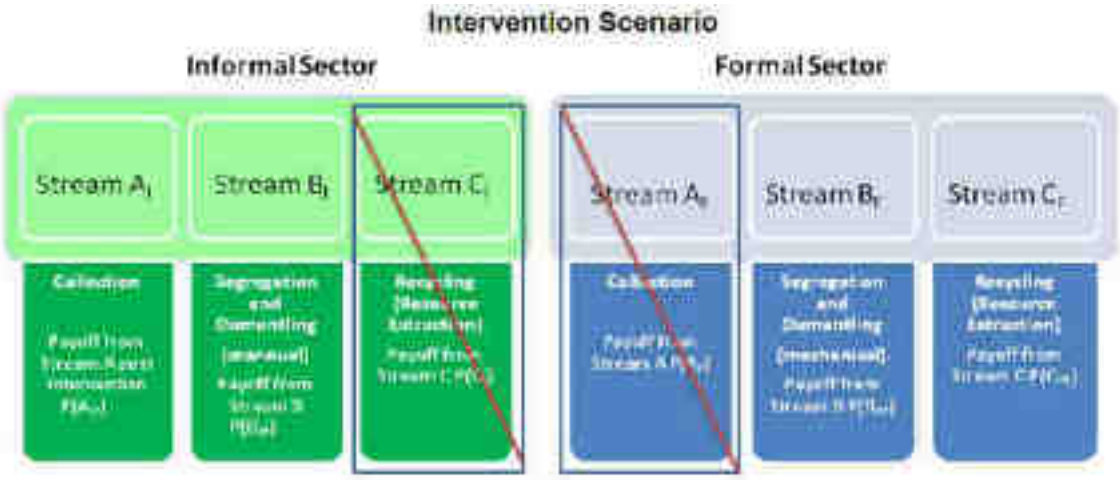

Figure 28: Intervention scenario

Figure 29: Proposed scenario

The optimization of resource flows is required to obtain quality products and has to be set as a goal while providing the model for integrating informal and formal e-waste recyclers. As a first step in the process all elements of the value chain need to be identified and all stakeholders have to be involved. The mechanism of transfer of e-waste needs to be

planned in such a way that the material reaches its destination in the shortest time possible and avoids any pilferage during handling and transit. A system of collection and transportation using third party or involving multi-stakeholder system would be a viable solution. Saving time and energy in the operations should become an integral part of the system.

The model provides the interaction between the formal and informal sector taking the interests of both into account in a rational choice framework. The model shows that there are mutual gains to be obtained from the trade of material from the informal and formal sectors because of their comparative advantages. We also show that the social welfare is enhanced by this interaction between the formal and informal sector and results in reduced pollution, better resource management and creation of green jobs in the recycling sector. The model recommends that the collection, segregation and primary dismantling of non-hazardous fractions of e-waste be focused in the informal sector while the other higher order processes can be concentrated in the formal sector.

Producer responsibility

It is crucial to motivate the large e-waste generators to apply minimum standards for their e-waste disposal. The new legal framework will help implementing this. Awareness measures need to provide accompanying guidance to enhance enforcement.

Governmental support and financial incentives

Due to the limited access of the informal sector to financial resources (e.g. loans) it has to be discussed if financial incentives need to be provided to the informal sector stakeholder to allow i) its formalisation process and ii) the improvement of its processes towards compliance with environmental, health and safety standards. E.g. specific allocation of funds for environmental surveillance and evolving Public Private Partnership (PPP) model based systems could be introduced. Additionally, financial aid/access to credit/ incentives/ subsidies and insurance scheme are further measures that may need to be made available. One of the best methods to improve the practices is to offer incentives to those complying with environment and health norms and also promote marketing of such products through a certification mechanism. This would then likewise benefit the formal recyclers, who in return should not be left out since their motivation to invest in this sector are also crucial basis for development of a sound e-waste recycling system. Hence, competitive aspects between the formal and informal sector require attention, and should not be neglected during the supporting process of the informal sector.

