Mapping of Informal Sector

involved in E-Waste Collection

SRI
SUSTAINABLE
RECYCLING
INDUSTRIES

2017

SUSTAINABLE RECYCLING INDUSTRIES

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Executive Summary

The current task is carried out within the framework of the Sustainable Recycling Industries (SRI) project being implemented by the Swiss Federal Laboratories for Materials Sciences (EMPA) as mandated by the State Secretariat of Economic Affairs (SECO) of Switzerland. The main objective of this task is to map the informal sector involved in WEEE collection and dismantling, to identify and design a platform that could integrate the material flow (sales) from informal sector and households to formal sector, and to allow financial transfers. The geographic scope of the mapping is the Greater Cairo Area (GCA). The report is structured in the following manner:

Full description of the Informal Sectors characteristics involved in WEEE collection, dismantling and fractions details are provided including the following:

- Geographic scope of WEEE
- Number of collectors for each mapped area
- Type and quantities of electronic waste produced from the areas of concern
- Collection methodology
- Dismantling processes
- Fractions type, quantities, recycling opportunities and the destination of each fraction
- List of dealers or users of each fraction
- Amount of locally used fraction against the exported quantity
- Conclusion and recommendations

The scope of work was implemented through a survey of the informal sector to identify their needs and the challenges that they face; the survey supported a study that focused on the informal sector that collect, dismantle and deal with the fractions of the WEEE in the GCA. The objective of this study is to:

- Support the WEEE informal sector to develop its work and plan for formal small enterprises that may be establish in the future
- Recommend interventions that may boost the sector activities towards being environmentally friendly and protect the workers in the sector
- Identify the steps, needs and the methodology required to transform this sector to formal one
- The study used a combined methodology including site visits and in depth interviews with key collectors and dealers of the sector. Mounir Boushra, an expert who has experience and is known to the sector was in charge of the survey.

The study showed that the informal sector plays a main role in garbage collection in general and in the WEEE management in particular as it controls more than 95% of this business; the survey reported the distribution of the main transfer stations for collection and sorting of solid waste (including the WEEE within the greater Cairo Area).

The study also revealed that the productivity of each area from the WEEE of different types as per the survey carried out by Engineer Mounir Boushra.

The main actors in this sector are:

- The Traditional Waste Collectors (Zabbaleen – Arabic name for garbage collectors)
- Robabekeia collectors or Roamers (Sarriiha)
- Middlemen and Intermediary Buyers/Dealers
- Main dealers that collect the WEEE for further trading

The study summarizes the current conditions of dismantling process in the informal sector and related challenges due to lack of legalisation and awareness, which are reflected on the informal sector on all spheres; in particular, the dismantling workers are acting at no protection measures at the workplace or to the environment.

The study also provided full details about the produced fractions from each collection area (transfer station) and the destination of each fraction; this included:

- The type of fraction
- The monthly quantity collected according to survey sample
- The main dealers
- The final destination of used fraction (Locally / Exported)

The study discussed the proposed steps and the methodology required to assist the informal sector to be a formal entity based on the opinion of main dealers of WEEE at the survey area (Greater Cairo).

The proposed steps to transform the informal to formal sector are described in this study at all levels such as:

- The technical level
- The administrative level
- The financial level
- The social level
- The institutional level
- The environmental level

The study also discussed the needs of the informal sector after identifying the current situation at all levels and the discussion of the weakness points.

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List of Abbreviations

BMs	Base Metals
CRT	Cathode Ray Tube
EW	Electronic Waste
ICT	Information Communication Technology
IT	Information Technology
LCD	Liquid Crystal Display
MCs	Metals of Concern
MCIT	Ministry of Communication & Information Technology
NGO	Non-Governmental Organization
PCB	Printed Circuits Board
PGMs	Platinum Group Metals
PMs	Precious Metals
PPE	Personal Protection Equipment
SEs	Scarce Elements
(SECO)	State Secretariat of Economic Affairs of Switzerland
SMEs	Small and Medium Enterprises
SRI	Sustainable Recycling Industries project
SFLMS (EMPA)	Swiss Federal Laboratories for Materials Sciences
WEEE	Waste of Electrical and Electronic Equipment

1

Introduction

The E-waste collection in Egypt is dominated by the Informal Sector; Civil Society Organizations (NGOs) play also a role in this domain by supporting the sector. The main actors in this sector are:

- The Traditional Waste Collectors (Zabbaleen – Arabic name for garbage collectors). They provide residents with a door to door, daily collection service to gather all sort of waste including used households. They live in certain areas in the Greater Cairo Area in what became known as garbage complexes.
- Robabekeia collectors or Roamers (Sarriiha): Their name derives from the nature of their activity; they are those who roam the streets buying, trading, and exchanging recyclable waste items including WEEE. They have also accumulated knowledge of fixing and repairing old appliances and simple machines and as well they know the professional refurbishers and where they could potentially sell these items.
- The collected waste is traded through dealers:

  Middlemen and Intermediary Buyers/Dealers: These live inside and outside garbage collector's neighborhoods. They are known as dealers who own small-scale depots. They sell to wholesalers and large buyers.

