SUSTAINABLE RECYCLING INDUSTRIES

Problematic Fractions Arising from WEEE in Egypt

Baseline assessment on the volumes and hazardousness of problematic fractions

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SRI builds capacity for sustainable recycling in developing countries. The programme is funded by the Swiss State Secretariat of Economic Affairs (SECO) and is implemented by the Institute for Materials Science & Technology (Empa) and the World Resources Forum (WRF). It builds on the success of implementing e-waste recycling systems together with various developing countries since more than ten years.

Acronyms

BFR	Brominated Fire Retardant
CAPMAS	Central Agency for Public Mobilization and Statistics (CAPMAS) – Statistical Data
CEDARE:	Centre for Environment and Development for the Arab Region and Europe
CRT	Cathode Ray Tube
EEE	Electrical and Electronic Equipment
EoL	End of Life
EEAA	Egypt Environmental Affairs Agency
ESIA	Environmental Social Impact Assessment
IEC	International Electro technical Commission
LCD	Liquid Crystal Display
MFA	Mass Flow Analysis
MoE	Ministry of Environment (Egypt)
MCIT	Ministry of Communication and Information Technologie
POP	Persistent Organic Pollutant
RoHS	Restriction of Hazardous Substances
UPS	Un-interrupted Power Supply
WEEE	Waste Electrical and Electronic Equipment
WMRA	Waste Management Regulatory Agency

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Executive Summary

The current report provides a comprehensive assessment of problematic fractions in electronic waste (e-waste) in Egypt. The study employed a systematic approach to assess hazardous materials in various types of electronic equipment, such as desktops, laptops, LCD panel displays, CRT panel displays, and old and smart mobile phones, which are the most important in terms of volumes handled by Egyptian recyclers. The assessment was based on a review of a significant number of peer previous work, including literature, technical reports, and field studies performed by the report's authors, followed by a comprehensive analysis of the collected data to quantify the concentration of each hazardous material in each fraction and sum the concentration of hazardous materials included in each equipment.

The typical hazardous materials found in e-waste include heavy metals such as mercury, lead, and cadmium; brominated flame retardants (BFRs) such as polybrominated diphenyl ether (PBDE) and polychlorinated biphenyl (PCB); chlorinated persistent organic pollutants (POPs) that exist in many fractions of e-waste; and unintentional POPs released from e-waste, such as dioxin and furan-like structures. The total concentration of hazardous materials in each e-waste fraction was calculated by summing up the concentration of each element in the fraction.

The study also conducted a WEEE (waste electrical and electronic equipment) mass flow assessment, focusing on equipment that is recycled in Egypt and considered the most problematic, in particular, equipment that includes the highest quantity of hazardous materials. A survey was conducted to assess the quantities of electronic equipment that Egypt consumed from 2015 to 2021, with the main source being CAPMAS (Central Agency for Public Mobilization and Statistics). The WEEE mass flow assessment employed the conventional assumption of estimating the equipment end of life (EoL) and using a logistic forecasting approach based on the information on products put on the market obtained from several sources, including CAPMAS.

The analysis of each equipment separately aimed to identify the quantities of hazardous materials evolving from each equipment. The results showed that lead constitutes the highest amount of hazardous materials in equipment such as CRT, LCD, laptop, and desktop, mainly present in batteries and leaded glass, followed by PBDE material in equipment such as desktop, LCD, laptop, and CRT, mainly existing within plastic fractions.

In conclusion, the study provides a comprehensive assessment of problematic fractions in e-waste in Egypt, including hazardous materials and WEEE mass flow assessment. The results of the study can inform policy and decision-making related to e-waste management in Egypt and contribute to the development of sustainable solutions for e-waste management.

Keywords

Problematic fractions, recyclers, waste management, hazardous waste.

1 Introduction

The Stockholm Convention clarified that the man-made materials used in electronic and electrical equipment (EEE) contain hazardous elements. It aimed to restrict or eliminate the usage of Persistent Organic Pollutants (POPs) due to their severe effects on both the environment and the human health[1]. The convention was signed by Egypt in 2002 and was effective on the 17th of May 2004. Following the convention, it was realized that the problem of the electronic and electrical equipment disposal as E-Waste is growing due to the swift increase in the availability of such equipment worldwide along with the decrease in their cost and the cost of their accessories, especially networking equipment mobile phones, desktops, laptops, and LCD monitors used for computers and televisions.

The main problem associated with E-Waste is that as much as it contains rare and precious metals such as gold, silver, platinum, and palladium; it also contains toxic, persistent and bio-accumulative materials that include heavy metals such mercury (Hg), lead (Pb), cadmium (Cd), chromium (Cr), tin (Sn), zinc (Zn), and non-metals such as brominated flame retardants (BFR) and chlorinated insulators containing highly toxic persistent organic pollutants (POPs). This combination of materials constitutes most of the E-Waste fractions rendering them of hazardous nature.

The current document shall detail the methodology and approach to assess the problematic fractions of the E-Waste and quantify and classify their hazard in order to find solutions and to reduce this hazard impact.

2 Scope of Work

The scope of this study includes certain category of electronic equipment such as Desktops, Laptops, Mobiles, CRT, LCD, and Mobile Boosting Stations. Such equipment is the main interest of recyclers in Egypt, as they include high grade printed circuit boards that yield certain amounts of precious metals such as gold, silver, platinum, and palladium, as well as basic metals such as lead and copper. As for printers, inverters, voltage regulators, toners & cartridges are not within the core interest of the recyclers. For instance toners and cartridges are mainly refilled for reuse and then at the end of many cycles they are disposed in hazardous waste landfill. As for Printers they dismantled and used as spare parts.

[1] Exposure to Dioxin and Dioxin-like Substances: A Major Public Health Concern", World Health Organization, Geneva, Switzerland,

3 Work Organization

The assigned work consists of two deliverables:

- Assessment of the problematic fractions
- Opportunity study on available solutions including impact assessment

The first deliverable (the current report) includes the **Baseline Assessment of Problematic Fractions**, in accordance with the normal approach of many interested parties on the international level since this is a new activity in Egypt. So the data shall be collected from previous published work to assess problematic fractions from several sources as referenced in the report (27 references).

The data was collected from Egyptian sources such as CAPMAS (main source of information in Egypt), the Ministry of Communication and Information Technology and WMRA (Waste Management Regulatory Agency) as they possess the main information about the quantities of electronic equipment annually delivered into the Egyptian market, as well as the management of hazardous waste in Egypt.

Legislations review is included in item (5) of the report. These are the legislations that govern the waste management in Egypt. It is worth noting that stakeholders in Egypt follow the European Directive 2002/96 activated in 2006 that control the content of hazardous materials in electronic equipment.

The second deliverable titled: **Solutions for Problematic Fractions from WEEE in Egypt** in which interaction with the recyclers, facilities practices including meetings, interviews, field observations, etc. shall be continued; analysis of obtained data shall be provided and actions to improve fraction management shall be prepared in detail.

4 Methodology and Approach for Assessment of Problematic Fractions

The assessment of problematic fractions is based on the review of a significant number of peer previous work including published literature and technical reports followed by a comprehensive analysis of the collected data to quantify the concentration of hazardous materials included in each fraction and sum the concentration of these materials in each equipment. Prioritization of hazard of the equipment shall be based on the concentration level of the hazardous materials included in such equipment.

Typical hazardous materials found in E-waste include:

- Among the heavy metals included in the fractions, the following are the most hazardous: Mercury (Hg), Lead (Pb), and Cadmium (Cd).
- BFRs that exist within plastic fractions contain POPs such as poly-brominated diphenyl ether (PBDE) and polychlorinated biphenyl (PCB) are of highest concern.
- Insulators contain chlorinated POPs exist in many fractions of the E–Waste
- Unintentional POPs Released from WEEE such as Dioxin and Furan like structure.

5 Basic Fractions and Elements of Electronic Equipment

The electronic equipment varies in type and functions. It is worth noting that the assembled closed properly functioning equipment at no leakage and no broken components is safe to use at no risk of exposure to any hazardous material, but once the equipment is broken or dismantled at the end of its life it becomes a source of hazard, as its internal components include a wide range of hazardous materials. The next Table shows each equipment, its fractions, and elements of each fraction. In the next section we shall list and describe the electronic equipment subject to dismantling at the end of life and list it's potentially hazard fractions. Each element shall be quantified to assess its hazard effect when dismantling the mother equipment.

Table 1: Equipment/ Fractions and Elements of Electronic Equipment[2]

Equipment	Fraction	Heavy Metals/ Metals Included in WEEE Fractions												POPS E	
		Lead	Mer-cury	Cad-mium	Barium	Copper	Lithium	Nickel	Chromium	Arsenic	Zinc	Indium	Tin	Antimony	Bromin POPS Retarda PBDE
Desktops	Printed Circuit Boards	√	√	√	√	√		√	√	√	√		√	√	√
	Metal Frame							√	√						
	Plastic Frame														√
	Internal Wiring	√				√					√		√		√
	Cables (PVC outer case)	√				√									
	AgO Button Cell	√	√												
	Transducers														
	Small transformers														
	Capacitors		√												
	CPU/processor														
Laptops	Motherboard	√	√	√	√	√		√	√	√	√		√	√	√
	LCD Panel Display	√	√	√		√		√	√		√		√		
	Plastic casing														√
	Keyboard														√
	Battery (Li-ion)						√	√					√		√
	A/C adaptor					√									√
	External Frame (Metallic)							√	√					√	

[2] Assessment of POPs, UPOPs, and Associated Hazardous Release from E-Waste Managing and Processing, Medical and Electronic Waste Management Project. UNDP in partn
December 2021.

Equipment	Fraction	Heavy Metals/ Metals Included in WEEE Fractions													POPS E	
															Bromin POPS Retarda	
		Lead	Mer-cury	Cad-mium	Barium	Copper	Lithium	Nickel	Chromium	Arsenic	Zinc	Indium	Tin	Antimony	PBDE	
LCD Panel Display	Polarizing Film											√	√		√	
	LCD Module (Panel Glass)	√								√	√	√		√		
	LCD Backlight Lamp		√													
CRT Panel Display	Funnel Glass															
	CRT Tube/ Electron Gun	√		√	√											
	CRT Neck	√				√								√		
	Plastic Casing														√	
	PCB	√	√	√	√	√		√	√	√	√		√	√	√	
Mobile Phone (Old phones)	Printed Circuit Board (PCB)	√	√	√	√	√		√	√	√	√		√	√	√	
	Plastic casing														√	
	Batteries (Li-Ion)	√	√	√		√										
	Screens	√	√							√		√		√		
Mobile Phone (Smart phones)	Printed Circuit Board (PCB)	√	√	√	√	√		√	√	√	√		√	√	√	
	Plastic casing														√	
	Batteries (Li-Ion)						√	√					√		√	
	LCD panels/ Florescent lamp	√	√							√		√		√		
	Metal Frame							√	√							
Mobile Boosting Station	Printed Wired Board	√	√	√	√	√		√	√	√	√		√	√	√	
	Cables and Internal Wiring	√				√										
	Non-Rechargeable Ni-Cd Battery			√				√								
	Non-Rechargeable Mercury Button Cell			√												
	Battery (Lead-Acid)	√													√	

Equipment	Fraction	Heavy Metals/ Metals Included in WEEE Fractions													POPS E Bromin POPS Retarda
		Lead	Mer-cury	Cad-mium	Barium	Copper	Lithium	Nickel	Chromium	Arsenic	Zinc	Indium	Tin	Antimony	PBDE
	Plastic Fan														
	Plastic Frame	√													√
	RAM Board	√													√

5.1 Desktops

Desktops consist of the following fractions:

- Motherboard: This fraction includes all sort of heavy metals the most hazardous of them are the Lead (Pb), the Mercury (Hg) and Cadmium (Cd), as well as epoxy raisin (BFR).
- Plastic casing, the plastic casing is fabricated from plastic material that sometimes contains brominated flame retardant, which releases un-intentional POP elements such as PBDD (Di-oxin like structure) and (PBDF) (Furan like structure) when heated or burned
- Metal casing, which is fabricated from Steel Alloy containing Nickel/Chrome (heavy metals) or from aluminum
- Internal wiring, where the core is copper wrapped with plastic material containing brominated material, which releases un-intentional POP elements such as PBDD (Dioxin like structure) and (PBDF) (Furan like structure) when heated or burned
- Cables (PVC outer case), is fabricated from lead and copper and insulated with chlorinated material that releases PCDD (Dioxin) and PCDF) (Furan) when heated or burned
- AgO Button Cell used inside the desktop devices for keeping the clock working inside the board, and containing lead, and mercury.
- Small transformers contain Polychlorinated Biphenyls (PCBs), which are POPs
- Capacitors contain mercury in addition to PCBs
- CPU/processor includes basic materials such as silicon, copper, aluminium, and various plas-tics, as well as some precious metal like gold and silver
- Hard disk drives (HDD), CD and DVD drives,
- Random access memory (RAM) card is composed of different materials.

5.2 Laptops

Laptops are quite similar to the desktops regarding the fractions; these fractions are designed to allow the laptop to function similarly to the desktop computer. The laptop fractions are Motherboard, key-board, plastic casing, HDD, CD/DVD drive, RAM card, battery (Ni-Cd), cables and wirings, A/C adaptor and LCD panel display. As shown from the previous Table, the laptop fractions include a combination of hazardous materials of metal and non-metal constituents. As shown from the same Table, the moth-erboard or the printed circuit board (PCB), the plastic casing, and the Ni-Cd battery include the most hazardous elements.

5.3 LCD Panel Display

The LCD includes Glass panels, cold cathode fluorescence lamps (CCFL) or tubes, backlight lamp power board, PCB and the plastic casing. The display panel sandwiching the liquid crystals, is coated with the drive electronics which are row and column electrodes. The LCD Panel includes many heavy metals such as Arsenic, Mercury and Zinc in addition to the plastic constituents. While the backlight lamp contains mercury.

5.4 CRT Panel Display

Most of the CRT composition is glass of different structural and chemical properties to perform differ-ent functions in the device. The components of the device include Funnel glass containing lead, panel

glass containing barium and strontium, frit with low melting temperature solder, neck glass with high lead content, shadow mask made of steel and the electron gun. Such materials combination makes the CRT highly hazardous type of E-waste harmful to human health and in need of careful treatment whether for recycling as raw materials or safe disposal. The Pb in the funnel and neck glass is found in the form of PbO3, PbO4 and PbO6, which are considered persistent in the environment. The front panel is considered also toxic, but it contains much less lead concentration in addition to Ba and St.

5.5 Old Mobile Phones

At the end of their life, the mobile phones are considered E-waste of concern as they include many hazardous materials such as toxic heavy metals as lead, mercury, and cadmium as well as other heavy metals as shown in the above Table, in addition to Printed Circuit Boards, cables and internal wirings, and the plastic casings. Various liquid crystalline substances including mercury. In specific variable types of batteries such as Nickel-metal hydride (Ni-MH), Lithium-ion (Li-Ion), nickel-cadmium (Ni-Cd); these batteries contain nickel, cobalt, zinc, cadmium, and copper, while Li-Ion batteries use lithium metallic oxide and carbon-based materials.

5.6 Smart Mobile Phones

All of the fractions of the smart mobile phone are similar to the old mobile phones; they contain many heavy metals such as lead, mercury and cadmium as well as high concentrations of other hazardous metals for instance antimony in addition to plastics and BFRs existing in the casing.

5.7 Mobile Boosting Station

As shown from the above Table, the fractions of the mobile boosting station incorporate a variety of hazardous metals as well as non-metallic hazardous such as POPs that release harmful elements such as Dioxin and Furan if they are maltreated.

6 Efforts to Restrict the Use of Hazardous Materials in Electronic Equipment

6.1 European directive for restriction of hazardous substances RoHS

The European Directive for Restriction of Hazardous Substances (RoHS) is restricting the use of certain hazardous substances in electrical and electronic equipment; the RoHS Directive, entered into force on July 1st, 2006. The Directive prohibits the placing on the market of such equipment if it contains more than regulated amounts of lead, mercury, hexavalent chrome (chromium (VI)), cadmium, poly-brominated biphenyls (PBBs) and poly-brominated diphenyl ethers (PBDEs). Limit values are set at 0.1% by mass of homogenous materials for all, but cadmium the limit is 0.01%. The stated purpose of the Directive includes, among others, “to contribute to the protection of human health and the environmentally sound recovery and disposal of waste electrical and electronic equipment”.

The directive application was applied to equipment produced after 2006, where the RoHS entered into force. However, a total of 21 exempt applications have been agreed upon in the Annex of the Directive, most of which permit continued the use of lead or mercury for certain specific applications on the basis that alternatives are not available. There are also exemptions for certain uses of cadmium, hexavalent chromium and for the PBDE ‘deca’ (decabromodiphenyl ether, or BDE-209) in polymeric applications.

The Directive promotes the recyclability of EEE, as EEE and its components that have become waste contain fewer hazardous substances. At the same time, it ensures a level playing field for manufacturers and importers of EEE in the European market. All products with an electrical and electronic component, unless specifically excluded, have to comply with these restrictions.

6.2 Stockholm Convention

The Convention requires Parties to eliminate or restrict the production and use of the intentionally produced POPs, subject to specified exemptions, with special provisions for DDT and Polychlorinated Biphenyl (PCBs), Polybromodiphenylethers (PBDEs) which are the main substance of many Brominated Flame Retardants, and Dioxin and Furan, unintentionally produced during burning fractions containing chlorinated and brominated elements. For PCBs, the Convention prohibits new PCB production and envisages phasing out electrical equipment that contains high concentrations of PCBs by 2025.

Among other things, the Convention requires Parties to develop appropriate strategies for identifying:

- Stockpiles consisting of or containing intentionally produced POPs chemicals.
- Products and articles in use and wastes consisting of, containing, or contaminated with any POPs chemical.
- Sites contaminated with POPs.

It also requires Parties to take appropriate measures so that POPs wastes are managed in an environmentally sound manner. This includes both destruction and disposal techniques. Although remediation of contaminated sites is not required, any such remediation must be performed in an environmentally sound manner.

7 Waste Legislative Framework in Egypt

The Egyptian legislations are discussed in this section to emphasis the needs for particular actions by introducing specific legislations for the WEEE management, since this subject is of global importance, as it is a fast-growing industry that should be properly regulated. Despite the Government effort, this business is still dominated by the informal sector. The already established formal facilities need yet a lot of support to be on the right track.

7.1 Egyptian Law No.4/1994 and Its Amendment Law 9/2009

Egypt addressed the waste management in general and the hazardous waste management in particular in Law 4/ 1994 amended by Law 9/2009 in many of its articles 29, 33, and 38 of the Law 4/1994 and the articles 25, 28 and 29 of the executive regulations. These articles did address the hazardous waste in general but not the issue of electronic Waste in particular.

7.2 Egyptian Waste Management Law No.202 of 2020

This law is the major legislation that manage the waste in general. It consists of 80 articles divided in six sections, and aims at regulating the organization of waste management in Egypt, excluding nuclear and radiological activities (regulated by Law No.7 of 2010). The main goals of the Law are:

- develop an integrated management of municipal, industrial, agricultural, demolition and construction waste as well as their safe disposal.
- reduce waste generation.
- promote reuse.
- work to ensure the recycling, treatment and final disposal of waste.
- manage waste in a way that reduces damage to public health and the environment.

A Waste Management Regulatory Authority (WMRA) is established with the following tasks:

- regulating, tracking, auditing, evaluating, and developing everything related to Integrated Waste Management activities.
- attracting investments in the field of Integrated Waste Management activities to ensure sustainable development.
- following up the implementation of the plans required to regulate waste management in cooperation with governmental institutions, municipal entities, the private sector, NGOs and international organizations.
- issuing the licenses needed to undertake waste management activities.

WMRA main planning and organizational actions are:

- preparing the national strategy for integrated waste management.

- establishing and managing the national system for managing waste information and data.
- determining the geographical scope of the service areas of the integrated municipal waste management and the type of services required.
- ensuring the availability of financial resources with the administrative authority to cover the contracted services.
- controlling the activities of integrated waste management, and preparing key performance indicators to monitor, follow up and evaluate the work.
- preparing and reviewing proposals to develop and update legislation, laws, regulations, standards, and technical rules that regulate the methods of integrated waste management.
- providing technical consulting services, support, and recommendations to the competent administrative authorities as well as to the actors in the waste management system.
- encouraging investment opportunities by setting incentive prices for compost outputs, excreta, and alternative fuels.
- encouraging research, applied studies, experimental projects and initiatives that contribute to improving and developing performance in waste management.