Promoting Women's Participation in e-Waste Recycling:

With an objective of environmentally sound recycling the Development Partnership Project (DPP) between GIZ India and the private sector Microsoft India Pvt. Ltd.(earlier NOKIA) was launched in 2012. GIZ India is implementing this DPP project on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ). The overall objective of the project was to improve the collection and recycling of e-waste from mobile phones and accessories in a more efficient and sustainable way in selected target cities of India, enhancing the consumption behavior of students and youth and improving the working conditions for informal waste collectors. The initiative had three inter-linked components and work packages viz. Schools to enhance the capacities of the teachers and students on sustainable consumption and safe e-waste disposal; Youth for reaching out to the young population for integrating sustainability and creative design and Informal Sector to focus on mainstreaming and formalization of the informal sector involved inhandling e-waste.

The project was developed on the experiences of GIZ India under the EU Switch Asia project titled WEEE Recycle, of working with the unorganized workers through partnershipswith local NGOs and waste pickers unions like the Solid Waste Collection and Handling (SWaCH) in Pune4, India. The learnings from working with agencies like SWaCH led to setting up of collection models which could be formalised and acceptable to government agencies, producers & manufacturers and bulk consumers. Another crucial aspect of this model was reaching out to the public or individual consumers and households, as under EPR reaching out to household consumers is one of the biggest challenges for the producers and manufacturers. This led to the selection of an agency named Self Employed Women's Association (SEWA) to implement the DPP project in Ahmedabad, Gujarat and work with the informal sector workers. SEWA as a partner was selected due to the following reasons:

a) To develop a collection model which reaches out to households consumers, bulk consumers, commercial establishments, schools and other institutions in the city;
b) To contribute to the political and economic empowerment of women waste pickers and in the process enable self-sufficiency;
c) To develop a recognition of the collection network of the informal sector workers ranging from door to door collection, storage & handling and transfer to authorized recyclers to ensure material recycling and recovery;
d) To develop a demonstration model for SEWA as an e-waste venture, which has huge potential for its upscaling and replication.

Informal to Formal Women Cooperation Model

Women waste pickers in the Ahmedabad region were initially engaged in sorting of municipal waste from dump yard, like similar others do. They often found e-waste as well while sorting the municipal waste dumps for recyclables, and eventually sell these to kabadiwalas (scrap dealers). This e-waste, categorized as 'black plastics' in local terminology for any discarded electronics item, used to fetch them little money. In order to get more economic benefits,they started burning the waste to extract copper and other precious metals, so as to get more value for the metals from the market. In this entire

process, these waste pickers risk their health unknowingly by releasing heavy metals like lead, cadmium, mercury etc. additionally resulting in environmental pollution.

Under the project, SEWA received trainings from GIZ India and Microsoft on the adverse effects of the uncontrolled burning of e-waste and the benefits of safe handling, collection, dismantling and recycling of e-waste. Under the umbrella of the cooperative, SEWA identified 50 women workers with the willingness to collect e-waste from residential and commercial establishments and to channelize the e-waste to the formal recyclers. These 50 women entrepreneurs are the change agents as they not only approached their fellow women workers towards safe handling of e-waste but also made visits to 500 shops, 100 schools, government offices, residential wards, multiplexes and malls to collect e-waste. SEWA is the first waste pickers union to be authorised as a collection agency by aProducer - Microsoft. In fact this authorisation and pilot model provides an example for countrywide replication and adoption by other municipalities, producers and bulk consumers. This intervention leads to not only fulfilment of the producer responsibility (EPR) but also enhances the social responsibility of the brand by creating green jobs andmainstreaming existing collection channels.

GIZ India with Microsoft was involved in the implementation of the developmentpartnership to a large extent with SEWA. Capacity development initiatives through training workshops were developed, designed and implemented where group discussions, role plays and site visits for exchange of experiences were seen as useful tools. These workshops also included management approaches which focused on marketing skills necessary for tackling all categories of consumers for collection and channelization of e-waste. The partnership supported considerable increase in the outreach and impact of the awareness campaigns.

