E-Aware

E-waste Management in India

CHANDIGARH AT A GLANCE

TOTAL POPULATION (2011)

CHANDIGARH	1,054,686	♂ 55.01%	♀ 44.99%
INDIA	1,210,193,422	♂ 51.53%	♀ 48.47%

TOTAL HOUSEHOLDS (2011)

CHANDIGARH	2,41,173
INDIA	248,408,494

PER CAPITA INCOME (2014-15)

CHANDIGARH	₹ 1,56,951
INDIA	₹ 88,533

LITERACY RATE (2011)

CHANDIGARH	86.77%
INDIA	74.04%

MUNICIPAL SOLID WASTE (2014-15)

CHANDIGARH	380 TPD
INDIA	127,486 TPD

E-waste (2014-15)

CHANDIGARH	4100 tones (E-Aware)
INDIA	1.7 Mt

KEY FINDINGS (E-Aware)

- E-waste awareness & inventory for Chandigarh was carried out using representative sample size from High Income Group (HIG), Middle Income Group (MIG) and Lower Income Group (LIG) households.
- Only 30% of the respondents know what is E-waste and associated environment & health risks.
- Only 12% respondents are aware of E-waste (Management and Handling) Rules, 2011 introduced by Government of India.
- Majority of residents (81%) are not aware about take back / exchange policies offered by several companies.
- 90% of respondents are not aware about the existence of E-waste collection bins at E-Sampark centers and other prominent places. Only 2% of the respondents made use of E-waste collection bins.
- Toll free service offered by Chandigarh Administration in collaboration with a private organization to pick up the E-waste from their residences is known to only 2% respondents.
- E-Aware Project (funded by PGIMER) estimate that Chandigarh generates around 4100 tones/year of E-waste from electronic devices & households appliances such as Refrigerator, Washing Machine, AC, TV, Computer, Laptops, Mobile etc.

What is E-waste?

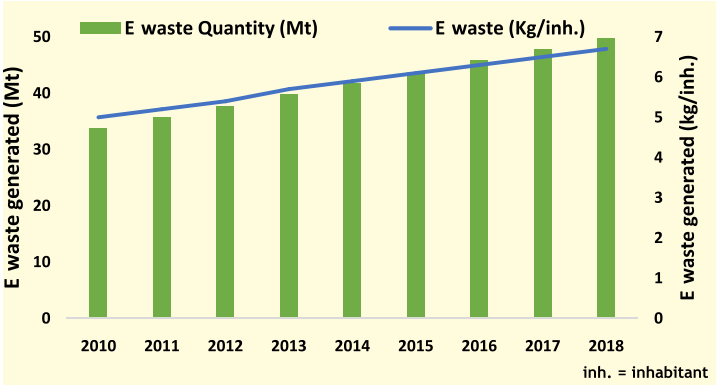
Waste electrical and electronic waste equipments (WEEE or E-waste) comprises of waste generated from used electronic devices and household appliances which are not fit for their original intended use and are destined for recovery, recycling or disposal.

What does it Include?

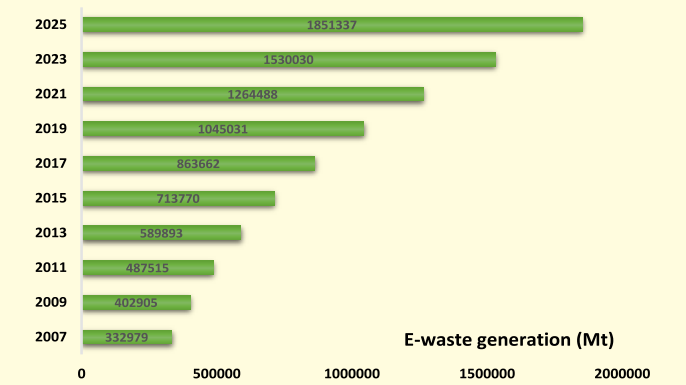
Electronic waste encompasses wide range of electrical and electronic devices such as computers, entertainment electronics, handheld cellular phones, electronic toys, sports equipments, medical devices, lighting equipments and monitoring and control equipments, personal stereos, including large household appliances such as refrigerators, air conditioners etc.