The Law expressly prohibits:

- open burning of waste.
- mix without approval any type of waste with each other by the licensee to practice any of the activities of integrated waste management.
- throw, sort, or treat municipal waste except in the places designated for these purposes.
- dump agricultural waste into waterways or disposed of in places other than those designated for these purposes.
- use empty packages of hazardous materials or use products resulting from their recycling except in accordance with the requirements specified by the Executive Regulations of this Law.
- export hazardous materials or waste to outside Egypt without approval.
- dump hazardous materials or waste into the regional sea, continental shelf, exclusive economic zone, or high seas of Egypt.

The Law classifies waste as (a) hazardous or (b) non-hazardous. The requirements for the management of hazardous waste are as follows:

- obtaining a special license for the integrated management of hazardous waste and substances.
- obtaining an approval from the Waste Management Authority for its circulation.
- maintaining a register of such waste and the methods of disposal.
- sterilizing and disinfecting the place where the facility producing such waste was established in case it was moved or its activities suspended.

As shown from the above, the law did not tackle WEEE in particular; however, it considered the WEEE as special hazardous waste and no further regulation tailored to this type of waste in both the law and its executive regulation. However, WMRA has set certain procedures for the WEEE circulation and recycling as detailed herein after.

7.3 WMRA Procedure for WEEE Management/ Recycling

The Waste Management Regulatory Agency WMRA is the main Egyptian agency that regulates and control the waste management in Egypt. The agency has promulgated certain rules to control the circulation of WEEE in Egypt. In Law 202/2020 act No. 55 of the Law (Integrated management of hazardous materials and waste) states that: “It is prohibited to handle hazardous materials and waste except

after obtaining the approval of the Environmental Affairs Agency and with a license from the competent administrative authority. This was followed by the regulation paper promulgated by WMRA to control the auctions, which are the main source of WEEE in the Egyptian Market (See Annex 3).

These acts have limited the circulation of WEEE within the Egyptian market and obligated waste and hazardous waste producers to hand over the waste except to establishment that possess environmental permits.

The current sources of WEEE in Egypt are:

- Auction of the IT Companies, banks and governmental entities
- Main Users of E Equipment (mainly households)
- Formal Collectors
- Electronic and Electrical Equipment Dealers (Shops and Brands)

Most electronic devices in Egypt are not locally manufactured. Instead, they are imported and sold by a large network of distributors.

EEE are used by all layers of society: consumers and households as well as public, private and civil society organizations.

The main WEEE aggregation points are:

- Companies with a heavy usage of EEE such as banks or telecom
- Government bodies
- Formal collectors
- Electronics shops.

The auctions of Telecommunications Companies, Banks and Governmental Entities are the major sources of WEEE. These auctions are ongoing so frequently; Accordingly, WMRA set some rules (attached are the set of rules issued by WMRA – last page of this document) to control the final disposal of WEEE resulting from these organizations as per the following:

- Companies applying for the auction must possess a recycling licensed facility of recycling capacity covering all recycling stages. The facility should have an environmental permit issued from EEAA in accordance with an approved ESIA
- Applicants for the auction of electronic and electrical waste are required to submit all documents, approvals, licenses and registers issued for the facility or company by the concerned authorities, whether it is the Ministry of Environment or the Ministry of Trade and Industry, indicating that they are authorized to carry out the activity of recycling electronic and electrical waste, according to the type of waste licensed to be recycled, and all these permits should be valid.
- Commitment not to cause any negative health or environmental impact while carrying out work related to recycling and safe disposal of hazardous waste.
- No company is allowed to participate to the auction unless it is listed in WMRA records, based on the company's fulfillment of the environmental approval and the license from the Industrial Development Authority through a field inspection of the facility to ensure its compliance with all licensing requirements.
- It is not allowed to participate into electrical transformers containing oils auctions except after obtaining a certificate from the Ministry of Electricity ensuring that that oil does not contain PCBs.
- It is prohibited to give up or hand over waste except in the places designated for it, according to each waste and each activity.

8 Methodology for Hazardous Materials Assessment in E-Waste Fractions

Some fractions are common in the waste equipment such as printed circuit boards, batteries, plastic frames, etc. these fractions have, in turn, some common heavy metals and hazardous non-metals. Many researchers (references are listed in Section 7) endeavoured to quantify the content of heavy metals and other hazardous materials through experiments and laboratory tests. Toxic metals content of discarded motherboards (printed circuit boards), monitor glass and monitor plastic housing of Cathode Ray Tube (CRT) monitors, Liquid Crystal Display (LCD) monitors, and LCD touch screen monitor, and others were used in these tests to identify the concentrations of chromium (Cr), cadmium (Cd), lead (Pb), mercury (Hg), and Bromine (brominated flame retardants BFRs) PBDEs, PBBs and HBCD.

8.1 Testing Details

To identify the amounts of hazardous substances in the WEEE fractions many researchers carried out a practical study of samples from different types of WEEE fractions. They found that different types of WEEE fractions contained hazardous materials in measurable amounts. High levels of brominated flame retardants, used to reduce the flammability of plastics, were found in many fractions such as old cathode ray tube (CRT) monitors and consumer equipment, particularly CRT televisions.

The tests were carried out using electronic equipment such as Laptops from different brands, desktops and others. To start with, the equipment was properly dismantled using the proper tools and the dismantler was using the necessary PPE. The experiment included pulverization, digestion, and chemical/physical analyses of all the materials of concern. The following Table shows the testing procedure of fractions aiming at identifying the concentration of the hazardous materials of concern in accordance with the European Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment. As previously stated, the Directive prohibits the placing on the market of such equipment if it contains more than regulated amounts of lead, mercury, hexavalent chrome (chromium (VI)) cadmium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs). Limit values are set at 0.1% by mass of homogenous materials for all but cadmium, for which the limit is 0.01%.

Table 2: Fractions Testing Details

Element to be Identified	Pre-testing preparation	Testing Device	Remarks
Preliminary Testing			
• lead (Pb), • mercury (Hg), • cadmium (Cd) and • chromium (Cr; total amount, all ionic states),bromine (Br)	None	X Ray device - X-ray microanalysis (EDAX):	An analytical technique which allows the detection and quantification (as percent by mass) of major elements in the surface layers of the material analyzed. This technique was used to identify the presence or absence of the metals lead (Pb), mercury (Hg), cadmium (Cd) and chromium (Cr; total amount, all ionic states), as well as the element bromine (Br) **as first indication of the possible presence of organobromine compounds or brominated polymeric materials used as flame retardants**. This technique does not provide data on the presence or absence of chlorine (Cl) in a material
Analytical Testing – Confirmatory Analysis			
Chromium (VI) **The presence of hexavalent chromium being indicated by the formation of a red violet colour**	Digestion of samples: To the surface of each sample, a solution of 0.4 g of 1,5-diphenylcarbazide, 20 ml acetone, 20 ml ethanol (96%), 20 ml orthophosphoric acid solution and 20 ml of demineralised water.	The analysis was carried out in accordance with method IEC 62321/1CD, 111/24/CD-method 97.	The most toxic and carcinogenic ionic form of chromium and the form controlled under RoHS
Bromine (brominated flame retardants BFRs)-PBDEs, PBBs and HBCD	Each sample was separately extracted with toluene using a Soxhlet extraction method, incorporating an internal labelled standard. The extract solution is then analysed	Subsequently cleaned by column chromatography and analysed using capillary gas chromatography – mass spectrometry (GC-MS) with identification of analytes using the molecular and fragmentation ions. Quantification of PBDEs, PBBs and HBCD was performed using labelled standards.	Polybrominated diphenyl ethers (PBDE), polybrominated biphenyls (PBB) and hexabromocyclododecane (HBCD) are some of the brominated flame retardants belonging to a group of halogenated flame retardants.
Tetrabromobisphenol A (TBBPA)	Each sample was separately homogenised and acidified and then extracted	Column chromatography	

	with toluene, incorporating an internal labelled TBBPA standard. Extracted TBBPA was derivatives in solution using acetic anhydride, prior to analysis	clean-up and analysis using capillary gas chromatography – mass spectrometry (GC-MS). Identification is made from molecular and fragmentation ions, and quantification of TBBPA was performed using a labelled standard.	
Lead		X-ray microanalysis	Lead was incorporated in: • solder (4.5%) • 13% lead by weight at the material surface) • identified as 'internal connector'.
Chromium		Using the qualitative diphenyl carbazide colorimetric method	The highest recorded values (17- 19% chromium) were associated with the metal casings of internal drives or external card slots. However, subsequent analysis of one chromium containing metallic component from each laptop showed that none contained detectable levels of hexavalent chromium (VI).
Cadmium		X-ray microanalysis	Not detected
Mercury		X-ray microanalysis	Not detected
Bromine			Around a quarter of all the components and materials tested in every laptop contained detectable levels of bromine, at surface concentrations ranging from 0.19% to 9.4%. These bromine positive samples included in circuit boards, chips, cables and wires, plastic cable connectors, insulating materials, fans and fan casings, touch mouse pads and various other internal components.
Glass Hazardous Materials Contents	The panel glass material was cut into pieces of dimensions approximately 1	After completion of the digestion solutions was analysed in its total content of:	ICP-MS was mainly chosen since it is a very effective technique in elemental determination

	cm * 1 cm. The samples were then pulverized by a solid sample homogenizer, a grid of 0.5 mm openings, followed by a cyclone. Then the specimen was digested using	Al, Cr, Fe, Ni, Cu, Zn, As, Cd, Sn, Hg and Pb. Quantification of these toxic metals were accomplished using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS, Agilent 7500-CX).	of trace and ultra-trace metals due to its excellent detection limits, simple spectra and capability for quick multi-elemental and isotopic determination.

9 Quantitative Assessment of Hazardous Materials in WEEE Fractions

A literature review was conducted on the hazardous materials evaluation in the WEEE fractions using the testing procedure presented in the previous section. The concentration in mg/kg (PPM) of materials of concern, which are considered the most toxic such as mercury, lead, cadmium, POPs were quantitatively assessed. This assessment included the electronic equipment produced after 2006, where the Directive RoHS Guideline came into force. As a result of the conducted review, the following Tables show the concentration in mg/kg of each hazardous material in each fraction of the equipment produced after 2006:

- Desktops
- Laptops
- LCD Panel Display
- CRT Panel Display
- Phone (Old phones)
- Mobile Phone (Smart phones)
- Mobile Boosting Station: Uninterruptible Power Supply (UPS), Control Panel and Antenna

9.1 Hazardous Materials Existing in Fractions

The following Table includes the concentration of hazardous materials in each fraction of selected equipment, which was tested in accordance to the testing procedure described in the previous section. This data was obtained following a conducted literature survey as listed in the Table.

Table 3: Concentration of Hazardous Materials of Concern in WEEE Fractions

Fraction	Heavy Metals Included in WEEE Fractions			BFRs Existing in WEEE		
				POPs	UPOPs	
	Lead	Mercury	Cadmium	PBDE	PBDD/F	PCDD/F
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Desktops						
Dismantled motherboard [1],[2],[3],[4]	85	2	-	300	0.06	6.50E-03
Dismantled power boards [1],[2],[3],[4]	85	2	-	300	0.06	6.50E-03
PWB in HDD drive [5]	600	-	-	300	0.06	6.50E-03
PWB in CD/DVD drive [5]	940	-	-	300	0.06	6.50E-03
Cables and internal wiring [5],[6],[7]	1,960	-	-	35	6.90E-03	3.40E-03
RAM cards [1],[2],[3],[4]	85	2	-	300	0.06	6.50E-03
Plastic casing [3],[8],[9],[10]	35	-	-	1,650	0.33	0.010
AgO button-cells [16]	39	-	15	-	-	-
Plastic fan [1]	-	-	-	5	1.00E-03	0.010
Laptops						
Dismantled motherboard [1],[2],[3],[4]	85	2	-	300	0.06	6.50E-03
Dismantled power boards [1],[2],[3],[4]	85	2	-	300	0.06	6.50E-03
RAM cards [1],[2],[3],[4]	85	2	-	300	0.06	6.50E-03
Plastic casing [9],[14]	-	-	-	70	0.01	0.01
Battery (Li-ion) [15],[16]	5	-	2	-	0.00	1.50E-04
PWB in HDD drive [5]	600	-	-	300	0.06	6.50E-03
PWB in CD/DVD drive [5]	940	-	-	300	0.06	6.50E-03
LCD glass panel [8]	1,400	6	-	7	1.40E-03	1.45E-03

Keyboard [1],[7],[10]	-	-	-	50	0.01	0.01
Fluorescent lamp (CCFL Tubes) [17], [18], [19]	-	212	-	-	-	
LCD Panel Display						
Monitor housing [8], [20]	192	0	0	3.94	8.00E-04	4.10E-03
Fluorescent lamp (CCFL Tubes) [8]	0	212	0	0.00	-	-
LCD glass panel [8]	1400	6	0	5.40	1.10E-03	2.80E-03
Dismantled printed wired board [2], [3], [1], [4]	85	1	11	17285	3.46	6.50E-03
Non-rechargeable mercury button cell [16]	0	20000	0	0	-	-
CRT Panel Display						
Funnel glass [8]	221000	0	0	0	-	-
Panel glass [8], [22]	30000	0	2	0	-	-
CRT neck [8]	196000	0	0	0	-	-
Plastic housing [17], [20], [23]	115	35	80	15.20	3.04E-03	1.00E-02
Printed wired board [2], [3], [1], [4]	85	2	0	300	0.06	6.50E-03
Mobile Phone (Smart phones)						
Printed wired board [15]	260	0.30	0	0	0	6.50E-03
Plastic casing [15]	0	0	0	0	0	0.01
Battery (Li-ion) [15]	5	0	2	0	0	0
LCD panels [25]	0	0	0	0	0	0
Routers (Low grade equipment)						
Printed wired board [2], [3], [1], [4]	85	2	0	300	0.06	0.0065

Plastic body [2], [3], [1], [4]	35.4	0	0	1,650	0.33	0.01
Cables and internal wiring [5], [6], [7]	1,960	0	0	34.5	0.0069	0.0034
Non-rechargeable Ni-Cd batteries [11], [12], [13]	52,800	0	552,000	0	0	0
Telephones (corded/cordless) (Low grade equipment)						
Printed wired board [2], [3], [1], [4], [24]	85	2	0	300	0.06	0.0065
Battery (Ni-Cd) [11], [12], [13]	52,800	0	552,000	0	0	0.00015
Battery (Li-ion) [15], [16]	5	0	2	0	0	0.00015
Cables and internal wiring [5], [6], [7]	1,960	0	0	34.5	0.0069	0.0034
Mobile Boosting Stations - Uninterruptible Power Supply (UPS)						
Battery (lead-acid)	750,000	0	0	0	0	0.00004

9.2 Total Concentration of the Hazardous Materials in WEEE

The total concentration in mg/unit of each hazardous material was calculated by summing up of each element in the fraction. The following Table shows the concentrations of the hazardous materials of concern in each equipment.

Table 4: Total Concentration in mg/unit Weight of Hazardous Materials of Concern in Each Equipment

Equipment	Lead	Mercury	Cadmium	PBDE	PBDD/F	PCDD/F
Desktops	402.02	1.90	0.15	2334.57	0.47	0.02
Laptops	656.84	50.86	0.66	226.11	0.05	0.01
LCD Panel Display	4495.19	104.12	2.05	3236.06	0.65	0.01
CRT Panel Display	502423.14	74.47	170.14	533.69	0.11	0.03
Mobile Phone	5.87	6.60E-03	0.06	2.70E-05	5.40E-09	3.28E-04

9.3 Display of the Hazardous Materials (in mg) in Each Equipment

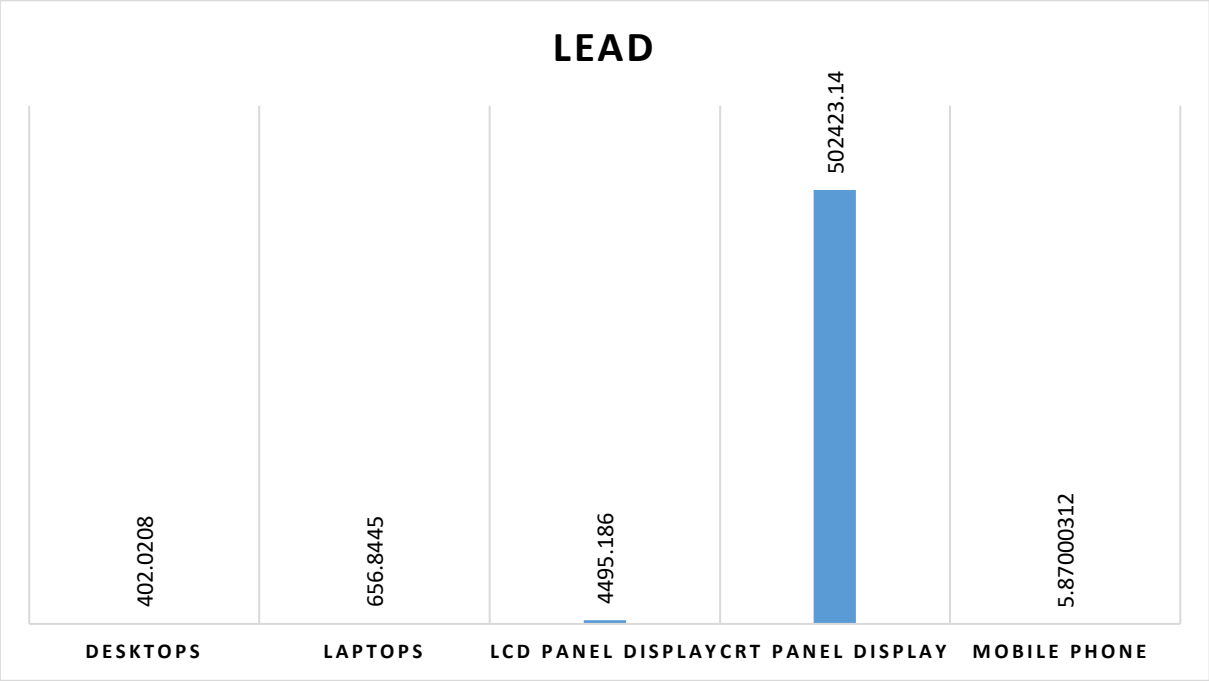


Figure 1: Total Concentration of Lead (in mg/Unit) in All Equipment

The Figure shows that the CRT Panel exhibits the highest concentration of Lead.

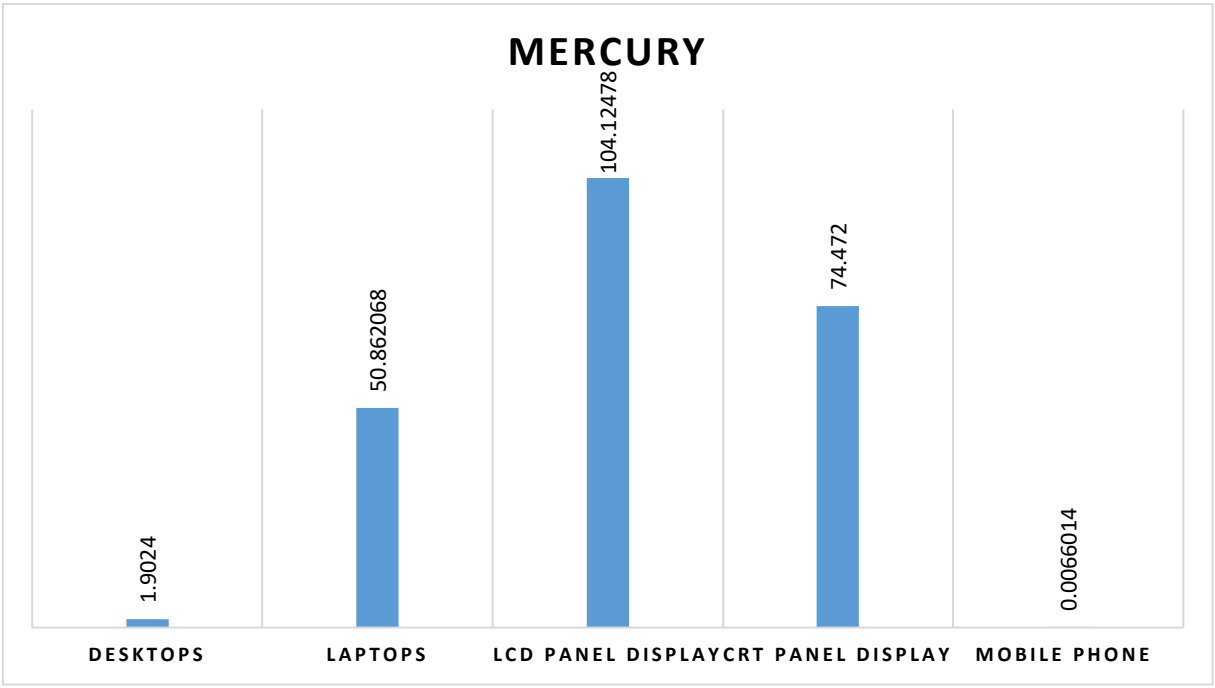


Figure 2: Total Concentration of Mercury (in mg/unit) in All Equipment

The Figure shows that the LCD exhibits the highest concentration of Mercury.