This partnership has empowered SEWA to apply for a formal recognition of the collection model by the stateregulatory agency i.e. Gujarat Pollution Control Board under the E-waste Management and Handling Rules, 2011. The other major results are as follows:

• *Increase in earning*: Their monthly income has increased from INR 1500-2000 to INR 2400-2500 which is around 40% increase on an average for the SEWA members;

• *Improvements in living conditions*: Extra earning eventually resulted in betterment of their living by providing better food for their children and being able to hire private tutors for their children's education;

• *Savings in time*: Previously, SEWA women were devoting the entire day for sorting and collection of solid waste from which their earnings were low. Currently, devoting just two hours a week towards the collection of e-waste has helped ensure these women extra income;

• *Recognition of waste pickers*: Initially these rag pickers never got waste from any formal waste sources like schools, commercial establishments etc. but upon attaining authorization they were able to access formal channels of e-waste ;

• *Environmental savings:* The workers have been able to channelize three tons of e-waste to the authorised recycler for processing and recovery of materials leading to a closed loop economy;

• *Awareness creation at local level*: SEWA carries a trust and brand name in Ahmedabad due to their work ofsolid waste. Their messaging on proper e-waste collection and channelization has been able to connect the schools, youth, colleges and other institutions to adopt sustainable consumption practices to channelize e-waste to the proper recycling channels;

• *Reduction to occupational risks*: Prior to the trainings received under the project, the women wouldbe accompanied by their children to the work place. This practice has stopped, leading to improvements in overall education and health of their children.

12.How to make EPR plans?

A producer company may practice its EPR either individually or collectively. Though these two implementation modes may seem contradictory, they are in fact complementary and are the two pillars of EPR. In other words, when IPR is desired, a collective solution is also necessary. The following paragraphs explain the mechanisms of both individual and collective models.

Individual Producer Responsibility Model

Producer

According to (Manomaivibool and Lindhqvist, forthcoming), IPR is an ideal type of EPR. Since a producer is responsible for his own products, we can assume that there would be an incentive for design improvements (in a way that a producer takes the end-of-life into account and balance it with other considerations).

Each producer is independently responsible for managing the e-waste generated by their products. The producers announce take-back policies and have contractual agreements with the collection agency which collects the waste from the generator at least free-of-cost. The producers, through the collection agency, however pay a fixed price for their products/ components to the generators, as in the collective responsibility model.