Global E-waste Generation

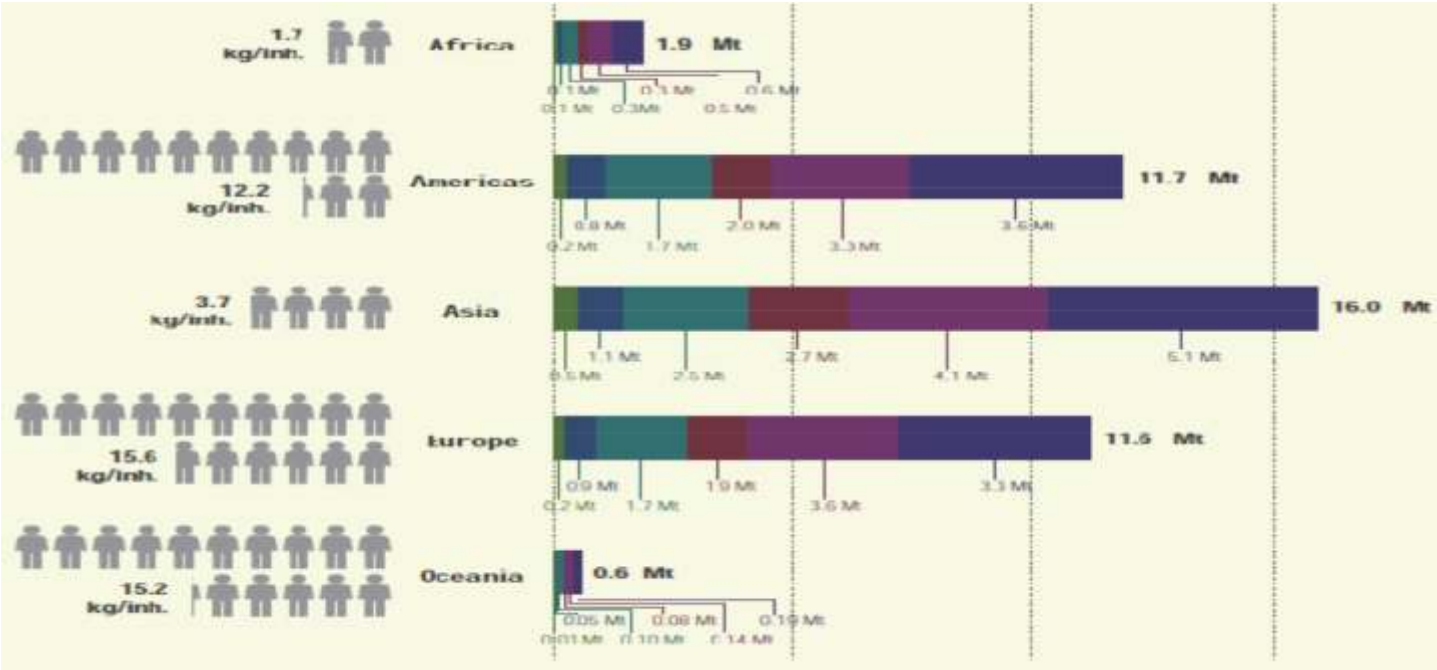
The current global production of E-waste is estimated to be 20-25 million tonnes per year, with most of E-waste being produced in Europe, United States and Australia. However, it is estimated that by 2018, domestic generation of E-waste in developing countries will outstrip generation in developed countries.