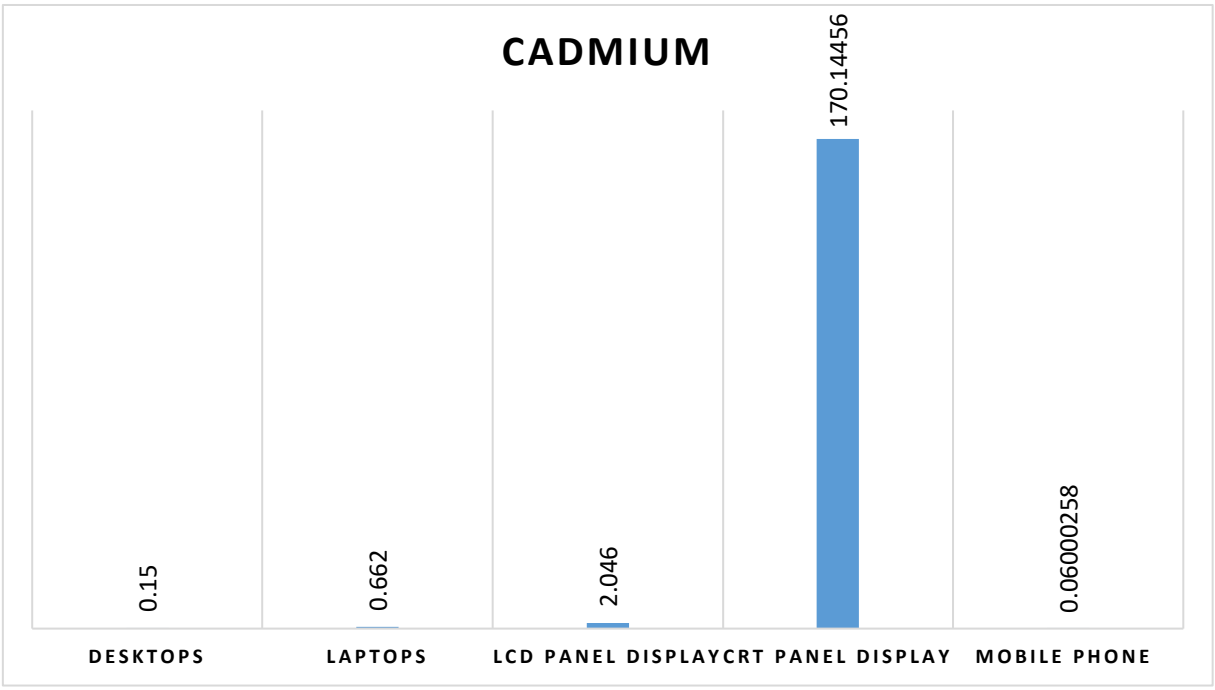


Figure 3: Total Concentration of Cadmium (in mg/unit) in All Equipment

The Figure shows that the CRT Panel Display exhibits the highest concentration of Cadmium.

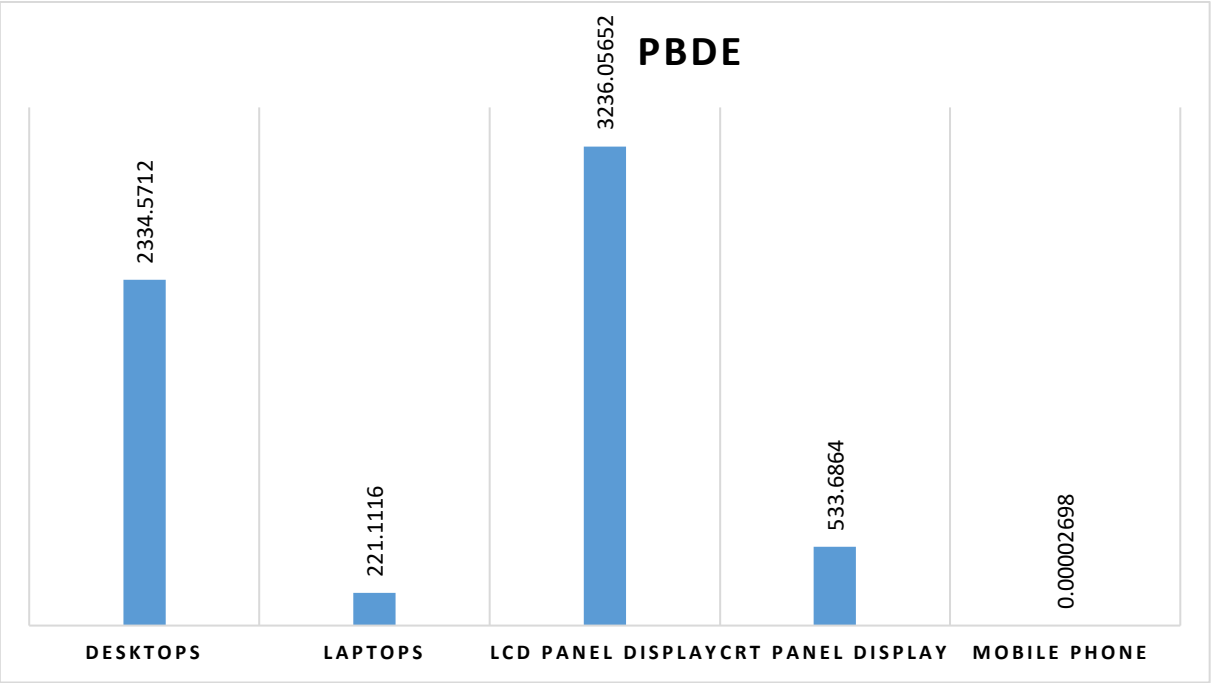


Figure 4: Total Concentration of POPs (in mg/unit) in All Equipment

As shown from the Figure, the highest concentration of Total POPs exists in the LCD Panel Display.

9.4 Display of the Hazardous Materials Accumulation in Each Equipment

The following Figure shows the accumulation of all hazardous metallic and non- metallic materials in each equipment as compared to each other.

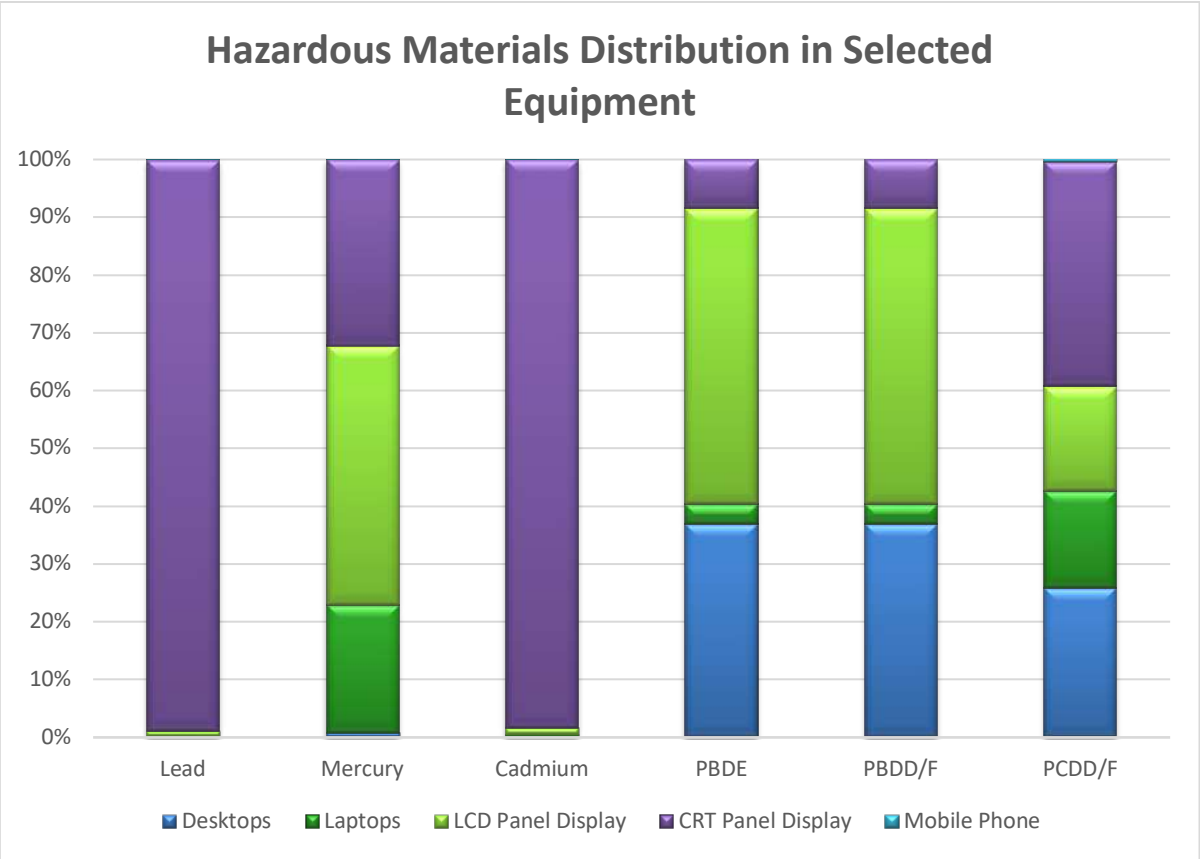


Figure 5: Hazardous Materials Accumulation (in mg/Unit) in Each Equipment

The previous Figure shows that:

The CRT Panel Display is the equipment that contains the highest concentration of lead, cadmium and includes mercury and POPs. The CRT is mainly composed of different kinds of glass: panel glass, made of strontium/barium oxides in front of the monitor; funnel glass, leaded glass that covers the CRT unit; neck glass, highly leaded glass that covers the electron gun; and front glass, highly leaded glass that results from welding the funnel glass to the panel glass. Aside from the glass, the CRT contains a ferrous shadow mask and an electron gun; this is in addition to the phosphorus content.

- The LCD includes mercury and the three types of POP
- The Desktop includes the three types of POP
- The laptop includes mercury and the three types of POP
- The mobile phone includes the three types of POP

CRT monitors are a substantial portion of the electronic waste stream. CRT monitors possess nominal or negative scrap value as they contain leaded glass; therefore, CRT monitors are difficult and expensive to recycle. As a result, CRT monitors should be transferred to be dismantled in a safe procedure.

10 Electronic Equipment Inventory in Egypt and WEEE Mass Flow Assessment

10.1 Objective of the Assessment

The assessment will help identifying the quantities of the WEEE generation in the past decade. This generation is mainly related to the existing inventory of the electronic equipment and how and when this inventory turns to waste. This, in turn, will help identifying and prioritizing the problematic fractions that should be tracked from source to provide proper solutions to manage these fractions in alignment with activities conducted within the existing governmental program.

10.2 Data Acquisition

A survey was conducted to assess the quantities of electronic equipment that Egypt consumes for the past years. Several sources were approached to collect the data required for the WEEE generation assessment starting from 2015 to 2021. This assessment focuses on equipment that are considered the most problematic; in particular, the equipment that include the highest quantity of hazardous materials are CRT, UPS equipment, and then the LCD panel display.

The main sources of the acquired data are shown in the next Table:

Table 5: Source of Data

Source	Data Input from
Governmental Sources	• Central Agency for Public Mobilization and Statistics (CAPMAS) – Statistical Data • Interviews with WMRA • Egyptian Ministry of Communications and Information Technology (MCIT)
Meetings and Interviews	• WEEE recyclers • Previous Projects
Previous Work	• Published Report from Previous Projects • SRI Reports
Periodicals Issued by Relevant Authorities	• Egypt Information Technology Reports

10.3 Collected Data

10.3.1 Data Obtained from CAPMAS

As shown from the previous Table, the data was acquired from several sources the most important of which is the Central Agency for Public Mobilization and Statistics (CAPMAS). The Agency is the main source of official data in Arab Republic of Egypt. The Agency issues periodic bulletin of foreign trade data to satisfy needs of users and policy makers.

The data covered the following:

- Egypt imports of electronic equipment including LCDs, Desktops, and Laptops from 2013 to 2015.
- Egypt imports of electronic equipment including LCDs, Desktops, and Laptops from, from 2017 to 2018
- Egypt imports of electronic equipment including LCDs, Desktops, and Laptops from 2020 to 2021

Annex 1 includes the data sheets obtained from the CAPMAS. Data was obtained from the Ministry of Communication and Information Technology (MCIT).

10.3.2 Data obtained from recyclers

There are 14 formal recyclers in Egypt at the time of writing. About half are not operating at full capacity, so six recyclers were willing to contribute in this survey (another round of meeting shall be arranged for the next report). Meetings with recyclers revealed that the main source of WEEE are the auctions of the main waste producers such as the telecommunication companies (WE, Orange, Estisalat, Vodaphone, and others), as well as the other waste producers such as banks, governmental entities, and others. It is obvious that the rate of E waste generation from these companies if much higher than the household, which makes them dominate the market. The equipment end of life for household is much higher.

10.3.3 Data collected from Waste Management Regulatory Authority of Egypt

The Waste Management Regulatory Authority of Egypt (WMRA) was visited several times to obtain available information about the formal sector of WEEE management. They provided the attached latest list of formal recycling facilities endorsed in December 2021 (Annex), which includes the following:

Table 6: List of Formal WEEE Recyclers

#	Facility Tittle	Scope of Work	Location
1	International Technology Group -ITG	WEEE Recycling	6 of October Industrial Area – Zone 6 – Giza Governorate
2	Green Core for Recycling	WEEE Collection, Recycling and Metals Extraction	May Industrial Zone – Helwan – Cairo Governorate
3	El Arayshy for Industry and Trade	Dismantling and Shredding of WEEE	May Industrial Zone – Helwan – Cairo Governorate
4	Triple REE for WEEE Recycling		6 of October Industrial Area – Storage Zone – Giza Governorate
5	Recycle Key for WEEE Recycling	WEEE Sorting and Recycling	Sadat City – Small Industries Compound- Developers Zone- Menoufeya Governorate
6	Green Plus	WEEE Collection and Recycling	6 of October Industrial Area – Youth Workshops – Giza Governorate
7	Egyptian Electronic Equipment Recycling Company -EERC	WEEE Recycling and Precious Metals Extraction	6 of October Industrial Area – Youth Workshops – Giza Governorate
8	Egyptian Company for Metals Working (Aly Hefzy Factory)	Recycling of Electrical and Telephone Waste Cables –	Industrial Zone - Helwan – Cairo Governorate

		Copper Smelting and Copper Bars Manufacturing	
9	Hussein and Ahmed Abou Soilman for Trade Company	Sorting, Categorizing and Recycling of WEEE – and WEEE Scrap Copper Smelting	Tebbin Zone for Technological Projects - Helwan – Cairo Governorate
10	Extreme Company for Contractual and Supply	WEEE Recycling and Copper Alloys Production	Tebbin Zone for Technological Projects - Helwan – Cairo Governorate
11	REMET Company for recycling	Sorting, Categorizing and Recycling of WEEE – and WEEE Scrap Copper Smelting	Ataka Industrial Zone Extension – North Suez Gulf Development – Suez Governorate
12	Energy Co	WEEE Recycling and Precious Metals Extraction	6 of October Industrial Area Abou Rawash – Industrial Zone - Giza Governorate
13	ATABIAN WEEE	WEEE Recycling and Precious Metals Extraction	6 of October Industrial Area – Youth Workshops – Giza Governorate
14	El Ferdous Recycling	Sorting, Categorizing, Recycling of WEEE, PCBs Secondary Treatment and Precious Metals Extraction	El Wehda El Wataneya Area -Abou Rawash – Industrial Zone - Giza Governorate

WMRA also provided the formal lead smelters list that can receive the Lead Batteries for environmentally sound secondary smelting.

Table 7: List of Formal Secondary Lead Smelters and Rubber Tiers Recycling

#	Facility Tittle	Scope of Work	Location
1	Chloride Egypt	Used Batteries Recycling	Abou Rawash – Industrial Zone - Giza Governorate
2	El Mottahida (United) for Batteries	Used Batteries Recycling	10th of Ramadan Industrial City – Zone A4 – Sharkeya Governorate
3	El Mottahida (United) for Batteries Recycling and Metals Manufacturing (Mostafa Abdel Wahab)	Used Storage Batteries Recycling	Benisuef Industrial Zone – Nasser Region - Benisuef Governorate
4	El Nisr for Chemical Industries	Used Batteries Recycling	Sadat Industrial City – Zone 7 Menoufeya Governorate
5	Lead Smelting, Refining and Manufacturing Plants	Used Batteries Recycling	Industrial Zone – Ara El Olaykat – Khanka Qalyoubeya Governorate
6	El Mottahida Company for Trade and General Agencies	Used Batteries Recycling	Industrial Zone – El Akrasha –Qalyoubeya - Governorate
7	El Hoda Company for Batteries	Used Batteries Recycling	Industrial Zone – El Akrasha –Qalyoubeya - Governorate
8	MARSO for Chemicals	Rubber Tiers Shredding	10th of Ramadan Industrial City – Zone A1 – Sharkeya Governorate

Among many smelters, these smelters are the only ones that are under the control of the periodic inspection of EEAA and WMRA. These smelters have prepared Environmental Impact Assessment to

obtain the environment permit for construction and operation. So they have to comply with the applicable legislation; further they are under control regarding occupying EHS and ambient environmental conditions, which are periodically inspected. Most of them are directly connected through a special server to the National Environmental Monitoring Network of the Environmental Affairs Agency. This Network is one of the basic tools for collecting data on the quality and volume of emissions from industrial establishments, and analysing these data contributes to giving a clear picture of the air quality in the places where these facilities are located by calculating the pollution loads issued by them. Monitoring emissions from chimneys depends on the use of specialized devices to monitor emissions from industrial processes in order to calculate the concentration values of those emissions, as the data is sent in each facility at the same time through the data collector to the main control room of the Environmental Affairs Agency. The National Network for Monitoring Industrial Emissions has contributed to: Amending the Executive Regulations of Environmental Law No. 4 of 1994, as amended by Law No. 9 of 2009.

10.3.4 Corporate Accreditation Procedure of WEEE Recyclers

The corporate accreditation procedure of WEEE recyclers includes:

- Obtain the environmental permit from EEAA through an Environmental Social Impact Assessment (ESIA) Study
- Obtain the operating license from The Industrial Development Authority (IDA)
- Accreditation in the WMRA list.

The facility shall be subject to periodic follow up from WMRA to ensure its compliance with the obtained permits requirements.

10.4 Egypt Electronic Equipment Inventory 2015-2021

The result of the survey is shown in the next Tables. The survey focused on Mobile, Telephones, Desktop, Laptop, LCD, and CRT; this equipment is considered the fasted growing waste streams and are widely used among private and governmental sector in Egyptian. The obtained data was from 2015 to 2021, the main source was CAPMAS. The following Tables show the results of the survey.