  Wholesale Merchants of Recoverable from Roamers: These buy in bulk from small merchants who roam the streets and from the middlemen. They are large-scale dealers, who own large warehouses specializing in a single type of recyclable.

Other actors are the NGOs that provide a lot of support to the informal sector. They educate and empower youth through learning opportunities related to sustaining entrepreneurial recycling businesses and also advocates the garbage collector's community.

However, the sector works under neither legislations nor awareness for E-wastes possible impacts on the waste handlers and the environment. Moreover, the prominence of the informal sector in the waste collection and management in general and accordingly in the E-waste in particular is merging from the fact that:

- It is a well-established sector for years ago (mainly in municipal and E-waste).
- It is an intensive labor business, as most of the handling relies is manual. According to Engineer Mounir Boushra (Contracted Expert to perform the survey of this task)[1], one ton of waste can employ about seven workers – based on assumptions made for door-to-door waste collections. This figure is dynamic and may change from one region to another.
- It is a waste valorization business as the sector contributes in collection, dismantling and exporting the waste through dealers.
- It is well known that the income generated from waste recovery and recycling maximizes the value of this sector despite the fact it is not projected on the state economy.
- It is a substantial supplier to the formal sector that starts it operation from beyond the collection.

The current report is complementing a formal "ASSESSMENT OF RECYCLING INDUSTRY OPPORTUNITIES – FORMAL SECTOR", which was prepared within the framework of the

(1) Consultant/SRI project, July to 30 September 2016

Sustainable Recycling Industries (SRI) project being implemented by the Swiss Federal Laboratories for Materials Sciences (EMPA) as mandated by the State Secretariat of Economic Affairs (SECO) of Switzerland. The overall aim of this task is to map the informal sector involved in e-waste collection and dismantling. Identify and design a platform that could integrate the material flow (sales) from informal sector and households to formal sector, and allow financial transfers. The geographic scope of the mapping is the Greater Cairo Area and if possible hot spots of other governorates. The report is structured in the following manner:

Full description of the Informal Sectors characteristics involved in e-waste collection, dismantling and fractions details are provided including the following:

- Number of collectors for each mapped area
- Type and quantities of electronic waste produced from the areas of concern
- Collection methodology
- Dismantling processes
- Fractions type, quantities, recycling opportunities and the destination of each fraction
- List of dealers or users of each fraction
- Amount of locally used fraction against the exported quantity
- Conclusion and recommendations

2

Scope and Objective

As part of work package of the SRI Project, the current study will focus on the informal sector that collect, dismantle and deal with the fractions of the WEEE in Egypt. The main objective of this study is to:

- support the WEEE informal sector to develop its work and plan for formal small enterprises that may be establish in the future
- recommend interventions that may boost the sector activities towards being environmentally friendly and protect the workers in the sector
- identify the steps, needs and the methodology required to transform this sector to formal one

3

Methodology

The study used a combined methodology including site visits and in depth interviews with key collectors and dealers of the sector. An expert who has experience and is known to the sector is in charge of the survey.

4

Characteristics of the Informal Sector

The informal sector plays a main role in Garbage collection in general and in the WEEE management in particular; the carried out survey is based on information obtained from the field visits and discussion with waste collectors; the numbers included in the survey may not be accurate since the collectors may not reveal the true numbers. It is estimated that the informal sector controls about 95% of the garbage collection from houses[2]; this garbage includes limited percentage of WEEE. Their activity is concentrated in the Greater Cairo Urban Area, which includes Cairo, Giza and Qalubeya Governorates. More details about the distribution of their structure are described in the following sections of this report.

(2) Eng. Mounir Boushra, SW Expert

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Geographic Distribution of the Informal Collection Centers[3] and the Number of Collectors in each Region

(3) System of Waste Sorting & Recycling, Ministry of Civilization and Development of Slums, October, 2014

The following map is produced by the Ministry of Civilization and Development of Slums in October 2014. It shows the distribution of the main transfer stations for collection and sorting of solid waste (including the WEEE within the greater Cairo Area). Although supervised by the local authorities, the main supply is through the informal sector.