Global E-waste Generation



E-waste Generation in India

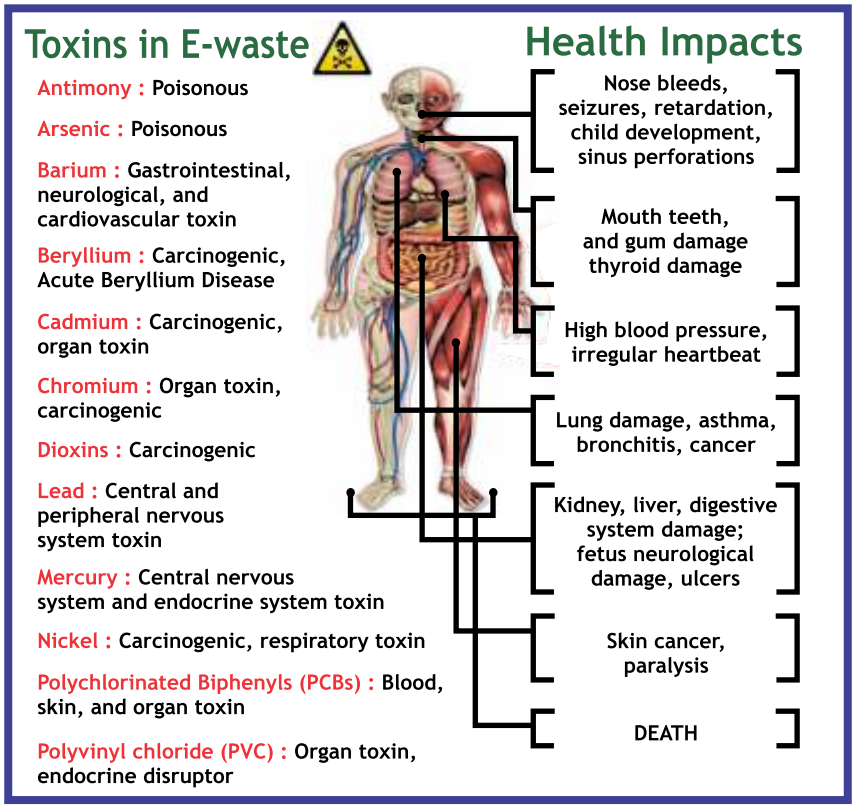


E-waste Generation per Category, Region and Person

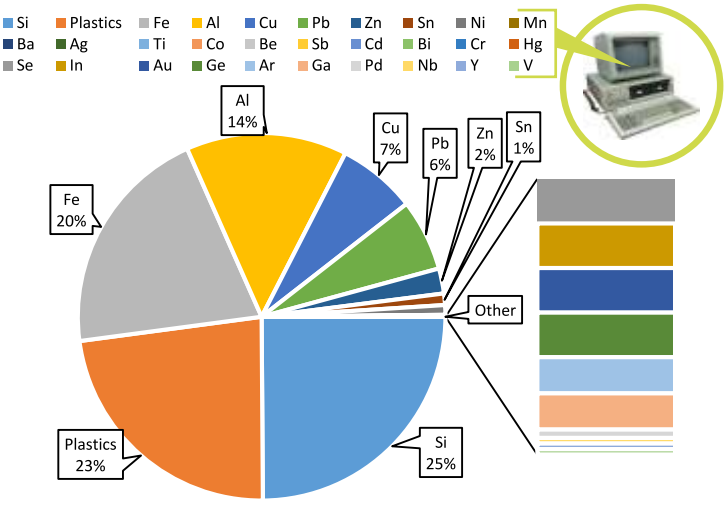
Source: The Global E-waste Monitor 2014 (UNU-IAS) and E-Aware 2016

Why to Focus on E-waste Management?

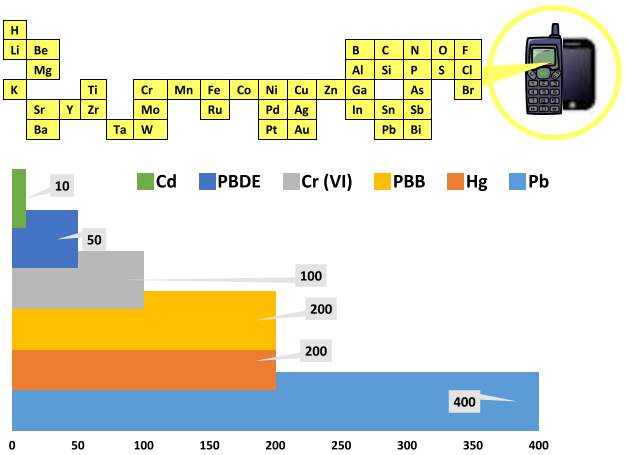
A vast majority of E-waste ends up in landfills as a part of municipal waste, putting an additional burden on the already stressed landfill sites. Unprotected landfill sites allow the hazardous substances of E-waste to make their way into air, soil and water. The informal recycling of E-waste emerges as new environmental challenge. Circuit boards are treated in open acid bath to extract copper and precious metals. Insulated copper wire are collected and burnt in open piles to recover reusable copper. Further, E-waste is usually processed under poor environmental conditions, resulting in adverse occupational implications. Hence, handling and processing of E-waste using primitive technologies releases various toxins in the environment; which may pose a serious risk to human health.