Table 8: Installed Equipment from 2015 to 2021

Installed Equipment 2015*	
Equipment	**Amount (Unit)**
Mobile**	94,020,000
Desktop	35,461,945
Laptop	28,369,416
CRT	10,415,142
LCD	25,046,802
Installed Equipment 2018*	
Equipment	**Amount (Unit)**
Mobile	93,780,000
Desktop	71,057,000
Laptop	NA
CRT	NA
LCD	17,797
Installed Equipment 2019*	

Equipment	Amount (Unit)
Mobile	95,340,000
Desktop	77,000,000
Laptop	NA
CRT	NA
LCD	137,000
Installed Equipment 2020*	
Equipment	**Amount (Unit)**
Mobile	95,360,000
Desktop	1,754,502
Laptop	NA
CRT	NA
LCD	323,405
Installed Equipment 2021*	
Equipment	**Amount (Unit)**
Mobile	103,450,000
Desktop	NA
Laptop	NA
CRT	NA
LCD	898,038

* Annex 1 includes the data sheets obtained from CAPMA

**Data obtained from ICT

10.5 Approach to WEEE Mass Flow Analysis and Assessment

Method employed to assess WEEE mass flow is the conventional assumption of estimating the equipment end of life (Eol). Basically, the calculation and prediction of the weight of EoL products is the information on products put on the market obtained from several sources the most important of which is CAPMAS as the official source of information in Egypt.

As shown from the above Tables, the year 2015 is the year which includes the comprehensive information about all equipment installed in the Egyptian market; accordingly, the MFA is based on this information using a very simple logistic forecasting approach that can use the obtained data.

Average life cycle/Obsolescence rate = Active Life + Passive Life + Storage

Where:

Active life: Is the number of years, an equipment can be effectively used.

Passive life: Is the period that it can be refurbished or reused for certain period.

Storage: Includes storage time before disposal and storage at repair shops before dismantling.

All the three parameters vary in different geographical regions. Therefore, average life cycle/obsolescence rate is a function of time and varies in each geographical region and leads to different WEEE/e-waste inventory. The EoL of equipment estimation according to which the WEEE Mass flow was identified is shown in the next Table.

Table 9: Equipment EoL

Equipment	Active life duration in Years	Average Weight in KG	Remarks
Mobile	4	0.1	Source UNEP and UNU 2009 These number could change with the technology development
Desktop & Monitor	5-8	25	
Laptop	5-8	5	
CRT	8	14.5	
LCD	8	30	

In accordance to the above Table, each equipment reach its EoL at a different life span. The following Table show the year at which the equipment is considered waste.

Table 10: WEEE Penetration in the Market

Equipment	Year at which Equipment Reach its EoL
Mobile	2018
Desktop	2015
Laptop	2015
CRT & Monitor	2015
LCD	2015

11 Data analysis

In this section the obtained data shall be analysed considering each equipment separately aiming at identifying the hazardous materials quantities evolving from every equipment.

11.1 Mobile Phones

The source of data for mobile phone is ICT Indicators Annual Report [26]. For the calculation of the number of mobile phones in use, the following factors shall be considered, and consequently deduct 10% from the total number of subscriptions:

- Prepaid SIM cards out of use
- SIM cards for data line (internet-access only)
- Mobile phones that operate on dual SIM cards
- Temporary cellular line for foreign travelers in Egypt.

It is estimated that the average lifetime of a mobile phone is around four years (Source UNEP and UNU 2009 [27]. The following Table shows the mobile subscription and penetration in the marked from 2017 to 2021.

Table 11: Mobile Subscription

Year	Mobile Subscription	Mobile - 10%
2017	101270000	91143000
2018	93780000	84402000
2019	95340000	85806000
2020	95360000	85824000
2021	103450000	93105000

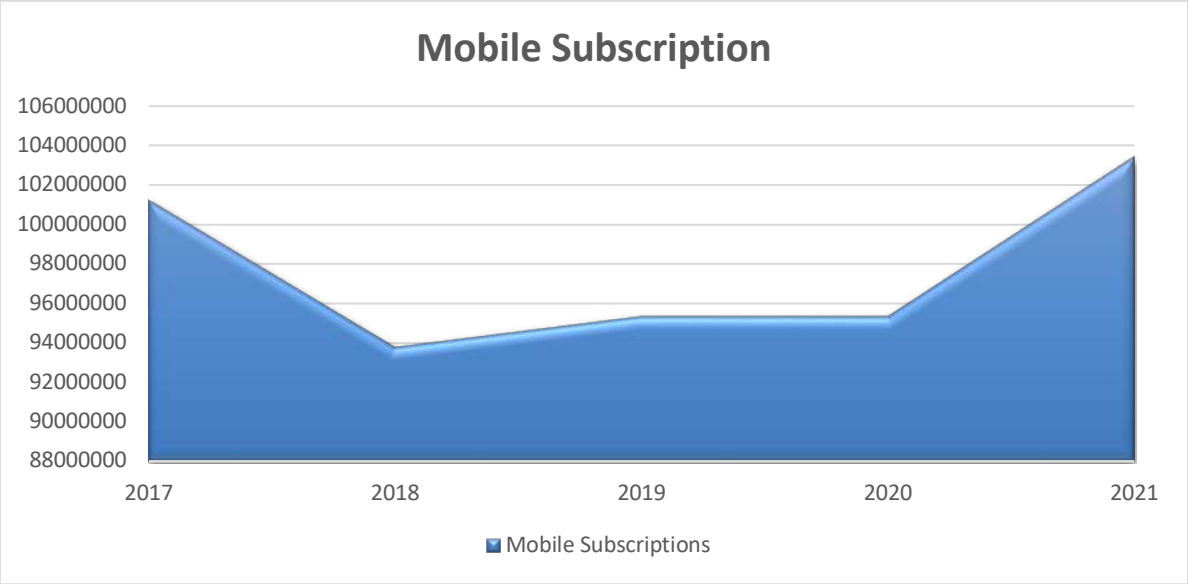


Figure 6: Mobile Subscription for the Period 2017 to 2021

The mobile phones subscription is shown in the above Figure, which shows that the number of mobile phones in use in Egypt declined between 2017 and 2018 and the rate was nearly flat between 2018 to 2020 and then started to rapidly increase in 2020 to 2021 where the number of mobile phones in use in Egypt is growing in parallel with the population and almost reaching the market saturation. This is due to the fact that mobile phone communication will continue to be seen as a basic necessity offering numerous social and economic opportunities.

11.1.1 Assessment of Hazardous Material in Mobile Phones

In reference to Table 9, the stock of mobile phone in use in 2018 shall penetrate the market as WEEE, where the number of mobile phones in use is 93,780,000 reduced to 84,402,000 by deducting the 10% due to the fact there is several subscriptions that are not resulting in a mobile instrument such mobile phone with two SIM cards, SIM cards for data line and temporarily cellular line for transit cases.

Table 12: Hazardous Materials in Mobile Phone

Mobile Phone	**Quantities of Hazard Materials per Unit (mg/unit)**					
Fraction	**Lead**	**Mercury**	**Cadmium**	**PBDE**	**PBDD/F**	**PCDD/F**
Dismantled printed wired board	5.72	6.60E-03	0	8.80E-06	1.76E-09	1.43E-04
Plastic casing	0	0	0	1.82E-05	3.64E-09	1.80E-04
Battery (Li-ion)	0.15	0	0.06	0	0	4.50E-06
LCD panels	3.12E-06	1.40E-06	2.58E-06	0	0	0
Total	5.87	6.60E-03	6.00E-02	2.70E-05	5.40E-09	3.28E-04
Total in Egypt (Kg)	495.44	0.56	5.06	2.28E-03	4.55E-07	2.76E-02

As shown from the next Figure the Lead is the relatively highest hazardous material in the mobile phone, as it exists in most of the equipment fractions, especially in printed wired board and battery.

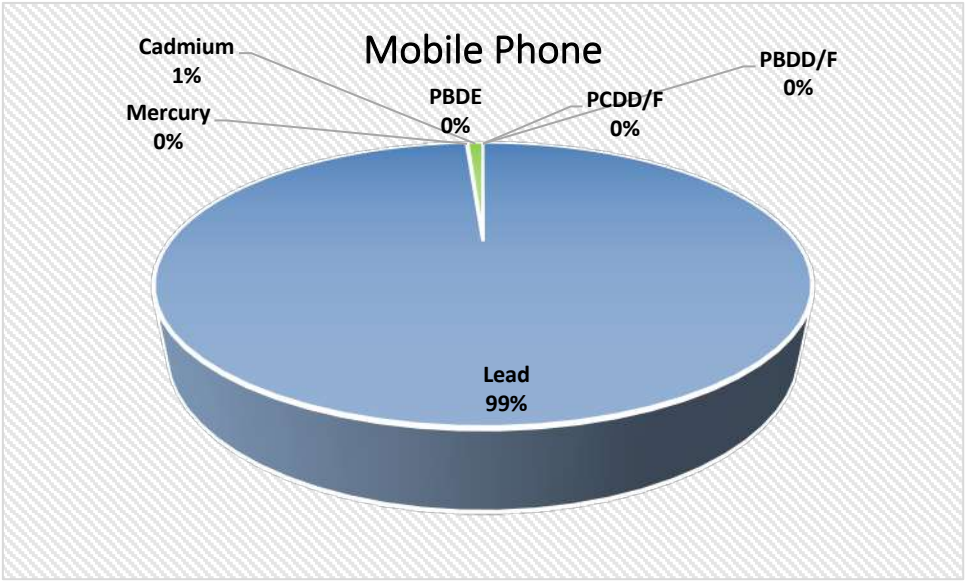


Figure 7: Hazardous Materials Distribution in Mobile Phone

Figure 8: Composition fractions of the smart mobile phone

11.2 Desktops

The calculation of problematic fractions and hazardous materials quantities in the desktop is based on the information obtained from CAPMAS. The estimated life of the desktop is 7 years, i.e., the stock of 2015 (35,461,945 unit) is turned to waste in 2022. The following Table shows the quantities of hazardous materials in desktop.

11.2.1 Assessment of Hazardous Material in Desktop

Table 13: Hazardous Materials in Desktop

Desktop	**Quantities of Hazard Materials per Unit (mg/unit)**					
Fraction	**Lead**	**Mercury**	**Cadmium**	**PBDE**	**PBDD/F**	**PCDD/F**
Dismantled motherboard	69.02	1.624	0	243.6	0.04872	5.28E-03
Dismantled power boards	8.041	0.1892	0	28.38	5.68E-03	6.15E-04
PWB in HDD drive	28.56	0	0	14.28	2.86E-03	3.09E-04
PWB in CD/DVD drive	45.12	0	0	14.4	2.88E-03	3.12E-04
Cables and internal wiring	203.84	0	0	3.59	7.18E-04	3.54E-04
RAM cards	3.791	0.09	0	13.38	2.68E-03	2.90E-04
Plastic casing	43.26	0	0	2016.3	0.40326	0.01222
Ag button-cells,	0.39	0	0.15	0	0	0
Plastic fan	0	0	0	0.64	1.34E-04	1.34E-03
Total per unit (mg)	402.02	1.90	0.15	2334.57	0.47	0.02
Total in Egypt (Kg)	14256.44	67.46	5.32	82788.44	16.56	0.73

The highest hazardous material is the PBDE (POP) used as BRF flame retardant as shown from the next Figure. The PBDE is the main constituent of the BFR, which exists in all desktop fractions as shown from the previous Table.

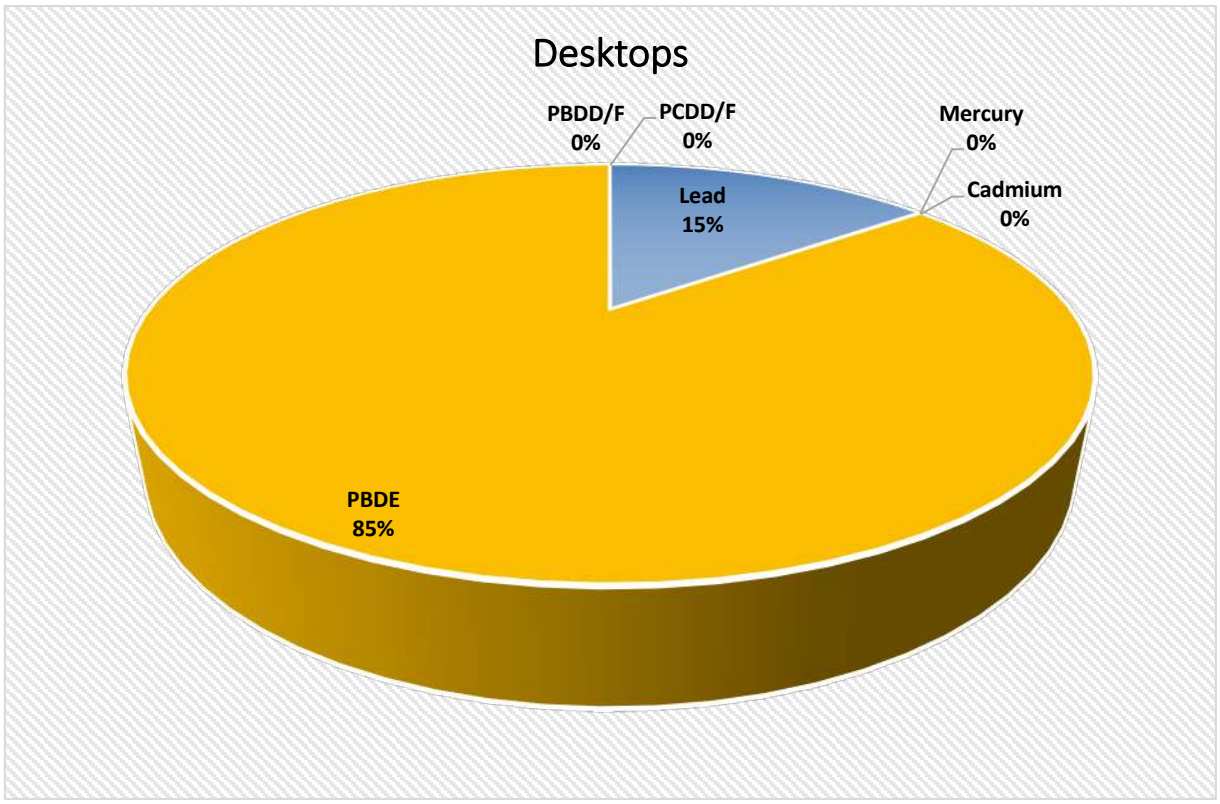


Figure 9: Hazardous Materials Distribution in Desktop

Figure 10: Desktop constituents

11.3 Laptop

11.3.1 Assessment of Hazardous Material in Laptop

The calculation of problematic fractions and hazardous materials quantities in the laptop is based on the information obtained from CAPMAS. The estimated life of the laptop is 7 years, i.e. the stock of 2015 (28,369,416 unit) is turned to waste in 2022. The following Table shows the quantities of hazardous materials in Laptop.

Table 14: Hazardous Materials in Laptop

Laptops	**Quantities of Hazard Materials per Unit (mg/unit)**					
Fraction	**Lead**	**Mercury**	**Cadmium**	**PBDE**	**PBDD/F**	**PCDD/F**
Dismantled Motherboard	22.01	0.52	0	77.67	1.55E-02	1.68E-03
Dismantled power boards	8.04	0.19	0	28.38	5.68E-03	6.15E-04
RAM cards	7.58	0.18	0	26.76	5.35E-03	5.80E-04
Plastic casing	0.00	0	0	66.82	1.34E-02	9.55E-03
Battery (Li-ion)	1.66	0	1	0.00	0	4.97E-05
PWB in HDD drive	8.52	0	0	4.26	8.52E-04	9.23E-05
PWB in CD/DVD drive	45.12	0	0	14.40	2.88E-03	3.12E-04
LCD glass panel	563.92	2.34	0	2.82	5.64E-04	5.84E-04
Keyboard	0	0	0	5.00	1.00E-03	1.00E-03
Fluorescent lamp (CCFL Tubes)	0	47.64	0	0	0	0
Total	656.84	50.86	0.66	226.11	4.52E-02	1.45E-02
Total in Egypt (Kg)	18634.29	1442.93	18.78	6414.65	1.28	0.41

The highest hazardous material is the lead followed by PBDE (POP) used as BRF flame retardant as shown from the next Figure. The lead exists in most of the laptop fractions, as for the PBDE, it is the main constituent of the BFR, which exists in most desktop fractions as shown from the previous Table.

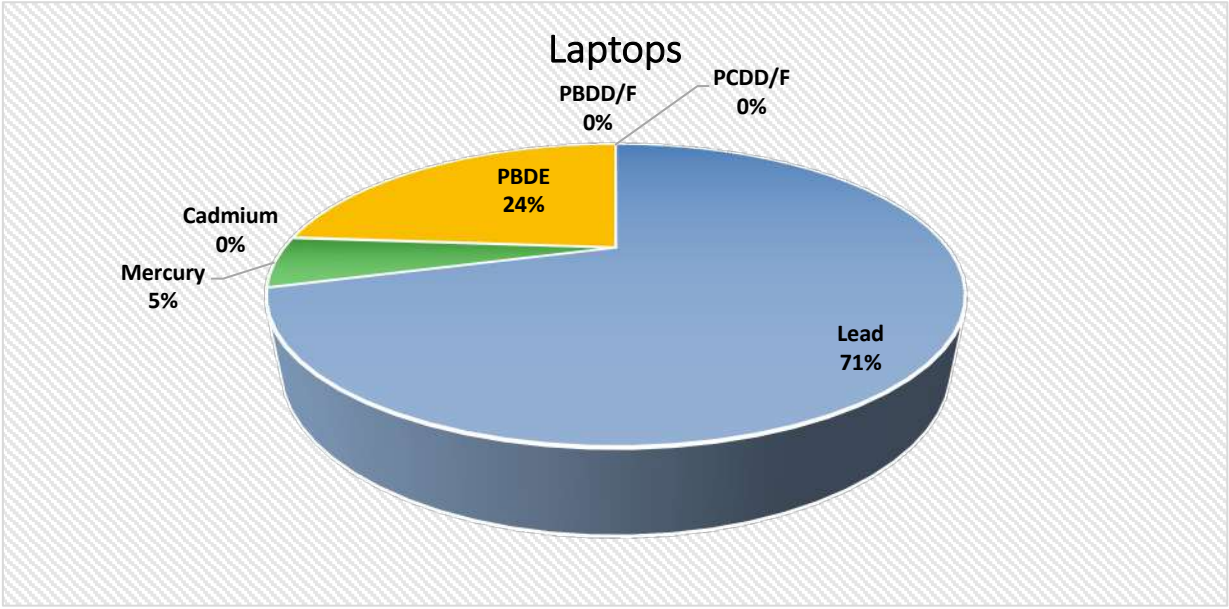


Figure 11: Hazardous Materials Distribution in Laptop

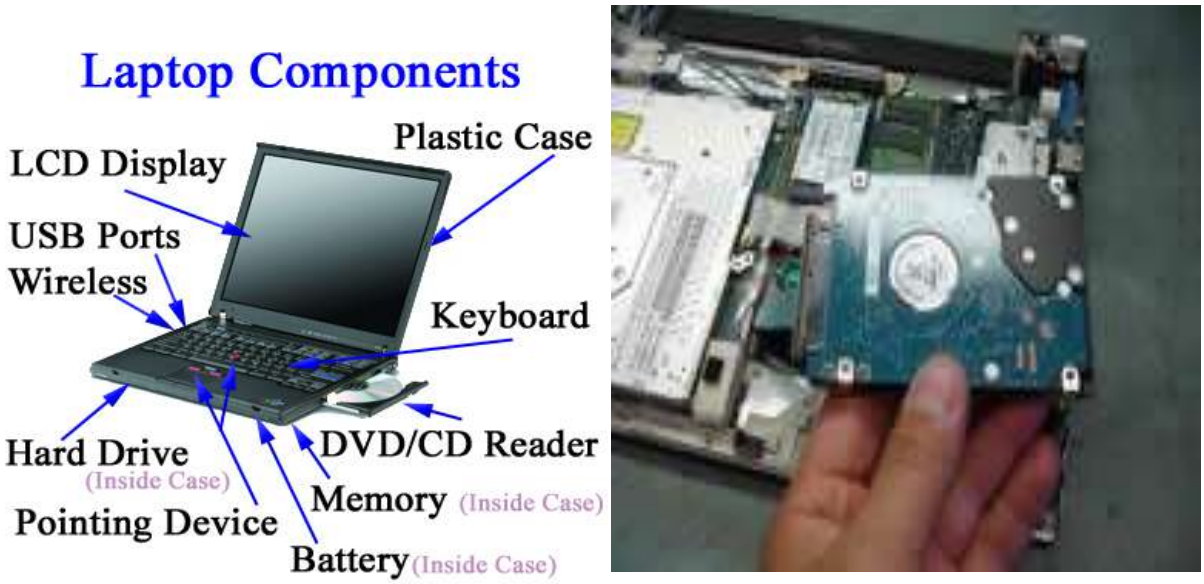


Figure 12: Laptop components

11.4 LCD

11.4.1 Assessment of Hazardous Material in LCD

The calculation of problematic fractions and hazardous materials quantities in the laptop is based on the information obtained from CAPMAS. The estimated life of the laptop is 7 years, i.e the stock of 2015 (25,056,802 unit) is turned to waste in 2022. The following Table shows the quantities of hazardous materials in Laptop.