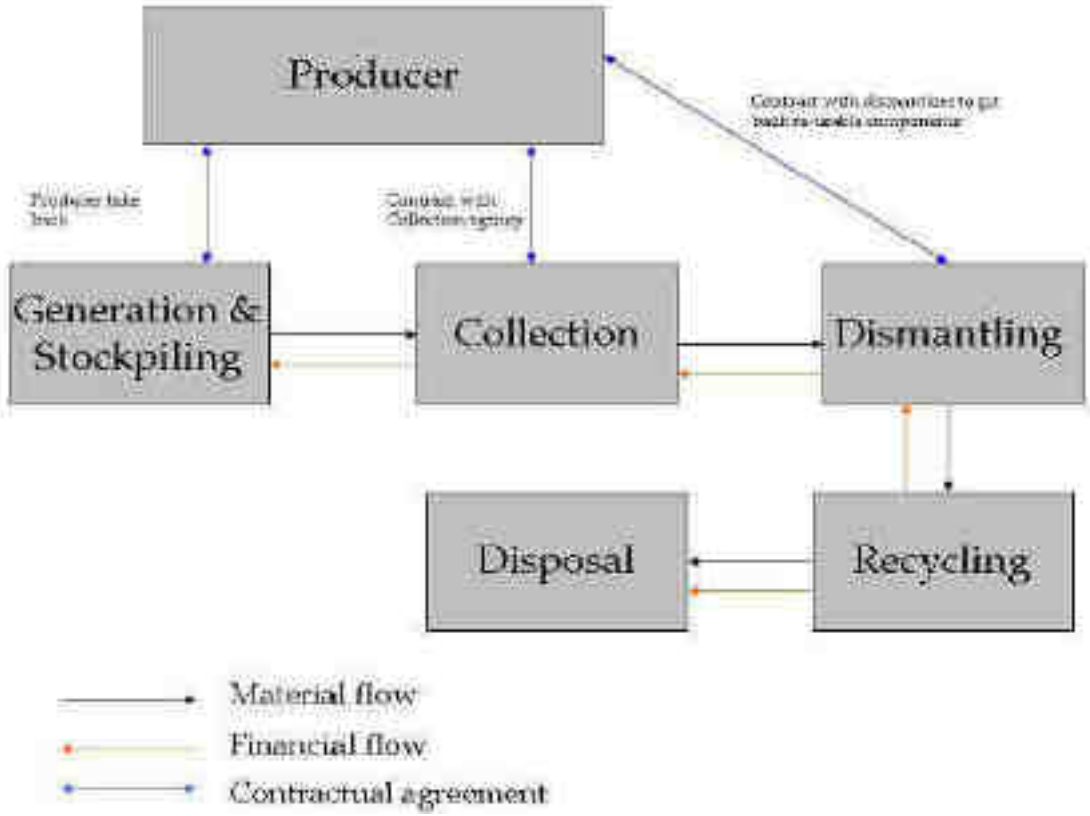

Figure 30: Individual Producer Responsibility Model

The individual producer in this model has the option of having direct contracts with the dismantler and/or the recyclers which allows them to get back the re-usable components from their obsolete computers. The producers can also get the data from the collector/dismantler/ recycler about the specific composition and characteristics of the waste generated by its products in terms of:

- Which models are recycled the most?
- Which components within the computer are most difficult to dismantle/ recycle?
- How can their product be redesigned to make it easier to dismantle and increase the fraction of components which can be reused?

One of the major advantages of having access to information above is the incentive it provides to the individual producer to design for increasing re-use as well as the product design. The economic rationale behind the incentive to redesign is the following: Individual producers, by redesigning their products to facilitate dismantling and increasing re-use of certain components can then transfer the benefits to the consumers who get better prices when they sell off their old computers to the designated collection agency.

Collection

The collection in this model is managed by not-for-profit collection agencies which are regulated by the appropriate authorities like the DPCC and CPCB. The individual producers have contracts with the collection agency and on behalf of the producer; the collection agency implements the producer take back schemes. The collection agency also collects from retailers as well other generators of e-waste through an extensive network of collection centres. As in the model with collective producer responsibility, there is scope for the involvement of the informal sector in the collection and storage of e-waste.

Dismantling and recycling

The roles and responsibilities envisaged for the dismantler and recycler remains the same in both the individual and producer responsibility models. However, in the individual responsibility model, the collection agencies would supply the material to the dismantlers and recyclers and not the collective producer body.

Comments:

The suggested model, which is based on the concept of Individual Producer Responsibility, has the following advantages:

- Market based mechanism: The model allows for the interplay of market forces in determining the price of each category of e-waste generated. It also allows individual producers to negotiate for the “appropriate” price or cost for each category/ brand of waste.
- Eliminates free riders once legislation is introduced: The model also creates a level playing field once appropriate legislation is introduced.
- Individual producer responsibility

- Innovation in production: As described above, the model can allow for designing of efficient recycling as well as dismantling. Such benefits can be passed on to the consumer.
- Efficient design of WEEE Management model by each producer: Each producer has the option of negotiating contracts with other players in the WEEE management system allowing for more flexibility and appropriate mechanism to suit the needs of the producer.

Some of the constraints and bottlenecks of the proposed Individual Responsibility Model are:

- Administrative expenses could be much higher as compared to the collective system due to the presences of duplicated systems and high transaction costs like administering contracts.
- Involvement of informal recyclers into the system would require careful capacity building because certain processes which are an integral part of the value chain of the informal sector are envisaged to be shifted to the formal recycling unit, for instance, no involvement of informal sector in material recovery.
- Uncertainty in provision of the end-of-life costs for complex products
- Its efficiency depends on the collection rate.
- Only e-waste A and C defined in 2.3 are covered in an IPR model and there remains a need to address the problem of waste which doesn't fit in any individual system.