Health Effects of E-waste

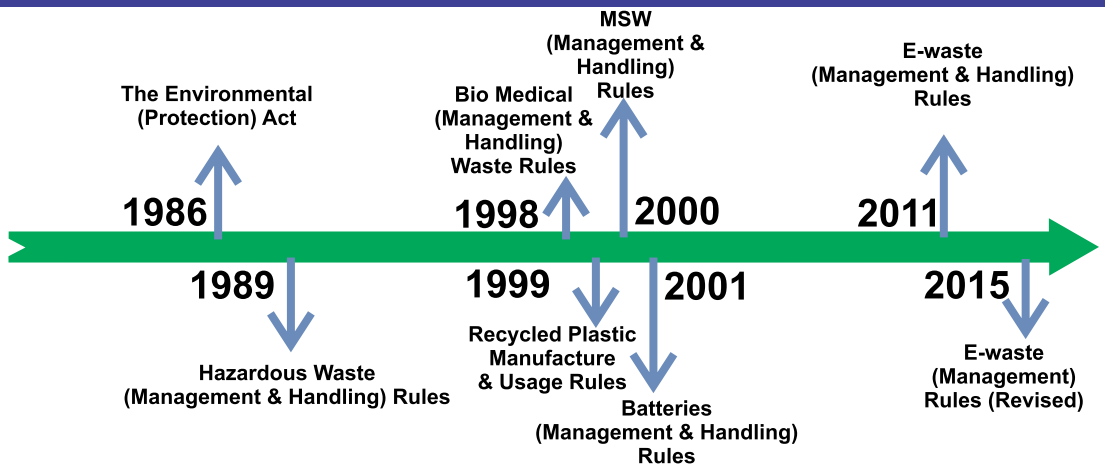


Composition of Computer (%, w/w)



Toxic substances in Mobile Phone (mg/kg)

Regulatory Framework of Waste Management



Progression in Regulatory Framework for Waste Management in India

Sustainable Technology & Management of E-waste

According to Associated Chambers of Commerce & Industry of India (ASSOCHAM), only 4% E-waste is being recycled and 95% of it is handled by informal sector. Figure below shows the difference between informal & formal practices and it is important to regulate it in scientific manner using formal approaches.

Recycling of E-waste in Formal and Informal Sector

- Cathode Ray Tubes' (CRTs) are broken manually to separate its components – glass, metal and copper. The glass, comprising lead, is sold to bakeries or bangle makers. Since it retains heat, the glass goes into the base of ovens. Phosphors, if inhaled, can be toxic. The CRTs are sold to non-branded television makers.
- Components of the CRTs are separated by heating in a closed chamber, which sucks out phosphors from the components. They are then crushed in shredder machines. Glass containing lead is sold to the companies that manufacture the CRTs.
- Circuit boards have gold plated brass pins, microchips and condensers which are separated by heating. Fumes released during heating are toxic. Gold-plated brass pins are soaked in acid to recover the gold and brass separately. Microchips and condensers are heated in big containers filled with acid.
- Circuit boards are crushed in shredder machines. They are sent to approved smelters, where after smelting at 1200°C, the metals in the circuit board collect together. Since smelting is carried out in closed chambers at high temperature, it is not hazardous. The metals—lead, copper, nickel, tin, gold, silver, palladium—are then separated by electro-refining.
- No safety precautions are being followed. Informal recyclers are paid ₹ 100-300 per day.
- Protective equipments—gloves, masks, shoes, caps—are provided to employees. ₹ 5,000 per month paid to skilled workers.
- Minimal capital investment required. Cost includes price of e-scrap, bribes to transfer it across state borders and set up and run shops, and rent for the workspace.
- Investment for a dismantler is about ₹ 30 lakh and for recycling plant is about ₹ 25 crore.

E-Aware Project (Appraisal and Awareness of E-waste Practices in Chandigarh)