Table 15: Hazardous Materials in LCD

LCD Panel Display	**Quantities of Hazard Materials per Unit (mg/unit)**					
Fraction	**Lead**	**Mercury**	**Cadmium**	**PBDE**	**PBDD/F**	**PCDD/F**
Monitor housing	226.18	0	0	4.64	9.42E-04	4.83E-03
Fluorescent lamp (CCFL Tubes)	0.00	26.29	0	0.00	0	0
LCD glass panel	4253.20	17.65	0	16.41	3.34E-03	8.51E-03
Dismantled printed wired board	15.81	0.19	2.05	3215.01	0.64356	1.21E-03
Non-rechargeable mercury button cell	0.00	60.00	0.00	0.00	0	0
Total	4495.19	104.12	2.05	3236.06	0.6478442	1.45E-02
Total in Egypt (Kg)	112590.03	2607.99	51.25	81052.87	16.23	0.36

The highest hazardous material is the lead followed by PBDE (POP) used as BRF flame retardant as shown from the next Figure. The lead exists in most of the LCD fractions, as for the PBDE, it is the main constituent of the BFR, which exists in most fractions as shown from the previous Table.

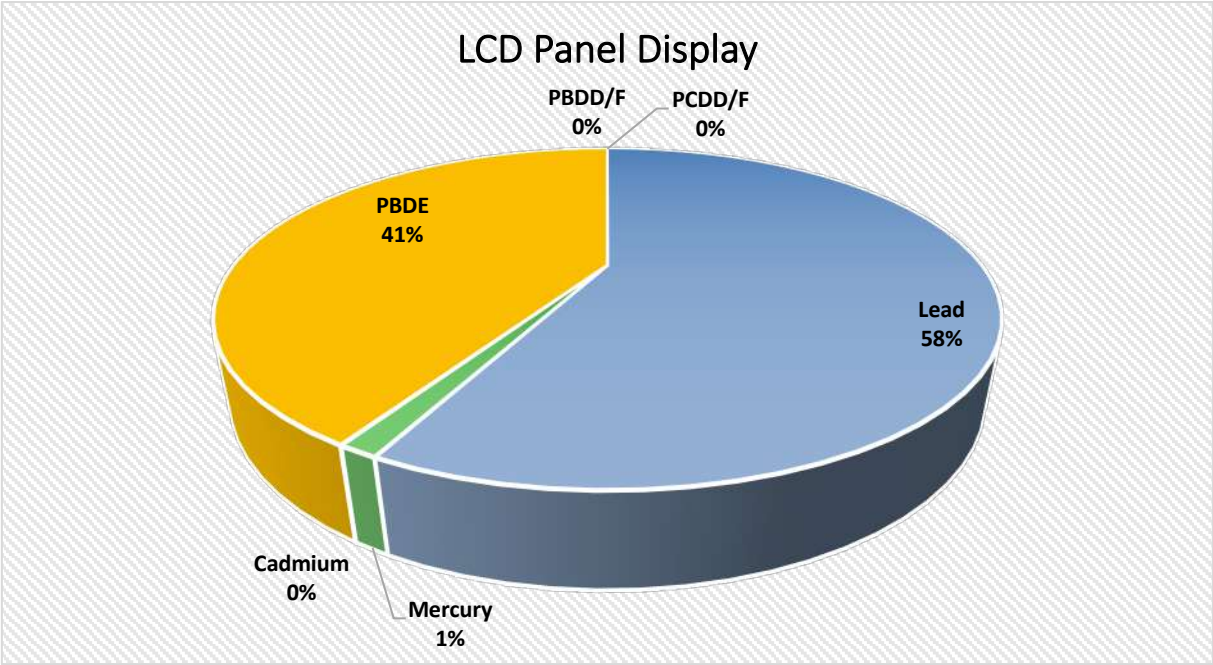


Figure 13: Hazardous Materials Distribution in LCD

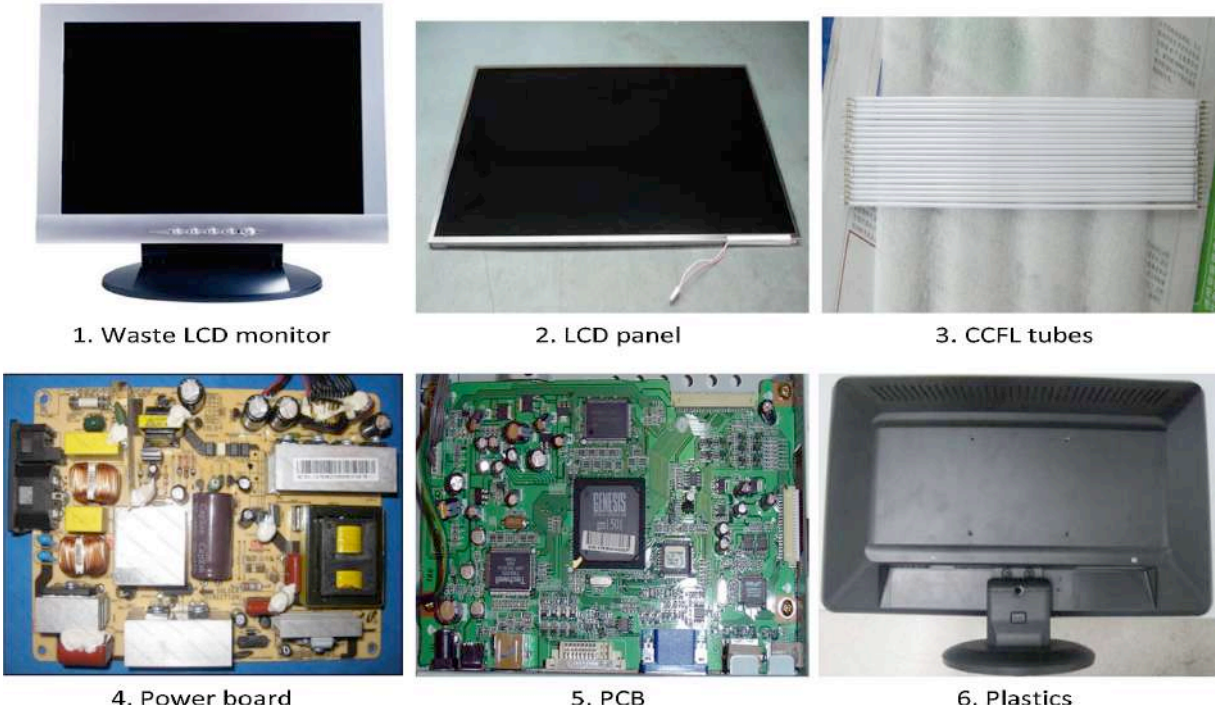


Figure 14: LCD Monitor Constituents

11.5 CRT

The CRT production was ceased in 2012; however, a large stock of this equipment was found in the Egyptian ports. In 2020, the UNDP project Medical and Electronic Waste Management Project managed to export about 930 ton of screens of cathode ray tubes (CRT) accumulated in various Egyptian ports due to illegal dumping of E-Waste in Egypt that is captured in the ports. The project supported

re-exporting the 930 tons of CRTs (equivalent to 66,428 unit) from seven Egyptian ports namely (Alexandria, Dekheila, Damietta, Port Said, Suez, Safaga and Aswan) to registered waste management facilities as per EU Directives in Greece to be recycled through a Best Environmental Practices (BEP) and Best Available Technologies (BAT) for E-waste management. However, an amount of 10,415,142 CRTs is still stocked in Egypt (As per the data obtained from CAPMAS).

11.5.1 Assessment of Hazardous Material in CRT

Table 16: Hazardous Materials in CRT

CRT Panel Display	Quantities of Hazard Materials per Unit (mg/unit)					
Fraction	**Lead**	**Mercury**	**Cadmium**	**PBDE**	**PBDD/F**	**PCDD/F**
Funnel glass	382551	0	0	0	0	0
Panel glass	100680	0	7.58	0	0	0
CRT neck	18816	0	0	0	0	0
Plastic housing	233.68	71.12	162.56	30.89	6.18E-03	2.03E-02
Dismantled printed wired board	142.46	3.35	0.00	502.80	0.10	1.09E-02
Total	502423.14	74.47	170.14	533.69	0.11	0.03
Total in Egypt (Kg)	5232808.35	775.64	1772.08	5558.42	1.11	0.33

As shown from the next Figure, the CRT includes a variety of hazardous materials such as lead cadmium and POP. As shown from the above Table, the Lead exists in all fractions.

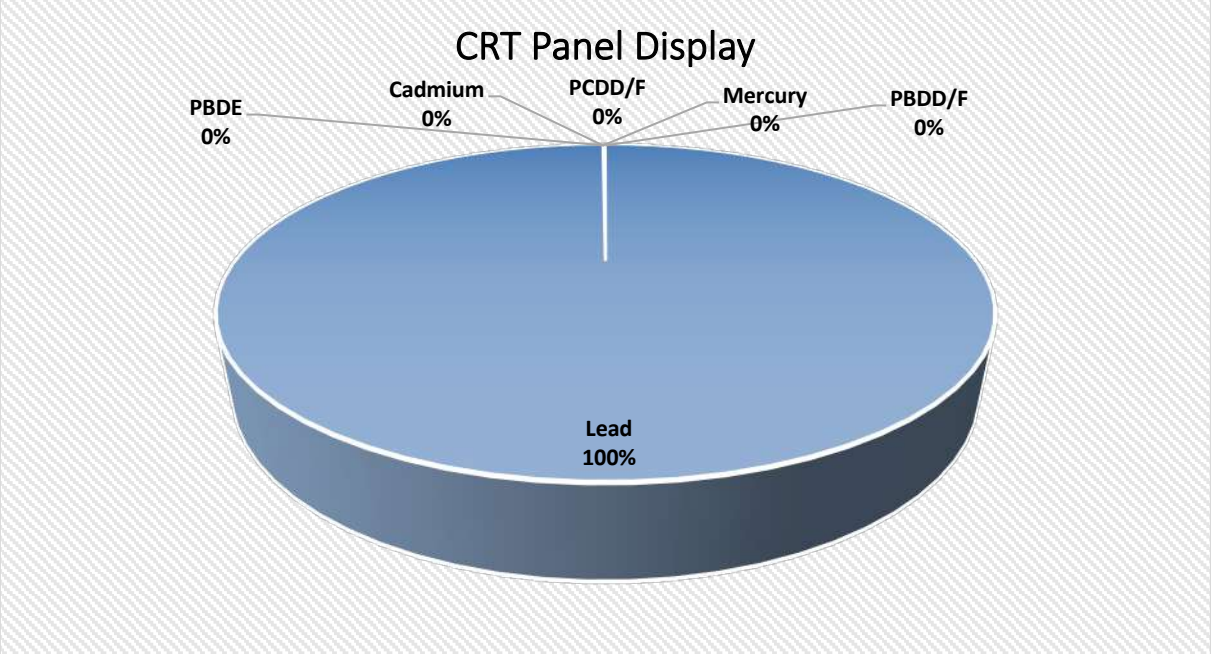


Figure 15: Hazardous Materials Distribution in LCD

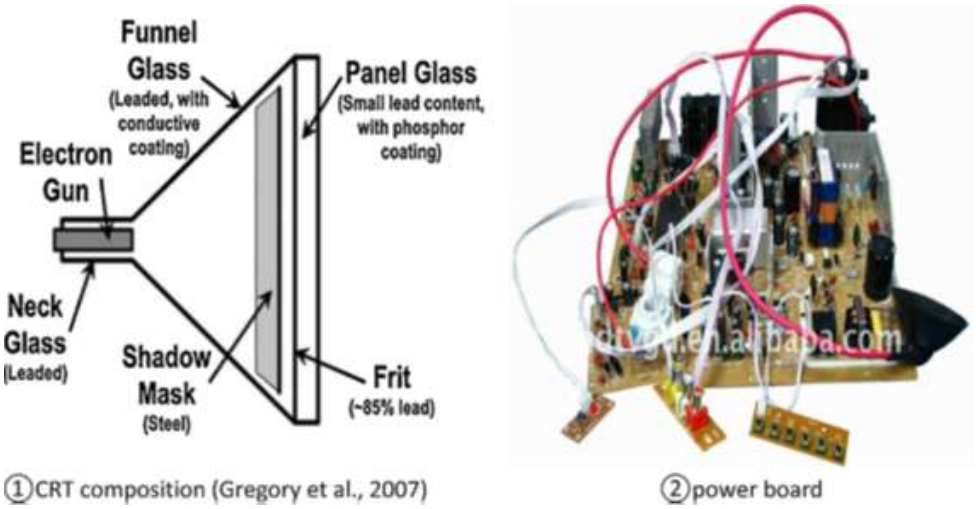


Figure 16: Components of a cathode ray tube monitor

11.5.2 Current Practices for Fluorescent Lamp Sound Management and Safe Disposal in Egypt

Lamps Processing

Fluorescent lamps are processed in special unit in Alexandria; El-Nasrya Landfill since 2011. The next Figure shows the fluorescent lamp unit at El-Nasrya landfill with an operation rate of 750 kg/hr. The main purpose of this activity is to prevent mercury emissions during the recovery of materials from fluorescent lamps processing. This includes the recovery of: Aluminum – Copper - Crushed glass – Tungsten – Mercury.

Figure 17: Florecent Lamps Processng Facilty at Nasreya Hazardous Waste Landfill

The technology used is Korean and applied in Egypt as follows:

1. Packaging: Fluorescent lamps are packed in a specific box with certain specification to be processed.
2. Crushing and Separation: Traditional Fluorescent lamps are crushed to separate metal caps from lamp tube glass while other types of fluorescent lamps should have metal caps removal at the recycler and sent to the crusher directly in El-Nasrya landfill.

- Metal caps are sorted to get aluminum, copper and etc.
- Crushed glass is fed into air blowing stage for cleaning.

3. Air Blowing (Dry Process): Fluorescent powder is separated from glass by air blowing to get clean glass that can be recycled.
4. Mercury vapors contained in the fluorescent powder are collected from all process stages to be fed into a dust collector filter, then the mercury vapor is adsorbed by activated carbon filter.
5. The crushed glass containing mercury and the carbon which is saturated with mercury are landfilled in a special cell in El-Nasrya hazardous waste landfill.

The following pictures show the output of the process.

Figure 18: Crushed Metal CAPS

Figure 19: Crushed Glass

Land Filling

The residual waste is landfilled in El-Nasrya Landfill, which is currently the only secured hazardous waste landfill site in Egypt. It is located in Qetaa Maryout, Qesm Al Amereyah, Alexandria Governorate. It started operation in June 2005. It receives the hazardous fraction resulted from E-waste to be disposed in a special cell constructed for this purpose. El-Nasrya Landfill consists of 10 main units:

- Weighting unit
- Old cell with an area 37 feddan (100 X 140 X 4 m)
- Evaporation ponds
- New cell under construction (100 x 150 x 5.25 m)
- Fluorescent lamp unit
- Physiochemical treatment unit
- Solidification unit
- Crushing Unit (a new crushing unit will arrive soon)
- Combustion unit (another 2 combustion units will arrive soon)

The following Figures show the structured cell in Nassereya Hazardous waste landfill.

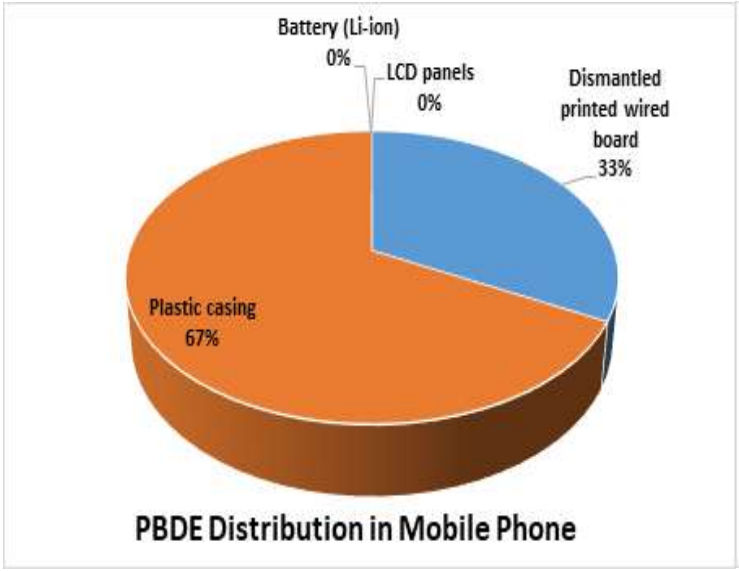
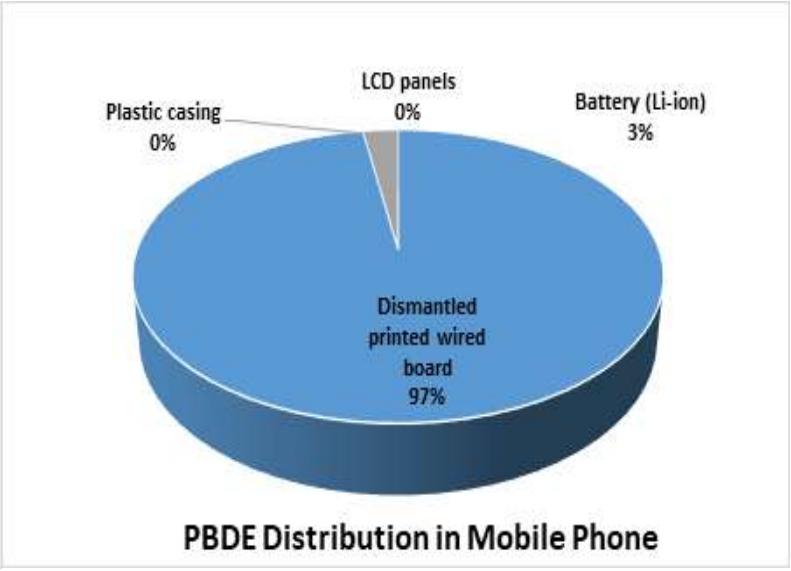
Figure 20: Burrying Cells