Proposed Collective Producer Responsibility Model

At the heart of this proposed collective e-waste model is the electrical and electronics industry, which comprises of various players in the field. This group contains not only the manufacturers but also the importers and assemblers of the EEE (Electrical and Electronic Equipments). The model recommends a very important role for the manufacturers/producers of electronic goods and proposes that they come together as consortium and establish an organisation, which takes the responsibility of the end-of-life disposal of products being manufactured or assembled by them. This organisation, which can be established with support from all producers, can be designated as 'Producer Responsibility Organisation (PRO)' and will largely be responsible for environmentally sound management of e-waste

There are several factors that make a PRO deem crucial in an EPR programme:

- Small producers might not have enough capacity & power in negotiating the contracts to carry on their responsibility alone
- Economy of scale in the operation
- Managing orphan and historical products
- Assuming monitoring and enforcement role to
    - Reduce transaction costs e.g. by certifying treatment facilities
    - Identifying free riders.

The producers will also enjoy a major advantage of their sales and service network to utilise this channel to collect the waste back at the end of life of such products.

A proposed implementation of a PRO in India is described in the following paragraphs

Structure of PRO: It is suggested that the PRO operates as a non-profit organisation built on the ethos of Corporate Social Responsibility (CSR) and be an active participant in this process. The top management of this PRO should have representation from various sectors making it a truly multi-stakeholder organisation.

The cost of establishing this organisation needs to be supported by the individual companies. The details on the contribution made by individual companies can be worked out through detailed deliberation. A part of revenue can also be generated through the sale of the e-waste being sold to the recycler/dismantler.

The PRO should operate with full operational transparency.

Function of PRO: The Producer Responsibility Organisation will take on overall responsibility of the complete recycling process of e-waste with different levels of engagements in various processes. The PRO will take on direct responsibility of collection and storage of all WEEE generated across the country and then pass this on to the dismantler/recycler for a price. He can outsource these operations (tying up with existing informal sector) but will still be responsible for ensuring proper collection and storage. Also the individual producers can run their own take back systems but have to tie up with the PRO for final disposal and recycling.

Some of the goods being classified as WEEE have an intrinsic material value and this value is an important key to the financial planning of this model. It is a globally accepted fact that lot of e-waste has a material value assigned and all recyclers, big or small, procure electronic wastes at a price and then make profits by selling the recovered materials.

This model suggests and recommends that a part of this material value be passed on to the generators of the waste. Part of this value (revenue) be utilised for logistical support of collection and storage of waste. This mechanism also provides incentive to the generators to be active participants and streamline the storage and collection system to an authorised agency. The PRO will pay the generators for the material collected and provide free collection system. The dynamic fee system for different end-of-life products will be fixed by the PRO and will be open to review at periodic intervals. This will give an option to vary the prices according to the prevailing market values of the materials extracted.

The revenue generated by PRO through sale of this waste to the recyclers will be utilised for financing the take back process from the consumers (cost paid for the WEEE) as well as the collection and storage of the waste. In case of products with no material value and a recycling cost attached, the producer will need to take responsibility (through PRO) as part of the EPR initiative.

Function of recyclers: The collected material will be sold to an authorised (individual or consortium) dismantler and recycler, who is an important component in this e-waste management system. The dismantling and recycling infrastructure will be responsible for establishing environmentally sound technologies to manage WEEE.

The revenue generated through sales of the materials recovered will support the administrative, plant and machinery and other overheads. The critical factor deciding the

breakeven period will be both an assured material supply as well as the scale of operation. The experiences across many countries suggest that the scale of operation for recycling such waste is growing and such ventures are considered viable and profitable.

The collection mechanism of the proposed model

1. *PRO take-back*: The PRO will provide free collection for the waste and the generators will be paid for the material according the product type (fixed by PRO). A proper reporting system has to be established for this to ensure transparency.

2. Dealer take-back: The dealers selling such products will have to take back the old products and the generators will get a discount on new purchase of electrical and electronic goods (the end-of-life cost can be fixed according to product type). These products will be then transferred back to the PRO with proper reporting.

3. By existing informal network: One of the biggest challenges to this model is from the existing informal sector and the operators will need to address this. The best option may be to channelise this sector in the collection and storage of waste from various sources, which is then passed onto authorized distribution channels. The informal sector will tie up with the PRO to ensure accountability.