E-Aware Objectives

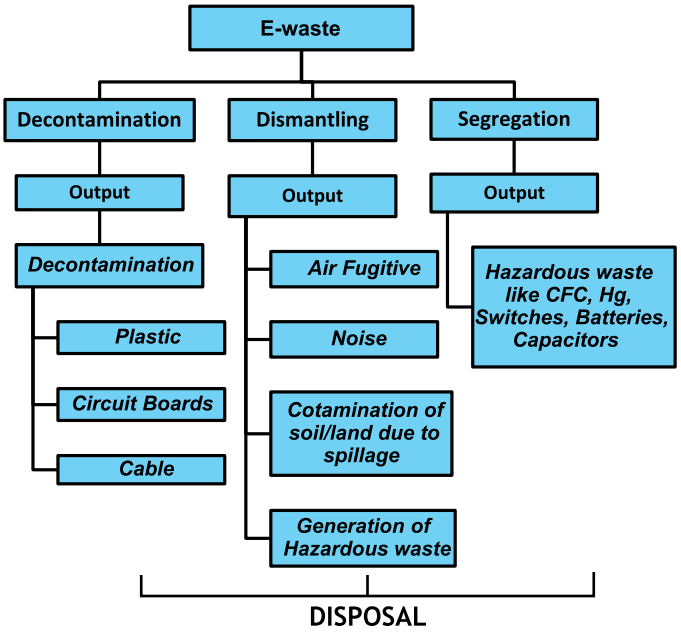
1. Appraisal of current management practices in the Chandigarh
2. Awareness about E-waste management practices

Methodology

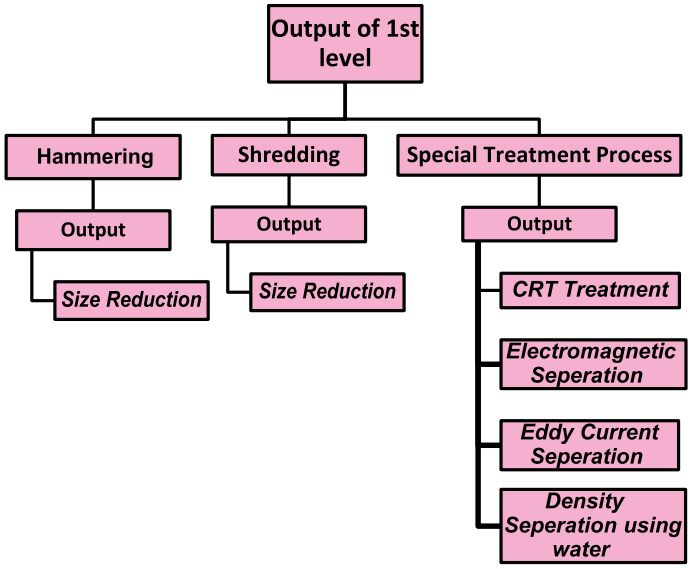
- Interview of lower, middle and higher income groups and inventory assessment
- Visit of E-sampark centers
- Awareness campaign and mobilization of household members to adopt safe disposal practices

E-waste Disposal Strategy as per MoEF Guidelines, 2008

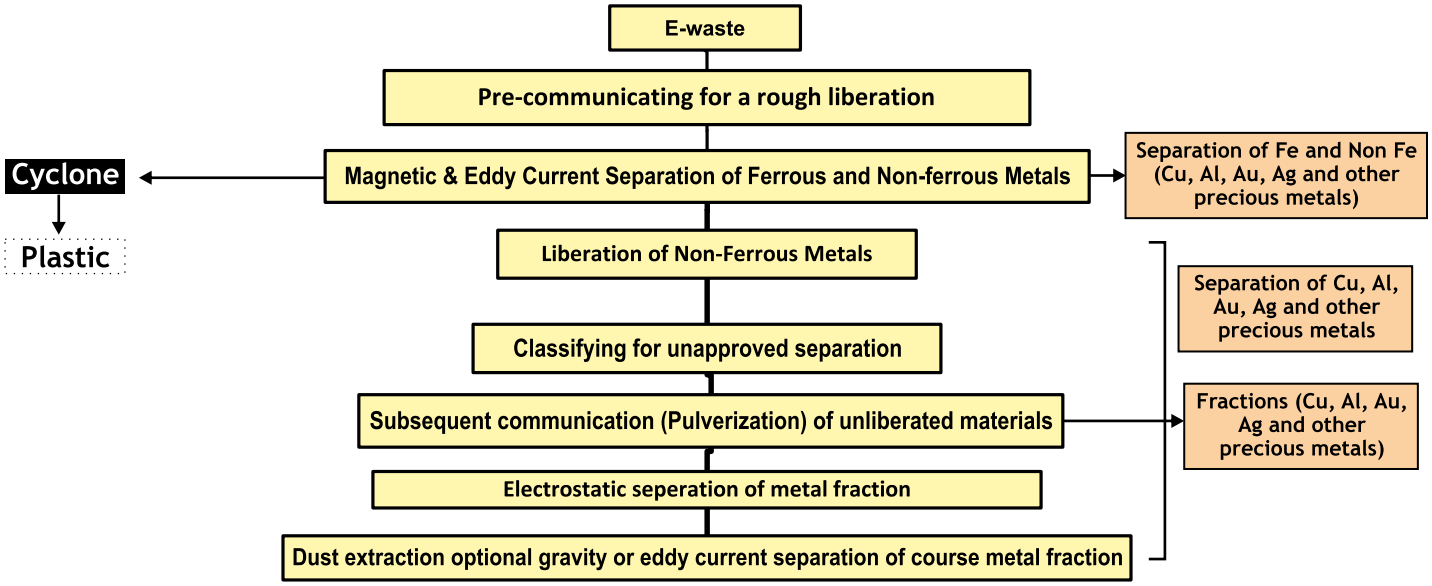
E-waste undergoes various stages of treatments i.e. 1st level, 2nd level and 3rd level treatments as presented below.