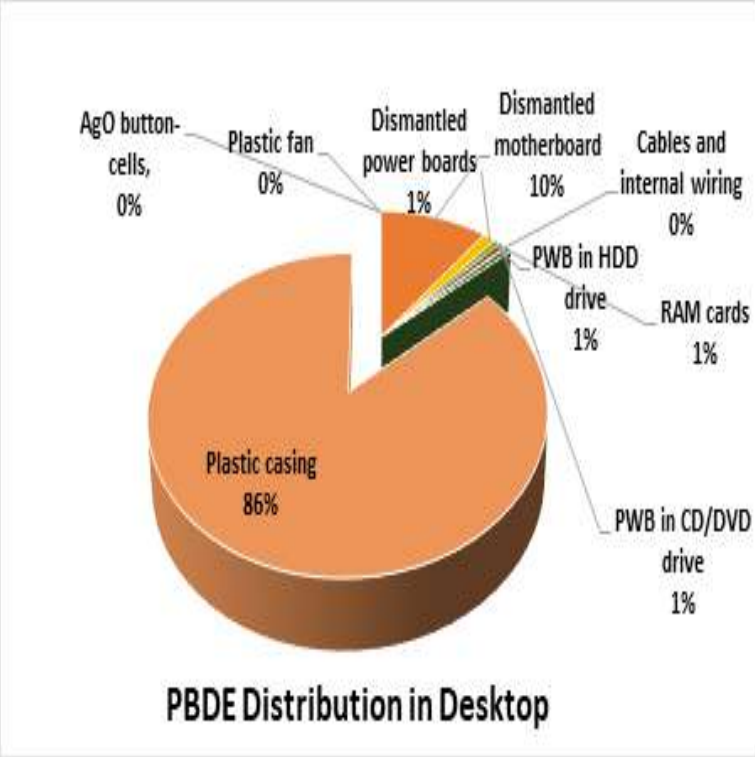
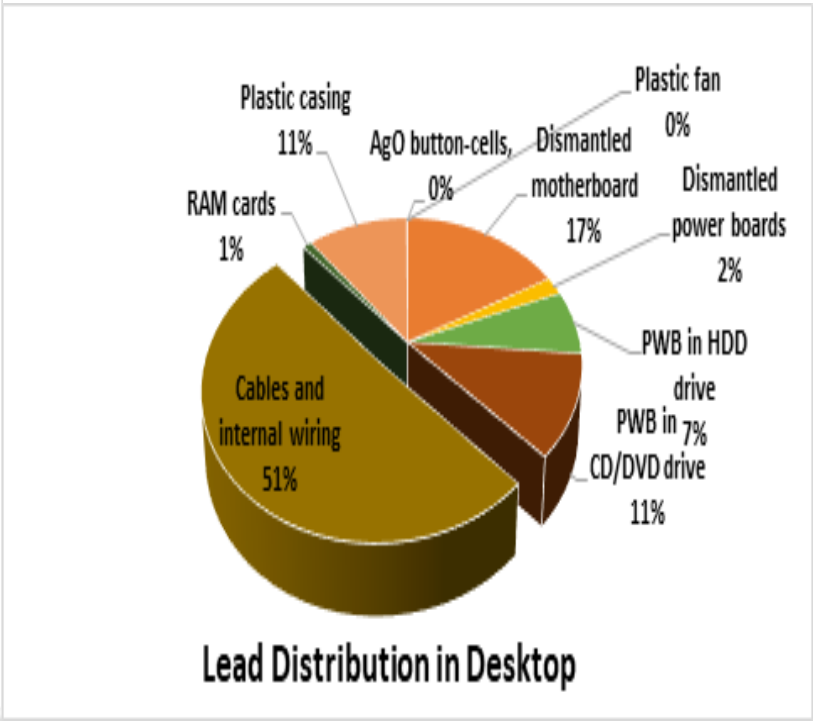
12 Prioritization of Problematic Fractions

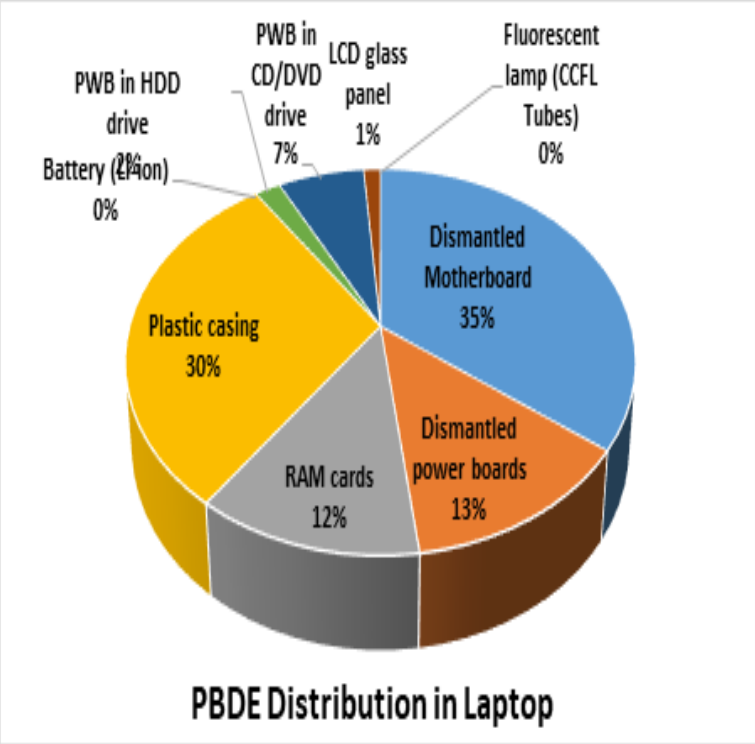
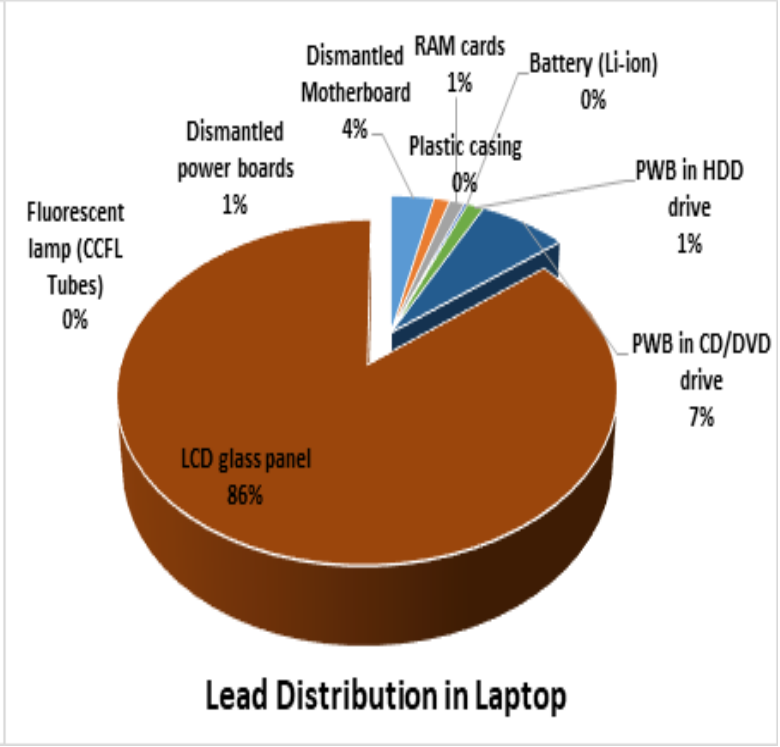
The first objective of this assignment was to conduct an assessment of the problematic fractions in a series of electronic equipment such as PCBs, batteries, hazardous parts containing BFR, etc. This assessment included also prioritization of the problematic fractions. The assessment is be based on the fraction hazard mainly the hazardous material type and quantity.

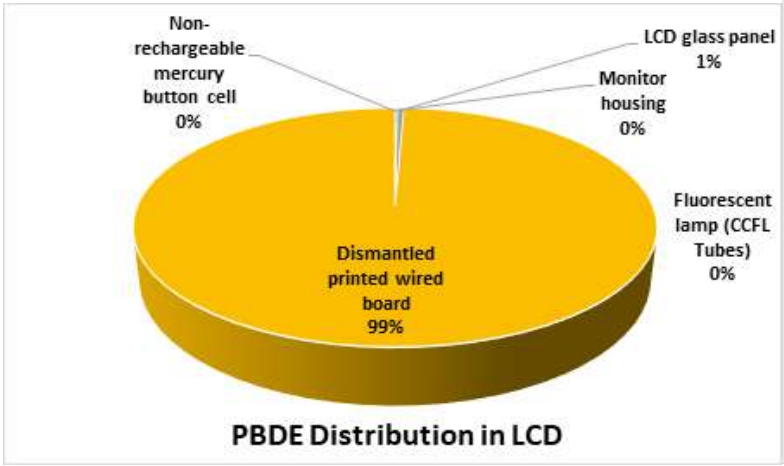
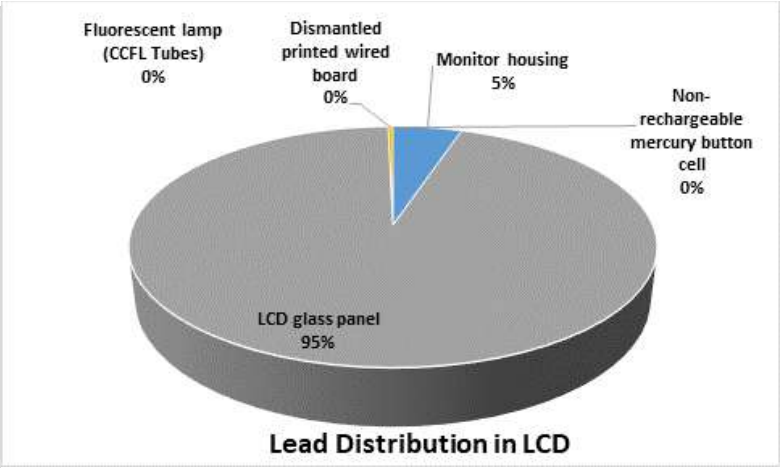
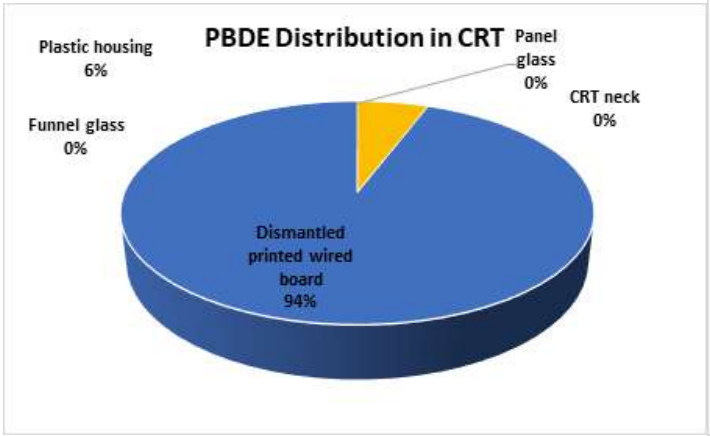
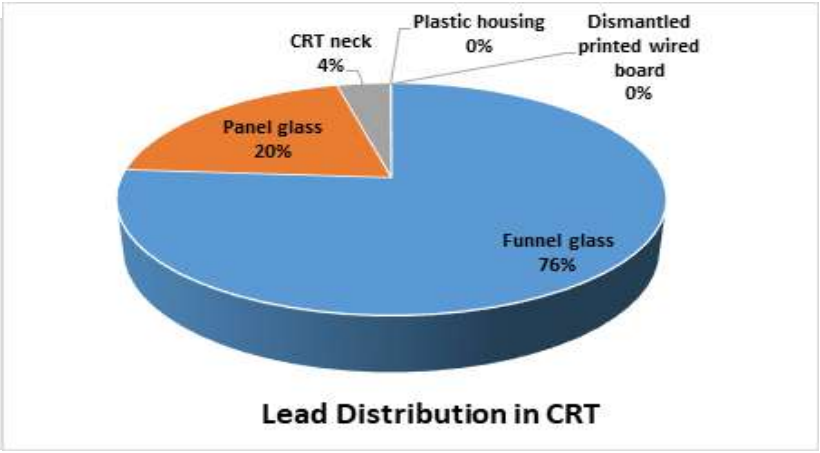
The following Table shows the classification of Problematic fraction in equipment.

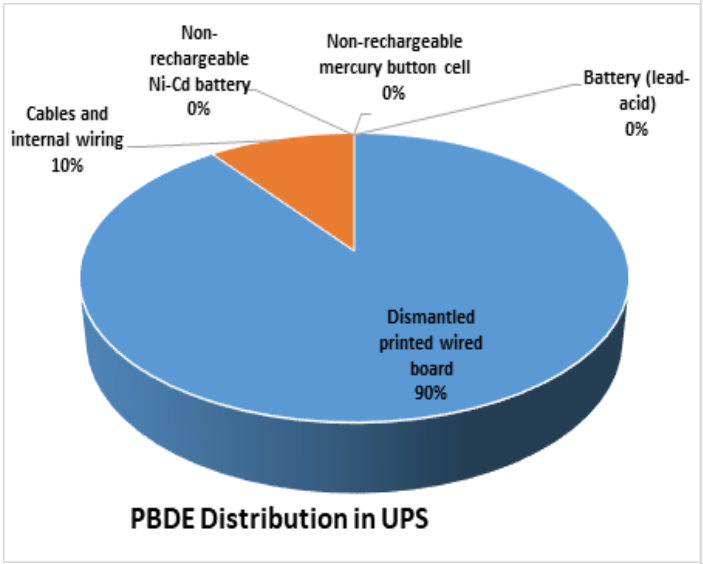
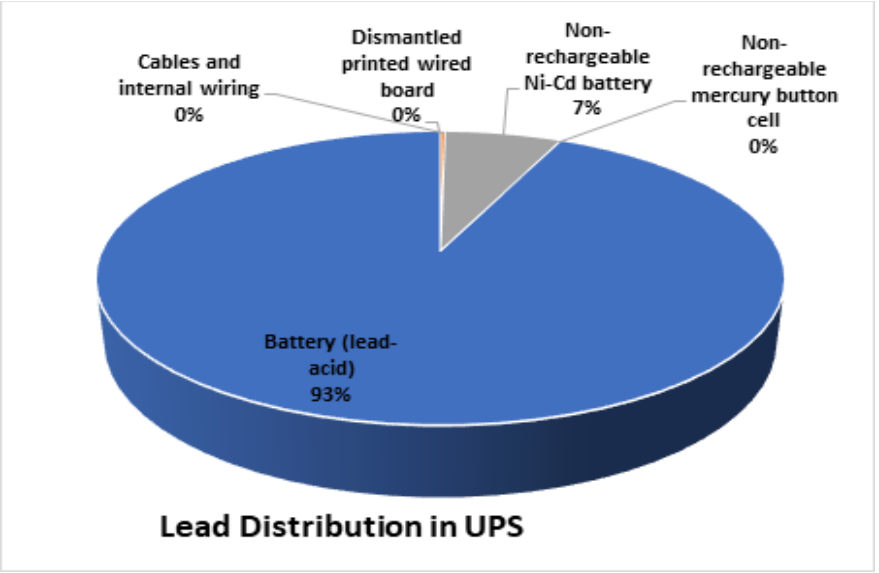
Table 17: Problematic Fraction in Each Equipment

Distribution of Most Significant Hazardous Material in Fractions	Problematic Fraction
Mobile Phones	
 	• Plastic Casing • Dismantled Printed Wired Board

Desktop	
 	• Plastic Casing • Cables and internal wiring • Dismantled motherboard

Laptop	
 PBDE Distribution in Laptop  Lead Distribution in Laptop	• Dismantled motherboard • Plastic Casing • Dismantled Power Boards • LCD Glass Panel

LCD		
 	• Dismantled printed wired board • LCD Glass Panel •
CRT		
 	• Dismantled printed wired board • Funnel Glass • Panel Glass • Plastic Housing •

UPS		
		• Lead Acid Battery • Dismantled Printed wired board

13 Prioritization of Hazardous Material in Equipment (WEEE)

The following Table summarize the results that show the total amount of hazardous materials contained in each equipment. It is shown from the next Table that lead constitutes the highest amount of hazardous materials in equipment such as CRT, LCD, Laptop and Desktop respectively present mainly in batteries and leaded glass; followed by PBDE material in equipment such as Desktop, LCD, Laptop and CRT respectively that mainly exist in plastics. It is worth noting that the CRT includes also certain amount of cadmium that increase its level of hazard.

Table 18: Expected Amounts of Hazardous Materials Generated from WEEE 2022 in Egypt

Expected Amounts of Hazardous Materials Generated from WEEE 2022						
	Unit	**Mobile**	**Desktop**	**Laptop**	**LCD**	**CRT**
Lead	KG	495.4	14256.4	18634.3	112590.0	5232808.3
Mercury	KG	0.6	67.5	1442.9	2608.0	775.6
Cadmium	KG	5.1	5.3	18.8	51.2	1772.1
PBDE	KG	0.002	82788.4	6272.8	81052.9	5558.4
PBDD/F	KG	0.0	16.6	1.3	16.2	1.1
PCDD/F	KG	0.0	0.7	0.4	0.4	0.3

Calculation Procedure:

- The calculation will be understood from the attached Excel Sheet, but we can summarize the calculation steps in the following:
- Identify the concentrations of haz. Materials from literature
- Identify the weight of each fraction
- Multiply the previous two values to get the hazardous content in mg per each fraction
- Sum the hazardous content from all fraction to get the hazardous content in mg per unit for each hazardous element
- Multiply the output of last point in the expected amounts in units of each equipment (in Egypt) to get the total amount of expected hazardous material.

The following graph shows classification of equipment following their hazardous fraction contents

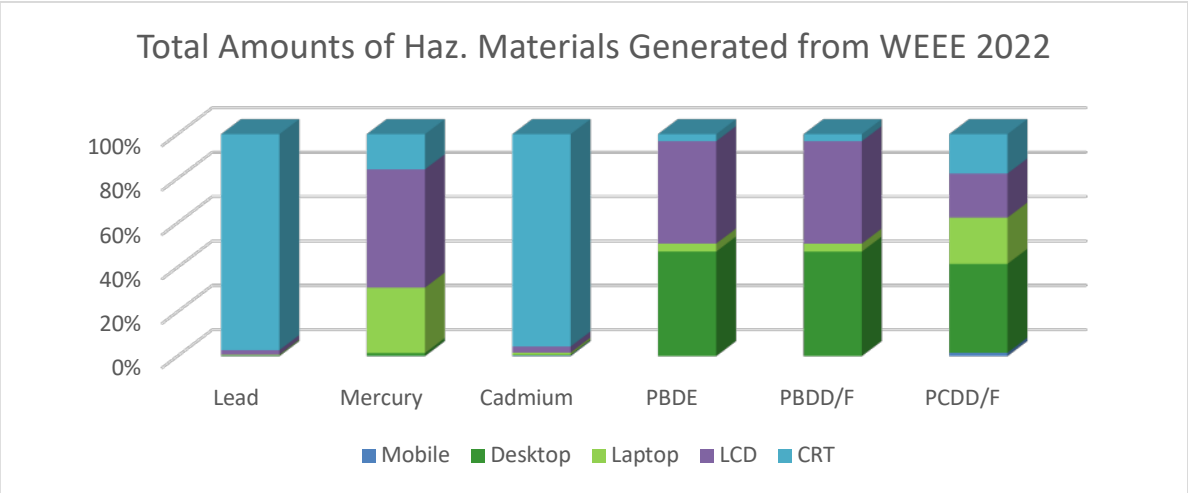


Figure 21: Distribution of Hazardous Materials in Equipment

Table 19: Prioritization of Equipment Regarding the Hazardous Material Contents

Equipment Classification Following its Hazardous Material Content	Hazardous Material Content	Remarks
CRT Panel Display	• Lead • Cadmium • Mercury • PCDD (UPOP)	• However discontinued production: it is still stocked in the market as waste (147,000 ton). • Contain high level of Hazardous materials
Desktop	• PBDE • PBDD (UPOP) • PCDD (UPOP)	• Around 350,000 ton Stocked in the market as waste
LCD	• Mercury • PBDE • PBDD (UPOP) • PCDD (UPOP)	• Around 117,000 ton stocked in the market as waste
Laptop	• Mercury • PBDE • PBDD (UPOP) • PCDD (UPOP)	• Around 99,000 ton stocked in the market as waste
UPS – Un-interruptible Power Supply	• Lead	• No information is available in the market despite of its hazardous contents.

In reference to the above Table, the equipment are arranged following their hazard, i.e the most hazardous id the CRT followed by the Desktop, LCD, Laptop and UPS respectively.