13. How do you finance EPR in the Indian context?

The financing of the Individual Producer Responsibility Model would depend, amongst other things, on the inherent material value of the EEE. This would be the most crucial element in determining whether another financial instrument, like an Advanced Recycling Fee (ARF) to be levied at the point of sale, is necessary at all. The price, inclusive of ARF, would therefore reflect the true price of the product including the environmental cost of the product. For instance, products like computers which have inherent material value that can cover the entire cost of recycling could potentially be recycled by levying a nominal or even zero ARF. However, products which do not have sufficient material value at the end of useful life will need to be recycled by levying either a visible or invisible ARF. Therefore under the individual responsibility model, there would be a menu of ARF ranging from zero to positive amounts, depending on the inherent material value of the end of life product. The exact amounts would depend on the producers' estimation of the recycling costs and the nature of contracting with the recyclers. If Individual Responsibility is a component of a larger Collective Responsibility Model, the proposed ARF might go down because the collective organization would be able to take advantage of economies of scale

14. Additional Awareness Materials and Sources of Information / References:

For RWAs:

Methods of identification of toxic substances in e-waste:
http://ewasteguide.info/hazardous-substances
http://www.who.int/ceh/risks/ewaste/en/

Kumar Binay. IRSEE / Prof. (Network Management) / NAIR, Vadodara: "e-Waste – Environment and Human Health Hazards and Management"
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How do you set up of a Producer Responsibility Organization (PRO) for collecting e-waste:

Steps for Setting Up a Producer Responsibility Organization by Dr. Ashish Chaturvedi, Senior Technical Advisor, GIZ-IGEP

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List of Abbreviations

MeitY: Ministry of Electronics and Information Technology
MAIT: Manufacturers Association for Information Technology
LOHAS: Lifestyles for Health and Sustainability
e-waste: Electronic Waste
RWAs: Resident Welfare Associations
EPR: Extended Producer Responsibility
PPP: Purchasing Power Parity
TV: Television
CRT: Cathode Ray Tube
LCD: Liquid Crystal Display
LED: Light Emitting Diode
CPCB: Central Pollution Control Board
PVC: Polyvinyl Chloride
PCBs: Polychlorinated Biphenyls
TSDF: Treatment, Storage and Disposal Facility
BFR: Brominated Flame Retardants
PBB: Polybrominated Biphenyls
PBDE: PolybrominatedDiphenyl Ethers
ATM: Automated Teller Machine
WEEE: Waste Electrical and Electronic Equipment
CFC: Chlorofluorocarbon
HCFC: Hydrochlorofluorocarbons
HFC: Hydroflourocarbon
HC: Hydrocarbon
UNEP: United Nations Environment Programme
DRS: Deposit Refund Scheme
PRO: Producer Responsibility Organisation
OHS: Occupational Health and Safety
PCDD/Fs: Polychlorinated dibenzo-p-dioxins
PBDD/Fs: Polybrominateddibenzo-p-dioxins
CO2: Carbon Dioxide
IEC: Information, Education and Communication

Annexure- 1

'Standard Mark' for the Registration Scheme

भारत का राजपत्र
The Gazette of India

MINISTRY OF CONSUMER AFFAIRS, FOOD AND PUBLIC DISTRIBUTION

(Department of Consumer Affairs)

(BUREAU OF INDIAN STANDARDS)

New Delhi, the 1st December, 2015

S.O. 3240(E).—In pursuance of sub-rule (1) of the Rule 9 and sub-rule (1) of the Rule 160 of the Bureau of Indian Standards Rules, 1987, the Bureau of Indian Standards hereby notifies the Standard Marks, for the Indian Standards given in the schedule. The use of the Standard Marks as in column (2) below shall denote the use of the words "Self declaration – Conforming to IS:...." mentioned in sub-rule (1) of the Rule 160 of the Bureau of Indian Standards Rules, 1987.

