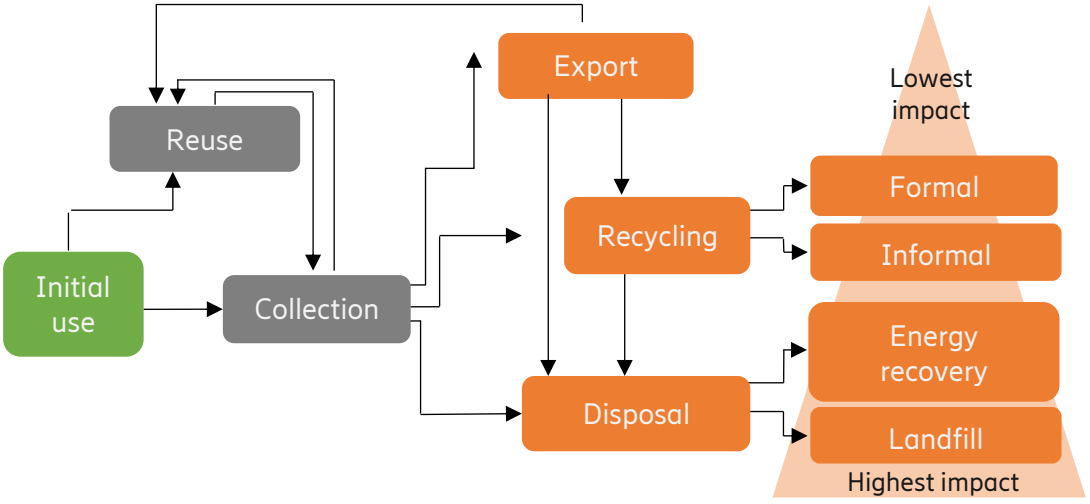
Research Brief

E-waste - major differences between regions

Defining realistic end-of-life scenarios for assessing impacts of Information and Communication Technologies (ICT) is challenging as homogenous and comprehensive data sets are missing. Waste from ICT is treated and reported differently between countries. Eventually all ICT waste ends up being recycled – either formally or informally, sometimes even illegally – or in a landfill. There are improvement opportunities for all regions.

Understanding the ICT waste collection

All products come to their end-of-use, and despite sometimes being reused, rebuilt or stored, eventually they reach their end-of-life. There are then three end-of-life treatment options: formal recycling, informal recycling and landfill. Depending on the different regions of the world, the three options are used to a different extent, and the situation may also differ considering the various types of products being treated.



In the best of worlds, all waste from electronics including equipment from the ICT sector would be used for their full technical lifetime and then fully recycled in a controlled process without environmental impacts.

However, the actual situation is more complicated and so there is a need to understand the ICT waste collection in different regions and the waste treatment flows around the world. These are needed to make credible end-of-life treatment scenarios for use in life cycle assessments (LCA) of products and to identify improvement areas for e-waste.

Europe mainly recycles formally

In Europe, most ICT waste is formally recycled and treated in developed waste management systems. Hence, the waste is collected and treated under controlled forms and any hazardous emissions are taken care of. As much of it as possible is recycled before incineration giving energy and a minimal rest goes to controlled landfills. In formal recycling, there is control over any hazardous emission both during the recycling processes and in the formal landfill. However, Europe still exports hazardous waste - about 10% of the ICT waste from the investigated countries is exported. The waste-flows from Western Europe mainly go to Eastern Europe, West Africa and Asia. Europe also treats imported waste from mainly North America in their controlled waste management systems.

Informal recycling is most common

Globally most ICT waste is recycled informally. In informal recycling, precious materials are recovered, but various uncontrolled methods are used. This may lead to emissions of large amounts of toxic organic pollutants and heavy metals, exposing the surrounding inhabitants and environment. Additionally, safety, human and environmental health concerns are often ignored.

Informal recycling is most common in Asia and Africa but also occurs in Latin America. These regions also import waste, where some is recycled through formal processes, but most are informally recycled. Over half of all ICT waste is generated in the Asia Pacific region.

USA use landfills

A majority of the ICT waste from USA is discarded to landfills, while only some are formally recycled. Waste is exported from USA to Europe for formal recycling, but some are exported to Asia and Latin America where most of the waste is treated informally before ending up being burnt or left at landfills. Landfills can be either controlled or uncontrolled. The uncontrolled landfills pose a high risk for harmful exposure to the surrounding environment. In Latin America, landfills are also a common end station for e-waste.

Global end-of-life scenario developed

In this study, a global end-of-life scenario was developed by comparing the weight of e-waste with the estimated total weight of ICT for a specific country or region. The rates indicate how waste is treated within the region. Since not all countries within a region were investigated it was assumed that the percentage of waste treated was the same within each region. For North America and Europe, the numbers are adjusted to exclude export-flows. The scenario was developed to more properly reflect regional differences in life cycle assessment studies of the ICT sector.

Region	Weight	Formal recycling	Informal recycling	Landfill
Sub-Saharan Africa	9%	9%	69%	23%
The Middle East and N. Africa	11%	7%	87%	6%
Europe	13%	63%	8%	29%
Asia Pacific	51%	10%	84%	6%
North America	6%	39%	0%	61%
Latin America	9%	17%	44%	39%
Global	100%	19%	64%	17%

In a life cycle assessment, the end-of-life treatment lies in the future. As the waste treatment and recycling rate vary from region to region, different scenarios need to be created. Sensitivity analysis of the effects of end-of-life stage scenarios should be used in any life cycle assessment.

A major challenge was that the available data were not comparable between countries – not even within the EU. Although recycling patterns may differ between business-to-consumer (B2C) and business-to -business (B2B) equipment, the end-of-life treatment could not be separately modeled due to the lack of granular data sets.

Formal recycling is best from a sustainability point-of-view

The main objective of recycling is to generate clean commodity materials that can replace primary raw materials. Today some metals are mixed in a way that makes them hard to separate.

From a sustainability point-of-view, formal recycling in controlled environments is preferred and is essential to not lose scarce and valuable resources but save them for future generations. This study shows that formal recycling can be expanded to all regions. Large investments are needed to move informal recycling to a safer and more sustainable formal recycling process and to reduce the amount of waste ending up as land-fill.

Reference to full paper:
Liebmann, A. 2015. ICT waste handling: regional and global end-of-life treatment scenarios for ICT equipment, Master of Science thesis, Royal Institute of Technology Stockholm. TRITA-IM-EX 2015:12