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15 Annex 1: CAPMAS DATA

الجهاز المركزى للتعبئة العامة والإحصاء

واردات ج.م.ع من أجهزة وشاشات أجهزة الكمبيوتر والمحمول وأجهزة التليفون الارضي و أجهزة الكمبيوتر الثابت (ديسك توب) والكمبيوتر المحمول (لاب توب) خلال الفترة من عام ٢٠١٣ الي عام ٢٠١٥

السنة	الكود	الصنف	الوزن (كجم)	العدد
٢٠١٣	٨٤٧١٣٠٠٠١٠	جهاز كمبيوتر لوحي وجهاز IPAD ، للمعالجة الذاتية للمعلومات .	٠	١٧٩٤١٢
	٨٤٧١٣٠٠٠٩٠	آلات أخر للمعالجة الذاتية للمعلومات قابلة للحمل لايتجاوز وزنها ١٠ كجم ، تتألف على الأقل من وحدة معالجة	٠	٢٨٧٧١٦
	٨٤٧١٤١٠٠١٠	آلات أخري للمعالجة الذاتية للمعلومات تحتوي علي الأقل في نفس البدن على طابعات الكمبيوتر الملونة	٠	١١٠٦٥١
	٨٤٧١٤١٠٠٩٠	آلات أخري للمعالجة الذاتية للمعلومات تحتوي علي الأقل فى نفس البدن على وحدة معالجة مركزية مع وحدة ادخال ووحدة اخراج للمعلومات أو وحدة مشتركة للادخال والاخراج ، عدا طابعات الكمبيوتر الملونة	٠	٩١٧٥٤
	٨٤٧١٤٩٠٠٠٠	آلات أخري للمعالجة الذاتية للمعلومات ،مقدمة في شكل أنظمة	٠	٤١٢٥٦
	٨٤٧١٥٠٠٠٠٠	وحدات معالجة أخر غير تلك الداخلة فى البند الفرعي ٨٤ ٧١ ٤١أو البند الفرعى٨٤ ٧١ ٤٩ سواء تضمنت أم لا ، فى نفس البدن على واحد أو إثنين من أنواع الوحدات التالية: وحدة تخزين ذاكرة ، وحدة إدخال ، وحد	٠	١٤٩٨٤٩
	٨٤٧١٦٠٠٠٠٠	وحدات إدخال أو وحدات إخراج للمعلومات ، سواء تضمنت أم لا وحدات تخزين ذاكرة فى نفس البدن	٠	٢٥٨٨٤٧
	٨٤٧١٧٠٠٠٠٠	وحدات تخزين للمعلومات	٠	١١٧٥٥
	٨٤٧١٨٠٠٠٠٠	وحدات أخر لآلات المعالجة الذاتية للمعلومات	٠	٣٣٣٢٤٩
	٨٤٧١٩٠٠٠١٠	قارئات بصرية (ماسحات ضوئية)	٠	٢٥١١٣
	٨٤٧١٩٠٠٠٩٠	قارئات مغناطيسية ، آلات نقل المعلومات على حوامل بهيئة رموز وآلات لمعالجة هذه المعلومات ، غير مذكورة ولاداخلة فى مكان أخر		٧٣٩٥
	٨٤٧٣١٠٠٠٠٠	أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة في البند ٨٤.٦٩ (عدا الأغطية وصناديق النقل وما يماثلها	٤٢١٧٨	٠
	٨٤٧٣٢١٠٠٠٠	أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية في الآلات الحاسبة الالكترونية الداخلة في البند الفرعي ٨٤,٧٠,١٠ أو ٨٤,٧٠,٢١ أو ٨٤,٧٠,٢٩ (عدا الأغطية وصناديق النقل ومايماثلها	٤١٧٥٥٩	٠

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واردات ج.م.ع من أجهزة وشاشات أجهزة الكمبيوتر والمحمول وأجهزة التليفون الارضي و أجهزة الكمبيوتر الثابت (ديسك توب) والكمبيوتر المحمول (لاب توب) خلال الفترة من عام ٢٠١٣ الي عام ٢٠١٥

السنة	الكود	الصنف	الوزن (كجم)	العدد
٢٠١٣	٨٤٧٣٢٩٠٠٠٠	أجزاء ولوازم أخر معدة للاستعمال حصرا أوبصفة رئيسية فى الآلات والأجهزة الأخري الداخلة في البند ٨٤,٧٠ (عدا الأغطية وصناديق النقل وما يماثلها) ، وعدا ماذكر في البند ٨٤,٧٣,٢١,٠٠	٣٧٨٥٦	٠
	٨٤٧٣٣٠٠٠٠٠	(أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة فى البند ٨٤,٧١ (عدا الأغطية وصناديق النقل ومايماثلها	٩٢٨٩١٠٨	٠
	٨٤٧٣٤٠٠٠٠٠	(أجزاء ولوازم معدة حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة في البند ٨٤,٧٢ (عدا الأغطية وصناديق النقل وما يماثلها	٢٠٧٨٦	٠
	٨٤٧٣٥٠٠٠٠٠	(أجزاء ولوازم يمكن إستخدامها علي حد سواء مع الآلات الداخلة فى بندين أو أكثر من البنود من ٨٤,٦٩ الى ٨٤,٧٢ (عدا الأغطية وصناديق النقل وما يماثلها	٦٤١٨٧	٠
	٨٥١٧١١٠٠٠٠	أجهزة هاتف (تليفون) سلكية بسماعات يد بدون سلك	٠	٨٠٥٣٥١٨
	٨٥١٧١٢٠٠١٠	تليفون محمول مجهز بخاصية GPS.	٠	٥١٨٩٨٨٤
	٨٥١٧١٢٠٠٩٠	أجهزة هاتف [تليفون] لشبكة المحمول [التليفون المحمول] أو للشبكات اللاسلكية الأخر ، خلاف ما ذكر أعلا	٠	١٣٩٠٧١٥
	٨٥١٧١٨٠٠٠٠	أجهزة هاتف (تليفون) أخر	٠	١٢٦٤٠٦
	٨٥١٧٦١٠٠٠٠	محطات قاعدة لإرسال أو إستقبال الصوت أو الصورة أو المعلومات الأخر ، لأجهزة الهاتف ، ماعدا أجهزة الإرسال أو الإستقبال الداخلة فى البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ ، ٨٥ ٢٨	٠	٥٩٠٢
	٨٥١٧٦٢٠٠٠٠	أجهزة لإستقبال أو لتحويل أو للإرسال أو لإعادة توليد الصوت أو الصورة أو المعلومات بما في ذلك المقاسم " سويتش " ما عدا أجهزة الإرسال أو الإستقبال الداخلة فى البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ ، ٨٥ ٢٨		٢٠٨٣٦٧٢
	٨٥١٧٦٩٠٠٠٠	أجهزة الإتصال بسلك أخر أو الأجهزة اللاسلكية [مثل الشبكة المحلية أو شبكة المنطقة الواسعة] ما عدا أجهزة الإرسال أو الإستقبال الداخلة في البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ أو ٨٥ ٢٨ و عدا ما ذكر أعلاه	٠	٦٧٢١٨٤٩
	٨٥١٧٧٠٠٠٠٠	أجزاء أجهزة الهاتف ، بما في ذلك أجزاء أجهزة الهاتف لشبكة التليفون المحمول أو للشبكات اللاسلكية الأخر ؛ ولأجهزة الإرسال والإستقبال للصوت والصورة أو المعلومات الأخر بما في ذلك أجزاء أجهزة الات	٣١٦٧١٥٥	٠
	٨٥٢٨٤١٠٠٠٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود من النوع المستعمل حصرا وبصفة أساسية في أنظمة المعالجة الذاتية للمعلومات الداخلة في البند ٨٤ ٧١ .	٠	١٢٣٢٧
	٨٥٢٨٤٩٠٠١٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود ، خلاف ماذكر أعلاه غير مشتملة على أجهزة تسجيل وإذاعة الصوت أو الصورة (فيديو) .	٠	٢٤٩٨٢٢
	٨٥٢٨٤٩٠٠٥٠	شاشات مونيتور ذات أنبوب أشعة كا ثود خلاف ماذكر أعلاه بالألوان أكثر من ١٦ بوصة .	٠	٣٧١
	٨٥٢٨٤٩٠٠٩٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود ، خلاف ماذكر أعلاه مشتملة على أجهزة تسجيل وإذاعة الصوت أو الصورة (فيديو) .	٠	١٦٢٣

واردات ج.م.ع من أجهزة وشاشات أجهزة الكمبيوتر والمحمول وأجهزة التليفون الارضي و أجهزة الكمبيوتر الثابت (ديسك توب) والكمبيوتر المحمول (لاب توب) خلال الفترة من عام ٢٠١٣ الي عام ٢٠١٥

السنة	الكود	الصنف	الوزن (كجم)	العدد
	٨٤٧١٠٠٠٠٠٠	آلات للمعالجة الذاتية للمعلومات ووحداتها ؛ قارئات مغناطيسية أوبصرية ، آلات نقل المعلومات على حوامل بهي	٠	٤٦٤
	٨٤٧١٣٠٠٠١٠	جهاز كمبيوتر لوحي وجهاز IPAD ، للمعالجة الذاتية للمعلومات .	٠	١٨٠٩٣١
	٨٤٧١٣٠٠٠٩٠	آلات أخر للمعالجة الذاتية للمعلومات قابلة للحمل لايتجاوز وزنها ١٠ كجم ، تتألف على الأقل من وحدة معالجة	٠	٤٠٩٤٩٠
	٨٤٧١٤١٠٠١٠	آلات أخري للمعالجة الذاتية للمعلومات تحتوي ع لى الأقل في نفس البدن على طابعات الكمبيوتر الملونة	٠	١١٠٠٩٦
	٨٤٧١٤١٠٠٩٠	آلات أخري للمعالجة الذاتية للمعلومات تحتوي علي الأقل فى نفس البدن علي وحدة معالجة مركزية مع وحدة ادخال ووحدة اخراج للمعلومات أو وحدة مشتركة للادخال والاخراج ، عدا طابعات الكمبيوتر الملونة	٠	١٣١٦٧٣
	٨٤٧١٤٩٠٠٠٠	آلات أخري للمعالجة الذاتية للمعلومات ،مقدمة في شكل أنظمة	٠	٩٠٣٠٣
	٨٤٧١٥٠٠٠٠٠	وحدات معالجة أخر غير تلك الداخلة فى البند الفرعي ٨٤ ٧١ ٤١أو البند الفرعى٨٤ ٧١ ٤٩ سواء تضمنت أم لا ، في نفس البدن على واحد أو إثنين من أنواع الوحدات التالية: وحدة تخزين ذاكرة ، وحدة إدخال ، وحد	٠	١١٧٧٩٦
	٨٤٧١٦٠٠٠٠٠	وحدات إدخال أو وحدات إخراج للمعلومات ، سواء تضمنت أم لا وحدات تخزين لذاكرة في	٠	٧٨٧٧٠
	٨٤٧١٧٠٠٠٠٠	وحدات تخزين للمعلومات	٠	٣٨٧٥٧
	٨٤٧١٨٠٠٠٠٠	وحدات أخر لآلات المعالجة الذاتية للمعلومات	٠	٥٤٣١٥٢
	٨٤٧١٩٠٠٠١٠	قارئات بصرية (ماسحات ضوئية	٠	١٣٣٧١
	٨٤٧١٩٠٠٠٩٠	قارئات مغناطيسية ، آلات نقل المعلومات علي حوامل بهيئة رموز وآلات لمعالجة هذه المعلومات ، غير مذكورة ولاداخلة في مكان أخر	٠	٤٥٦٥٢
٢٠١٤	٨٤٧٣١٠٠٠٠٠	أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة فى البند ٨٤,٦٩ (عدا الأغطية وصناديق النقل وما يماثلها	١٦٧٤٢	٠
	٨٤٧٣٢١٠٠٠٠	(أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات الحاسبة الالكترونية الداخلة في البند الفرعي ٨٤,٧٠,١٠ أو ٨٤,٧٠,٢١ أو ٨٤,٧٠,٢٩ (عدا الأغطية	٢٧٨٢٠	٠
	٨٤٧٣٢٩٠٠٠٠	أجزاء ولوازم أخر معدة للاستعمال حصرا أوبصفة رئيسية فى الآلات والأجهزة الأخري الداخلة فى البند ٨٤,٧٠ (عداالأغطية وصناديق النقل وما يماثلها) ، وعدا ماذكر في البند ٨٤,٧٣,٢١,٠٠	١٠٥١٠٨	٠
	٨٤٧٣٣٠٠٠٠٠	(أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة فى البند ٨٤,٧١ (عدا الأغطية وصناديق النقل ومايماثلها	٣٩٩٤٢٤٤	٠
	٨٤٧٣٤٠٠٠٠٠	(أجزاء ولوازم معدة حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة في البند ٨٤,٧٢ (عدا الأغطية وصناديق النقل وما يماثلها	٤٣٣٣١	٠
	٨٤٧٣٥٠٠٠٠٠	(أجزاء ولوازم يمكن استخدامها علي حد سواء مع الآلات الداخلة في بندين أو أكثر من البنود من ٨٤,٦٩ الي ٨٤,٧٢ (عدا الأغطية وصناديق النقل وما يماثلها	٣٦١٣٠	٠
	٨٥١٧١١٠٠٠٠	أجهزة هاتف (تليفون) سلكية بسماعات يد بدون سلك	٠	١٧٩٥١٢٦
	٨٥١٧١٢٠٠١٠	تليفون محمول مجهز بخاصية GPS.	٠	٢٤٤٤٨٧٢
	٨٥١٧١٢٠٠٩٠	أجهزة هاتف [تليفون] لشبكة المحمول [التليفون المحمول] أو للشبكات اللاسلكية الأخر ، خلاف ما ذكر أعل	٠	٢٥٦٥٧٧٨
	٨٥١٧١٨٠٠٠٠	أجهزة هاتف (تليفون) أخر	٠	١١٣٩٤٦
	٨٥١٧٦١٠٠٠٠	محطات قاعدة لإرسال أو إستقبال الصوت أو الصورة أو المعلومات الأخر ، لأجهزة الهاتف ، ماعدا أجهزة الإرسال أو الإستقبال الداخلة في البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ ، ٨٥ ٢٨	٠	٣٧٠١٣

واردات ج.م.ع من أجهزة وشاشات أجهزة الكمبيوتر والمحمول وأجهزة التليفون الارضي و أجهزة الكمبيوتر الثابت (ديسك توب) والكمبيوتر المحمول (لاب توب) خلال الفترة من عام ٢٠١٣ الي عام ٢٠١٥

السنة	الكود	الصنف	الوزن (كجم)	العدد
	٨٥١٧٦٢٠٠٠٠	أجهزة لإستقبال أو لتحويل أو للإرسال أو لإعادة توليد الصوت أو الصورة أو المعلومات بما فى ذلك المقاسم " سويتش " ما عدا أجهزة الإرسال أو الإستقبال الداخلة فى البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ ، ٨٥ ٢٨	٠	١٨٩٥٢٠٢
	٨٥١٧٦٩٠٠٠٠	أجهزة الإتصال بسلك آخر أو الأجهزة اللاسلكية [مثل الشبكة المحلية أو شبكة المنطقة الواسعة] ما عدا أجهزة الإرسال أو الإستقبال الداخلة في البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ أو ٨٥ ٢٨ و عدا ما ذكر أعلاه	٠	٥٩٠٢٨٨
	٨٥١٧٧٠٠٠٠٠	أجزاء أجهزة الهاتف ، بما في ذلك أجزاء أجهزة الهاتف لشبكة التليفون المحمول أو للشبكات اللاسلكية الأخر ؛ ولأجهزة الإرسال والإستقبال للصوت والصورة أو المعلومات الأخر بما في ذلك أجزاء أجهزة الإت	٤٧١٥٥١٨	٠
٢٠١٤	٨٥٢٨٤١٠٠٠٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود من النوع المستعمل حصرا وبصفة أساسية في أنظمة المعالجة الذاتية للمعلومات الداخلة في البند ٨٤ ٧١ .	٠	٢٠٣٥٢
	٨٥٢٨٤٩٠٠١٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود ، خلاف ماذكر أعلاه غير مشتملة على أجهزة تسجيل وإذاعة الصوت أو الصورة (فيديو) .	٠	١٠٠٢١
	٨٥٢٨٤٩٠٠٥٠	شاشات مونيتور ذات أنبوب أشعة كاثود خلاف ماذكر أعلاه بالألوان أكثر من ١٦ بوصة	٠	٢٢٢٣
	٨٥٢٨٤٩٠٠٩٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود ، خلاف ماذكر أعلاه مشتملة على أجهزة تسجيل وإذاعة الصوت أو الصورة (فيديو) .	٠	٣٩٤
	٨٤٧١٣٠٠٠١٠	جهاز كمبيوتر لوحى وجهاز IPAD ، للمعالجة الذاتية للمعلومات .	٠	٣٠٠٠٥٥
	٨٤٧١٣٠٠٠٩٠	آلات أخر للمعالجة الذاتية للمعلومات قابلة للحمل لايتجاوز وزنها ١٠ كجم ، تتألف على الأقل من وحدة معالجة	٠	٢٤٠١٠٨
	٨٤٧١٤١٠٠١٠	آلات أخري للمعالجة الذاتية للمعلومات تحتوي ع لي الأقل في نفس البدن علي طابعات الكمبيوتر الملونة	٠	١٨٧٠٨٦
	٨٤٧١٤١٠٠٩٠	آلات أخري للمعالجة الذاتية للمعلومات تحتوي علي الأقل في نفس البدن علي وحدة معالجة مركزية مع وحدة ادخال ووحدة اخراج للمعلومات او وحدة مشتركة للادخال والاخراج ، عدا طابعات الكمبيوتر الملونة	٠	١٤٥٨٥١
٢٠١٥	٨٤٧١٤٩٠٠٠٠	آلات أخرى للمعالجة الذاتية للمعلومات ،مقدمة في شكل أنظمة	٠	٥٢٧٦٨٣
	٨٤٧١٥٠٠٠٠٠	وحدات معالجة أخر غير تلك الداخلة فى البند الفرعي ٨٤ ٧١ ٤١أو البند الفرعي٨٤ ٧١ ٤٩ سواء تضمنت أم لا ، في نفس البدن على واحد أو إثنين من أنواع الوحدات التالية: وحدة تخزين ذاكرة ، وحدة إدخال ، وحد	٠	١٥٧٩٣٦
	٨٤٧١٦٠٠٠٠٠	وحدات إدخال أو وحدات إخراج للمعلومات ، سواء تضمنت أم لا وحدات تخزين ذاكرة فى نفس البدن	٠	١٧١٥٧٢١
	٨٤٧١٧٠٠٠٠٠	وحدات تخزين للمعلومات	٠	١٠٤٥٣٢
	٨٤٧١٨٠٠٠٠٠	وحدات أخر لآلات المعالجة الذاتية للمعلومات	٠	٩٩٢٢٩٩
	٨٤٧١٩٠٠٠١٠	قارئات بصرية (ماسحات ضوئية	٠	١٢٦٥٦
	٨٤٧١٩٠٠٠٩٠	قارئات مغناطيسية ، آلات نقل المعلومات على حوامل بهيئة رموز وآلات لمعالجة هذه المعلومات ، غير مذكورة ولاداخلة في مكان آخر	٠	٣٤٤٥٠٠

واردات ج.م.ع من أجهزة وشاشات أجهزة الكمبيوتر والمحمول وأجهزة التليفون الارضي و أجهزة الكمبيوتر الثابت (ديسك توب) والكمبيوتر المحمول (لاب توب) خلال الفترة من عام ٢٠١٣ الي عام ٢٠١٥