SCHEDULE

Sl. No.	Design of the Standard Mark	Product/Class of Product	Indian Standard	Effective Date
(1)	(2)	(3)	(4)	(5)
1.	IS 302-2-25 R-XXXXXXXX	1. Microwave Ovens	IS 302-2-25	01 December, 2015

2.	IS 302-2-26 R-XXXXXXXX	1. Electronic Clocks with Mains Power	IS 302-2-26	01 December, 2015
3.	IS 616/IEC 60065 R-XXXXXXXX	1. Planar LCD/LED Televisions of screen size 32" and above 2. Power Adaptors for Audio, Video & Similar Electronic Apparatus 3. Amplifiers with input power 2000W and above 4. Electronic Musical Systems with input power 200W and above 5. Optical Disc Players with built in amplifiers of input power 200W and above 6. Electronic Games (Video)	IS 616 / IEC 60065	01 December, 2015
4.	IS 10322 (Part 5/Sec 1) R-XXXXXXXX	1. Fixed General Purpose LED Luminaires	IS 10322 (Part 5/Sec 1)	01 December, 2015
5.	IS 13252 (Part 1)/ IEC 60950-1 R-XXXXXXXX	1. Point of Sale Terminals 2. Power Adaptors for IT Equipment 3. Automatic Data Processing Machine 4. Laptop/ Notebook/Tablet 5. Power Banks for use in portable applications	IS 13252(Part 1)/ IEC 60950-1	01 December, 2015

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			6. [illegible] 7. [illegible] 8. [illegible] 9. [illegible] 10. [illegible] 11. [illegible] 12. [illegible] 13. Set Top Box 14. Telephone Answering Machines 15. Scanners 16. Wireless Keyboards 17. Visual Display Units, Video Monitors of screen size 32" and above	
6.	IS 15885 (Part 2/Sec 13) R-XXXXXXXX	1. DC or AC Supplied Electronic Controlgear for LED Modules	IS 15885 (Part 2/Sec 13)	01 December, 2015
7.	IS 16046/IEC 62133 R-XXXXXXXX	1. Sealed Secondary Cells/Batteries containing Alkaline or other non-acid electrolytes for use in portable applications	IS 16046/ IEC 62133	01 December, 2015
8.	IS 16102 (Part 1) R-XXXXXXXX	1. Self Ballasted LED Lamps for general Lighting Services	IS 16102 (Part 1)	01 December, 2015

9.	IS 16242 (Part 1)/ IEC 60240-1 R-XXXXXXXX	1. UPS/Inverters of rating ≤ 5kVA	IS 16242 (Part-1)/ IEC 60240-1	01 December, 2015

Note : R-XXXXXXXX below the Standard Mark denotes the 8 digit Registration Number

[F. No. CMD-VII/1]

ALKA PANDA, Director General, BIS

About this Manual

Under the Digital India Mission, the Ministry of Electronics and Information Technology (MeitY) has initiated a project "*Awareness Programme on Environmental Hazards of Electronic waste*". The programme aims to enhance awareness on the growing challenges and opportunities provided by e-waste.

This manual, for RWAs and Localities, is a part of a series of training materials prepared for all the relevant stakeholders involved in e-waste management in India. Through this programme and by publication of awareness materials, MeitY aims to develop standardized content for reaching out to the relevant stakeholders.

The focus group of this particular manual are residents of RWAs and localities, a critical and vibrant community of change agents in society. This manual intends to present the subject of e-waste and its multiple facets in a manner that engages citizens in experiential learning about e-waste. The manual uses state of the art methodological approaches such as Harvard Case Methodology and Walker Learning Cycle to enable residents of RWAs and Localities not only learn but also act – as responsible consumers and communicators for environmental change.

The manual uses different methods to achieve the change objective including the Donna E. Walker's 'Learning Cycle' that has five steps including Mind Jog, Personal Connection, Information Exchange, Information Application and Real World Connection. This method takes into account that different learners have different learning abilities and at least one of the steps of the cycle would be able to transfer the learning effectively.

In addition it uses Harvard case method that involves presenting a case to citizens where they associate themselves with a role as they read through the situation and identify the problem. The next step is to perform the necessary analysis to determine the cause and possible solutions to the problem. The manual provides essential information and situations that form cases that can be discussed with the citizens by the trainer.