1st Level E-waste Treatment

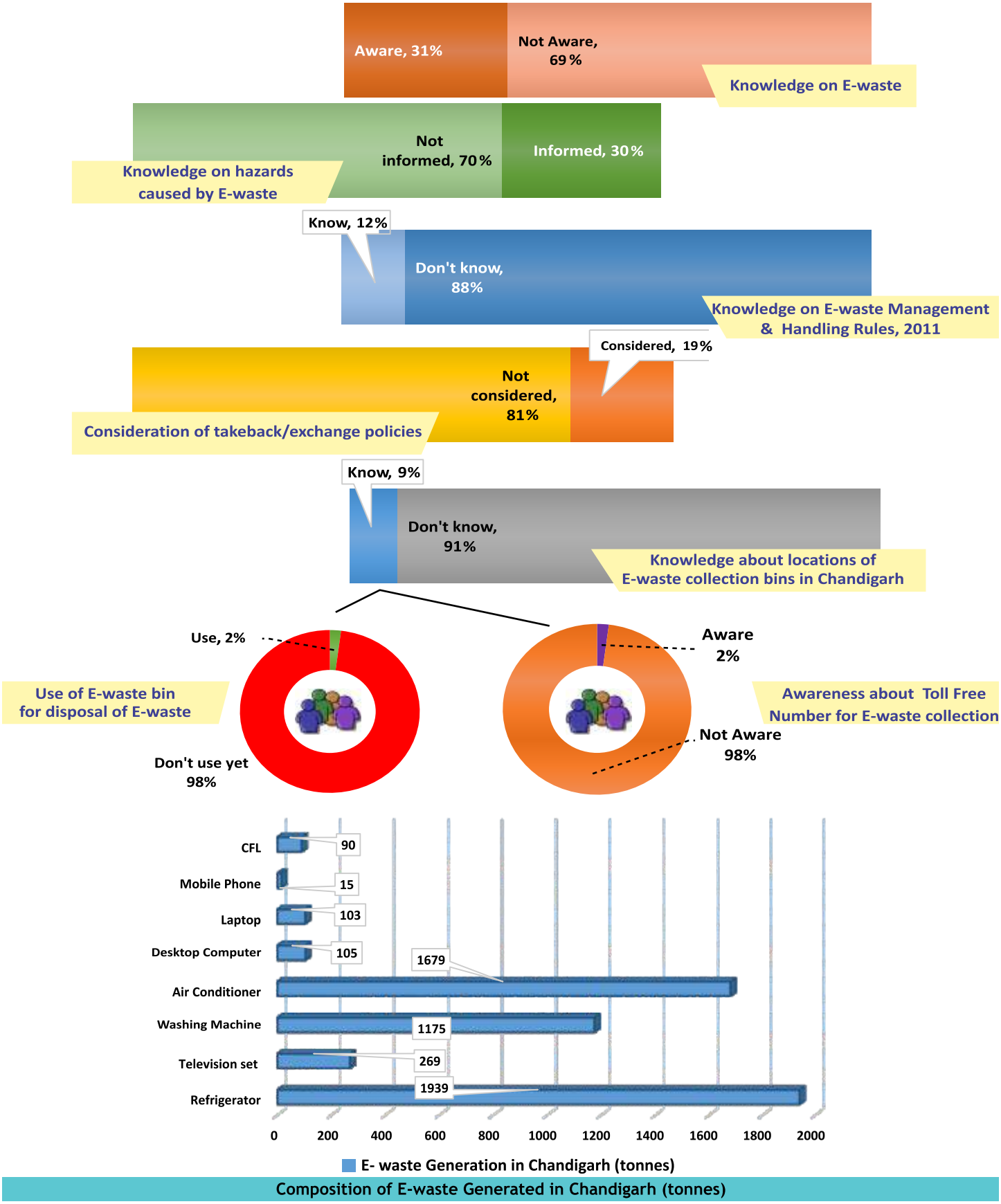


2nd level E-waste Treatment

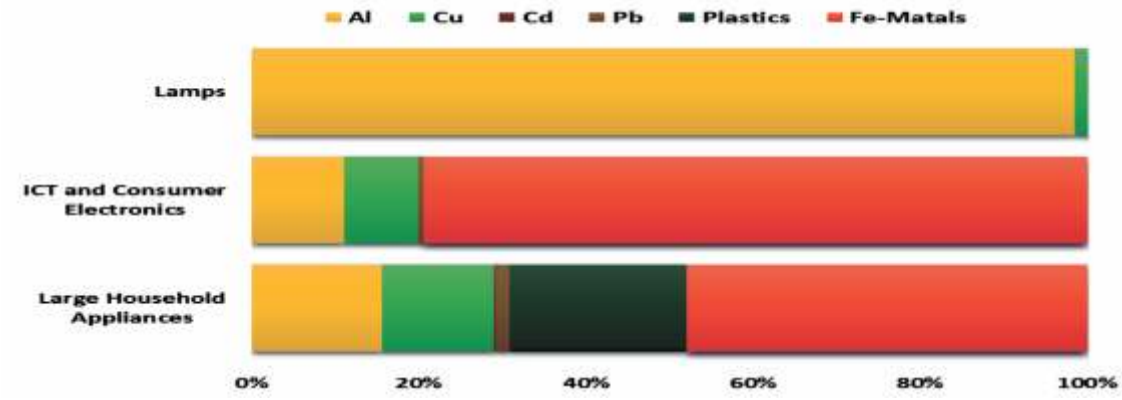


3rd Level E-waste Treatment

Key Findings of E-Aware Project



Composition of E-waste Generated in Chandigarh (tonnes)



Heavy Metal Composition of E-waste in Chandigarh

Current E-waste Management Practices in Chandigarh

E-waste collection bins are kept at 18 places in Chandigarh in addition to E-sampark centers and includes UT Secretariat building, Sector-9, EDC Centre, I.T. Park, Sector-17 Plaza, Confederation of Indian Industry office, Sector-31, Deputy Commissioner office, Sector-17, Government School, Sector-36, MCM DAV College, Sector-36, Punjab Engineering College, Sector-12 etc.

Administration also started a toll free number for collection of large sized electronic items which cannot be put in these bins e.g. TV, printer, refrigerator, computers etc. The toll free phone number is 1800-419-3283.

E- waste Bins Used in Chandigarh

Best E-waste Management Practices

- Reduce the volume, Re-use, Repair and/or upgradeability
- Use of less toxic, easily recoverable and recyclable materials
- Public-private-partnerships in setting up buy-back or dropoff centers

Selective Publications on Waste Management by E-Aware Team

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Kaur K, Mor S, Ravindra K (2015). Waste Management Policies in India: Can We Address the Implementation Challenges? *Waste Management*, 36, 1-3.

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Ravindra K, Kaur K, Mor S (2015). System Analysis of Municipal Solid Waste Management in Chandigarh and Minimization Practices for Cleaner Emissions. *Journal of Cleaner Production*, 89:251-56.

Kaur K, Mor S, Singh K, Ravindra, K. (2012). Assessment of Landfill Leachate Toxicity using Chickpea. *Journal of Sustainable Environmental Research*, 1(2): 115-20.

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Mor S, Ravindra K, De Visscher A, Dahiya R P, Chandra, A. (2006). Municipal solid waste characterization and its assessment for potential methane generation: a case study. *Science of the Total Environment*, 371:1-10.

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E-Aware Project

Chandigarh is becoming a technological hub for its respondents and electrical and electronic companies are expanding in Rajiv Gandhi Technology Park. However, to the best in our knowledge, no study has been conducted on E-waste generation and management practices in Chandigarh. Considering this, the current study quantified and analyze the trade value chain of E-waste. Further project also aim to prepare intervention to enhance E-waste collection for safe treatment/disposal and to minimize the environmental and human health impact of E-waste.

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