السنة	الكود	الصنف	الوزن كجم	العدد
	٨٤٧٣١٠٠٠٠٠	(أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة فى البند ٨٤,٦٩ (عدا الأغطية وصناديق النقل وما يماثلها	١٣٣٤٣	٠
	٨٤٧٣٢١٠٠٠٠	(أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات الحاسبة الالكترونية الداخلة فى البند الفرعي ٨٤,٧٠,١٠ أو ٨٤,٧٠,٢١ أو ٨٤,٧٠,٢٩ (عدا الأغطية وصناديق النقل ومايماثلها	٧٦٢١٣	٠
	٨٤٧٣٢٩٠٠٠٠	أجزاء ولوازم أخر معدة للاستعمال حصرا أوبصفة رئيسية فى الآلات والأجهزة الأخرى الداخلة في البند ٨٤,٧٠ (عداالأغطية وصناديق النقل وما يماثلها) ، وعدا مذكر في البند ٨٤,٧٣,٢١,٠٠	٣٠٣٤٣	٠
	٨٤٧٣٣٠٠٠٠٠	(أجزاء ولوازم معدة للاستعمال حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة فى البند ٨٤,٧١(عدا الأغطية وصناديق النقل ومايماثلها	٥٦٧٢٢٥٤	٠
	٨٤٧٣٤٠٠٠٠٠	(أجزاء ولوازم معدة حصرا أو بصفة رئيسية فى الآلات والأجهزة الداخلة في البند ٨٤,٧٢ (عدا الأغطية وصناديق النقل وما يماثلها	٣٨٩٦٥	٠
	٨٤٧٣٥٠٠٠٠٠	(أجزاء ولوازم يمكن استخدامها على حد سواء مع الآلات الداخلة في بندين أو أكثر من البنود من ٨٤,٦٩ - ٨٤,٧٢ (عدا الأغطية وصناديق النقل وما يماثلها	١٧٢٠٥٠	٠
	٨٥١٧١١٠٠٠٠	أجهزة هاتف (تليفون) سلكية بسماعات يد بدون سلك	٠	١٧٤٧٤٢٤
	٨٥١٧١٢٠٠١٠	تليفون محمول مجهز بخاصية GPS.	٠	١٥٠٢٤٨٩
	٨٥١٧١٢٠٠٩٠	أجهزة هاتف [تليفون] لشبكة المحمول [التليفون المحمول] أو للشبكات اللاسلكية الأخر ، خلاف ما ذكر أعلا	٠	٢٤٧٦٦٩١
	٨٥١٧١٨٠٠٠٠	أجهزة هاتف (تليفون) أخر	٠	٢١٤١٦٥
٢٠١٥	٨٥١٧٦١٠٠٠٠	محطات قاعدة لإرسال أو إستقبال الصوت أو الصورة أو المعلومات الأخر ، لأجهزة الهاتف ، ماعدا أجهزة الإرسال أو الإستقبال الداخلة فى البنود ٨٤ 43،85 ٢٥ ، ٨٥ ٢٧	٠	٢٠٦٦٩
	٨٥١٧٦٢٠٠٠٠	أجهزة لإستقبال أو لتحويل أو للإرسال أو لإعادة توليد الصوت أو الصورة أو المعلومات بما فى ذلك المقاسم " سويتش " ما عدا أجهزة الإرسال أو الإستقبال الداخلة فى البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ ، ٨٥ ٢٨	٠	٢٥٦٣٣٤٨
	٨٥١٧٦٩٠٠٠٠	أجهزة الإتصال بسلك أخر أو الأجهزة اللاسلكية [مثل الشبكة المحلية أو شبكة المنطقة الواسعة] ما عدا أجهزة الإرسال أو الإستقبال الداخلة في البنود ٨٤ ٤٣ ، ٨٥ ٢٥ ، ٨٥ ٢٧ أو ٨٥ ٢٨ و عدا ما ذكر أعلاه	٠	٥١٩٢٨١
	٨٥١٧٧٠٠٠٠٠	أجزاء أجهزة الهاتف ، بما في ذلك أجزاء أجهزة الهاتف لشبكة التليفون المحمول أو للشبكات اللاسلكية الأخر ؛ ولأجهزة الإرسال والإستقبال للصوت والصورة أو المعلومات الأخر بما في ذلك أجزاء أجهزة الإت	٦٧٦٧٦٠٣	٠
	٨٥٢٨٤١٠٠٠٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيوني ، ذات أنبوب إشعة كاثود من النوع المستعمل حصرا وبصفة أساسية في أنظمة المعالجة الذاتية للمعلومات الداخلة في البند ٨٤ ٧١ .	٠	٣٩٩٥٨
	٨٥٢٨٤٩٠٠١٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيوني ، ذات أنبوب إشعة كاثود ، خلاف مذكر أعلاه غير مشتملة على أجهزة تسجيل وإذاعة الصوت أو الصورة (فيديو) .	٠	٤٩٥٥٢
	٨٥٢٨٤٩٠٠٥٠	شاشات مونيتور ذات أنبوب أشعة كا ثود خلاف مذكر أعلاه بالألوان أكثر من ١٦ بوصة	٠	٩٢٤
	٨٥٢٨٤٩٠٠٩٠	شاشات مونيتور غير مشتملة على أجهزة إستقبال الإرسال التليفزيونى ، ذات أنبوب إشعة كاثود،خلاف مذكر أعلاه مشتملة على أجهزة تسجيل وإذاعة الصوت أو الصورة (فيديو) .	٠	١٠٤٥

The most important imports according to the Usage Degree During December and (January/ December) 2021 compared to 2020

CON.Table No.5 Value in 000 $

Commodities	مقدار التغير Amount of Change	January/December 2020	يناير / ديسمبر 2021
5- Durable Cosumer Commodities , which includes :	**1605448**	**6271300**	**7876748**
Refrigerators and Freezers	66356	142843	209199
Washing Machines	17429	43800	61229
Magnatic Tapes And Discs	1127	10319	11446
Televisions and Antennas	574633	323405	898038
Motor Vehicles	808661	2766279	3574940
Furniture, Seats and Mattres	-8873	145388	136515
Telephone Sets	-134944	1754502	1619558

المنتجات المعدنية والماكينات و المعدات عدا معدات النقل

تابع جدول : 14 القيمة بالالف جنية

السـلعة	وحدة الكمية	عـام 2017 / 2018		عـام 2018 / 2019	
		كمية	قيمة	كمية	قيمة
اجهزة منزلية اخرى للطبخ والتدفئة	000	000	27570	000	3677
أجهزة رياضية	000	000	13104	000	5104
حاسب آلى	000	000	71057	000	000
الف عدى	000	000	000	12	77000
محركات كهربائية ذات قدرة صغيرة	عدد	8104	7357	48899	28543
اجزاء للمحركات	000	000	000	000	149

المنتجات المعدنية والماكينات و المعدات عدا معدات النقل

تابع جدول : 14

القيمة بالالف جنية

السـلعة	وحدة الكمية	عـام 2017 / 2018		عـام 2018 / 2019	
		كمية	قيمة	كمية	قيمة
لمبات عادية	الف عددى	33874	112835	32918	127329
لمبات الفلورسنت	الف عددى	1524	11240	1597	12543
اجزاء و مكونات تليفزيون ملون	000	000	17779	000	137000
أجزاء ولوازم أخرى لأجهزة إدارة الإسطوانات وأجزاء الكاسيت	000	000	836	000	88000
اجزاء اخرى لاجهزة الارسال والرادار والارشاد الملاحى	000	000	196092	000	177660

جدول (١٤) : حركة الانتاج والتجارة الخارجية وكمية المتاح للاستهلاك من المنتجات المعدنية والماكينات لعام ٢٠١٧/٢٠١٨

القيمة : بالالف جنيه

اسم السلعة	وحدة الكمية	حركـــــة الانتـــــــاج										التجارة الخارجية				كمية المتاح للاستهلاك
		الطاقة القصوى		الطاقة المتاحة		الإنتاج الفعلى		الطاقة العاطلة		كمية المخزون		الصادرات		الواردات		
		كمية	قيمة	كمية	قيمة	كمية	قيمة	كمية	قيمة	أول المدة	آخر المدة	كمية	قيمة	كمية	قيمة	
غلايات مياه وهوايات كهربائية ومواقد بوتاجاز	عدد	٢٥٢٥٨٦	١٠٠٧٩٦	٢٥٢٤٨٨	١٠٠٧٥٧	٢٢١٢٦٣	٥٠٢٩٢	٢٦٢٢٥	١٠٤٦٥	٢٥٢٧٣	١٣٠٩٤	٦٤٩	٢٥٩	٣٥٠٨	١٤٠٠	٢٤١٣٠٢
سخانات بوتاجاز أو غاز طبيعى	الف عددى	٦٤٦	٥٣٠١٦٩	٦١٥	٥٠٤٨٤٠	٥٠٥	٤١٤٦٠٦	١١٠	٩٠٣٣٤	٢٤	٢٩	٣	١٢٥٤	١٩	١٥٨٦٨	٥١٨
سخانات شمسية	عدد	١٢٢٩	١٧٧٩٦	١٩٢٩	١٧٧٩٦	١٦١٨	١٧٦٩٢	١١	٩٠٤	٠٠٠	١٩٩٥	٠٠٠	٠٠٠	٤٣٨٤	٤٠٤٥٠	٥٠٠٧
غلايات كى	الف عددى	٣٢	١٦٧٥٤٠	٣٠	١٥٠٤١٩	٢٧	١٣٧٥٤٠	٣	١٢٨٧٩	١٢	٢	٠٠٠	٠٠٠	٦٢	٣١٣٨٥٧	٩٩
مولدات كهربائية	عدد	٤٣٠٣	١٤٢٠١١	٤٠٥٢	١٣٣٧٤٤	٣٥١٢	١١٥٨٧٣	٥٤٦	١٧٨٧١	١٢٩١	١١٨	٢٣٠	٧٦٠٤	١٠٣٤٨	٣٤١٥١٤	١٤٨٠٢
محولات كهربائية ذات قدرة عالية	الف عددى	٢٧٥	٦٨٨٨١٢١	٢٤٥	٦١٤٦١٧٥	٢١٠	٥٢٦٧٨٧٨	٣٥	٨٧٤٧٩٧	١	٩	٠٠٠	٨١٦٢	٢٧	٦٧٢٦٧٣	٢٢٩
خافض تيار للمصابيح الفلورسنت - تراانس	الف عددى	٣٩٨	٦٧٨٣	٣٣٩	٥٧٧٤	٢٥٤	٤٣٢٦	٨٥	١٤٤٨	١٠٤	٣٣	١٠١٥	١٧٢٨٢	١٧٧١١	٣٠١٦٥٢	٢٢٠٢٢
مصاهر -فيوزات-	عدد	٦٦٩٥٧	١٨٦١٤	٦١٧٩٥	١٧١٧٩	٥٥٣٠٨	١٥٣٧٥	٦٤٨٧	١٨٠٣	٠٠٠	٤٠٥٠	٣٢٧	٩١	٧٠٧٥٥١	١٩٦٦٩٥	٧٥٨٤٨١

16 Annex 2: DATA Obtained from WMRA

WMRA
جهاز لتنظيم إدارة المخلفات

القائمة المعتمدة
للمصانع/ للشركات العاملة فى مجال إعادة تدوير بطاريات الرصاص والكاوتشوك
والحاصلة على موافقة بيئية وترخيص من الهيئة العامة للتنمية الصناعية

م	اسم الشركة	نوع النشاط	بيانات التواصل
١	شركة كلوراید ایجیبت	تدوير بطاريات الرصاص	٢٨ طريق مصر اسكندرية الصحراوى – المنطقة الصناعية- أبورواش - الجيزة
٢	الشركة المتحدة للبطاريات	تدوير بطاريات الرصاص	العاشر من رمضان - المنطقة الصناعية A4
٣	الشركة المتحدة لتدوير وتصنيع المعادن (مصطفى عبد الوهاب)	تدوير بطاريات التخزين	القطعة رقم (٢٩) -المنطقة الصناعية ٣١/١/جزيرة أبو صالح/ مركز ناصر/ بنى سويف.
٤	شركة النسر للصناعات الكيماوية	تدوير بطاريات الرصاص	القطعة رقم (٧٠٢١) -المنطقة الصناعية السابعة - جهاز مدينة السادات
٥	مصنع صهر وتكرير وتصنيع الرصاص	تدوير بطاريات الرصاص	القطعة رقم ٧ – حوض الزهار رقم ٨ – عرب الطيقات – المنطقة الصناعية – مركز الخانكة – محافظة القليوبية
٦	الشركة المتحدة للتجارة والتوريدات والتوكيلات العمومية	تدوير بطاريات الرصاص	المنطقة الصناعية – العكرشة - أبوزعبل – شارع يوسف أبو حجر خلف ميزان أحمد عبد الوهاب
٧	شركة الهدى لتدوير البطاريات	إعادة تدوير البطاريات	المنطقة الصناعية بأبو زعبل - العكرشة – محافظة القليوبية
٨	شركة مارسو للكيماويات	خطوط انتاج تكسير كاوتش وفصل سلك	٣/ ٢٤- المنطقة الصناعية الثالثة – A1 –مدينة العاشر من رمضان

مدير عام الإدارة العامة للمواد والمخلفات الخطرة
ك/ الهام رفعت

الرئيس التنفيذى
لجهاز تنظيم إدارة المخلفات
أ.د/ طارق العربى

WMRA
جهاز تنظيم إدارة المخلفات

القائمة المعتمدة للمصانع/ الشركات الرسمية العاملة فى مجال إعادة تدوير المخلفات الإلكترونية والكهربائية والحاصلة على موافقة بيئية وترخيص من الهيئة العامه للتنمية الصناعية

م	اسم الشركة	نوع النشاط	العنوان	التواصل
١	شركة إنترناشيونال تكنولوجى ITGجروب	تدوير المخلفات الإلكترونية والكهربائية	٢/ب القطعة ٦٩ - المنطقة الصناعية السادسة - السادس من أكتوبر الجيزة	٠١٢٢١٢٧٧٤٧٨
٢	شركة جرين كور لإعادة التدوير	تدوير المخلفات الإلكترونية واستخلاص المعادن منها وجمعها	قطعة ٦ بلوك ٥ منطقة ٨-١٥ مايو - حلوان - القاهرة	٠١٠٠١٨١٢٢٢٥
٣	مصنع تدوير المخلفات الإلكترونية والكهربائية (مؤسسة العرايشى) للتجارة والصناعة	تكسير وفرم المخلفات الإلكترونية	القطعة رقم (١٥) - المنطقة الصناعية الأولى - مدينة ١٥ مايو - محافظة القاهرة.	٠١٢٢٧٣٩٥٨١٢
٤	مصنع تدوير المخلفات الإلكترونية (تريبل رى)	تدوير المخلفات الإلكترونية	القطعة رقم (٩٥) - المنطقة الصناعية - منطقة المخازن الصناعات الصغيرة (مشروع الشباب) - السادس من أكتوبر.	٠١١٢٢٢٩٤٤٤٠ ٠١٠٠٠٦٩١٠١١
٥	مصنع تدوير المخلفات الإلكترونية (ريسيكل كى)	عمليات الفرز والتدوير للمخلفات الإلكترونية	القطعة رقم (١٠) - مجمع الصناعات الصغيرة - منطقة المطورين بالمنطقة الصناعية - مدينة السادات.	٠١٠٠٢٢٨١٨٣٣
٦	شركة (جرين بلاس)	جمع وتدوير المخلفات الإلكترونية والكهربائية	قطعة (٤٧) ورش الشباب – السادس من أكتوبر	٠١٠٢٣٤٥٦١٨٠
٧	الشركة المصرية لإعادة تدوير المخلفات الإلكترونية EERC	إعادة تدوير واستخراج المعادن النفيسة من المخلفات الإلكترونية	القطعة رقم ٧٨٧ – مصانع الشباب – إمتداد المنطقة الصناعية السادسة – مدينة ٦ أكتوبر.	٠١١١٦٦٠٤٨٣٣
٨	الشركة المصرية لتشغيل المعادن (مصنع حفظى)	إعادة تدوير مخلفات الكابلات الكهربائية وكابلات التليفونات وإضافة فرن لصهر النحاس وتصنيع بارات من النحاس	المنطقة الصناعية بكفر العلو – حلوان - القاهرة	٢٥٤٣٤٣٠٣ ٠١٠٩٢٤٥٧٠٠٧
٩	شركة حسين وأحمد أبو سليمان للتجارة	فرز وتصنيف وتدوير المخلفات الإلكترونية والكهربائية وصهر النحاس	الوحدة رقم (٣٠٠١) بحضانة التبين للمشروعات التكنولوجية – شارع الحديد والصلب – التبين – القاهرة.	٠١٠٠٢٠٠٦٠١٠

		الناتج عن عملية التدوير لإنتاج سبائك نحاس.		
١٠	شركة إكستريم للمقاولات والتوريدات	إعادة تدوير المخلفات الإلكترونية والكهربائية وإنتاج سبائك النحاس.	الوحدة رقم (٣٠٠٠) بحضانة التبين للمشروعات التكنولوجية – شارع الحديد والصلب – التبين – القاهرة.	٠١٠٠٢٠٠٦٠١٠
١١	شركة ريمت للتدوير	فرز وتصنيف وتدوير المخلفات الإلكترونية والكهربائية وصهر النحاس الناتج من عملية التدوير لإنتاج مسبوكات وسبائك نحاس متنوعة	القطعة رقم (٥٢/٤٥١) – منطقة توسعات عتاقة الصناعية – تنمية شمال خليج السويس – محافظة السويس	٠١٢٢٦٣١٢٣٣٣
١٢	شركة إنرجى كو	إعادة تدوير المخلفات الإلكترونية والكهربائية واستخراج المعادن النفيسة	منطقة ال (٧٥) فدان – القطعة رقم (٦٢) – المنطقة الصناعية بأبورواش – مدينة السادس من أكتوبر – محافظة الجيزة	٠١٠٢٣٠٢٣٢٣٦ ٠١١١١٣٦٥٦٥١
١٣	شركة اريبيان وى	إعادة تدوير المخلفات الإلكترونية والكهربائية واستخراج المعادن النفيسة	قطعة رقم (٥٥٥) – المنطقة الصناعية – مخازن الشباب – مدينة ٦ أكتوبر	٠١٠٠٠٥٥٥٠٨٤
١٤	شركة الفردوس ريسايكل	جمع وفرز وتفكيك وتصنيف وتدوير المخلفات الإلكترونية والمعالجة الثانوية للبوردات وإستخراج المعادن النفيسة منها.	القطعة رقم (٨٨) – مدينة الوحدة الوطنية – المنطقة الصناعية – أبو رواش – الكيلو (٢٦) طريق مصر إسكندرية الصحراوى – محافظة الجيزة	٠١٠٠٦٤٠٣٤٠٨

مدير عام الإدارة العامة للمواد والمخلفات الخطرة

ك/ الهام رفعت

الرئيس التنفيذى لجهاز تنظيم إدارة المخلفات

أ.د/ طارق العربى

حررت فى ٢٠٢١/١٢/٢٧

17 Annex 3: WMRA Rules for WEEE auctions

الاشتراطات البيئية التي يجب إضافتها بكراسة الشروط والمواصفات

يشترط في المتقدمين لمزاد بيع المخلفات الإلكترونية والكهربائية تقديم كافة المستندات والموافقات والتراخيص والسجلات الصادرة للمنشأة أو الشركة "من الجهات المعنية سواء كانت وزارة البيئة – وزارة التجارة والصناعة ... وغيرهم" الدالة على التصريح لهم بالقيام بنشاط إعادة تدوير المخلفات الإلكترونية والكهربائية، حسب نوع المخلف المرخص بإعادة تدويره على أن تكون هذه التراخيص والموافقات والسجلات (الصناعية – البيئية – المواد والمخلفات الخطرة) سارية.

وأن يكون للمتقدم سابقة أعمال في مجال تدوير المخلفات الإلكترونية مبينة في سجلات المنشأة أو الشركة.

تقديم تعهد يتضمن ما يلي:

الالتزام بعدم حدوث أية أضرار صحية أو بيئية أثناء القيام بالأعمال الخاصة بالمزاد وأعمال إعادة التدوير والتخلص النهائي الآمن من الأجزاء الخطرة.

الالتزام بالقوانين والإجراءات المتبعة بشأن إعادة تدوير المخلفات الخطرة والتخلص الآمن منها.

في حالة إذا ما ثبت تقديم مقدم العرض أي بيانات أو مستندات غير صحيحة، سوف يتم اتخاذ الإجراءات القانونية طبقًا لأحكام القانون ٢٠٢ لسنة ٢٠٢٠ والقوانين ذات الصلة:

- لا يسمح بدخول أى شركة إلى المزاد الا اذا كانت فى القائمة المعتمدة من جهاز تنظيم المخلفات والتى تعتمدعلى استيفاء الشركة على الموافقة البيئية والترخيص (هيئة التنمية الصناعية) من خلال معاينة الإدارة العامة للمواد والمخلفات الخطرة والهيئة العامة للتنمية الصناعية وتمت الموافقة عليها بأنها لا يوجد بها أى مخالفات.
- لا يسمح بإدخال المحولات الكهربائية المحتوية على زيوت فى المزادات الا بعد الحصول على شهادة من وزارة الكهرباء وبعد تحليلها وإنها لا تحتوى على مواد ثنائى فينيل متعدد الكلور PCBs.
- يحظر التخلي عن المخلفات أو تسليمها ألا في الأماكن المخصصة لها أو للأشخاص المرخص لهم بذلك ، وذلك حسب كل مخلف وحسب كل نشاط .
- فى حالة طرح المزادات الخاصة بالمخلفات الإلكترونية يتعين طرحها فى كراسة شروط مستقلة.

الرئيس التنفيذى

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