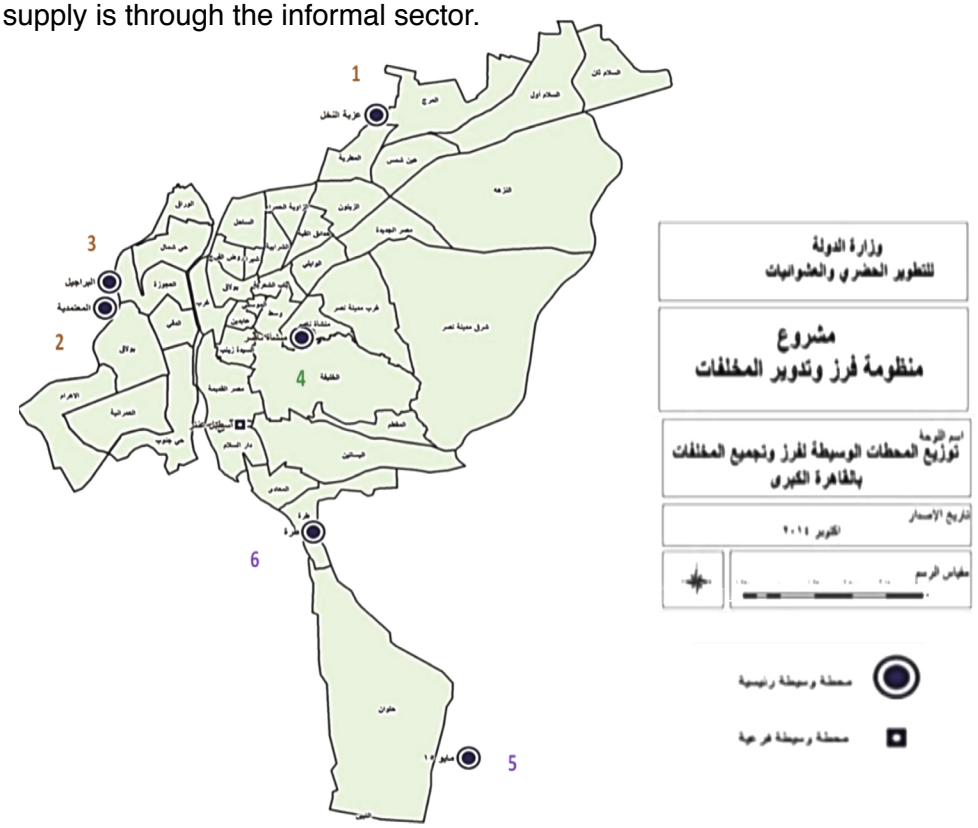

Figure 1: Distribution of Collection Centers all over the Greater Cairo Area

Table 1: Collection Centers Details

Collection Centers (Transfer Stations)				
Number	**Name of the Collection Center**	**Location (Governorate)**	**Number of Collectors***	**Remarks**
Region 1	Manshiet Nasser	Center of Cairo, Cairo Governorate	250	Central receiving area of waste
Region 2	Torah	South West of Cairo, Cairo Governorate	66	Main receiving area of the South West of Cairo
Region 3	15th of May	South west of Cairo Governorate	39	Main receiving area of the South of Cairo
Region 4	Ezbet El Nakhl and Khososus	Qalubeya Governorate	137	Main receiving area
Region 5	El Baraguel	Giza Governorate	82	Main receiving area
Region 6	El Moatamadia	Giza Governorate	109	Main receiving area
Waste Dealing Markets				
1	Souk El Gomaa	Cairo Governorate		Trading of most E waste
2	Open Market	Giza Governorate		

** Numbers in this Table is reported by Eng. Mounir Boushra as counted during the survey. Part of the counted people gave information and others did not (average percentage of collectors that contributed to the survey is 30%).*

5-1 Characteristics of Each Collection Center and Waste Market

As shown from the previous Figure and Table, the Greater Cairo Area incorporates six main collection centers (transfer stations) and two main waste markets. Further details about these centers are described in the following.

Manshiet Nasser Collection Center

This is largest area located in Mokattam near enough to the Cairo Center; where 65,000 inhabitants are mainly working in waste collection. They door to door daily collect all sort of waste including WEEE from several districts of Cairo. The Center receives about 8,000 ton of waste daily, where it is stored on site for further sorting and classification. About 80% of the received waste is recycled. The collected fractions are mainly Plastic frames that are crushed and prepared for sale to recycling companies the main fractions such as printed circuit boards PCBs are dismantled and sold to dealers.

Torah Collection Center

Torah settlement is located at the South West of Cairo; it is the smallest cluster among all of the Greater Cairo Area of about 5,000 inhabitants, most of them are working in the waste collection. Part of those inhabitants moved to Kattamia area as part of a program to relocate the Zabbaleen settlements outside the city skirts. This program is managed by one of the largest NGO in the field of waste management (the Association for Protection of the Environment – APE). They collect the waste and dismantle the equipment and sell the fractions to Middlemen and Intermediary Buyers/ Dealers.

15th of May Region

The waste is recycled at the collector's premises and the rest is directed to a solid waste management integrated facility of 2,000 tons management capacity per day. Waste further sorting process is carried out at this facility of approximately 1,500 tons/day, comprising assorted residential and commercial waste materials, which are directed to the composting facility for processing and recycling. Only rejects or overflows (35%) of the composting facility are directed to the neighboring landfill adjacent to facility. The WEEE is sorted and sold to main dealers.

Ezbet El Nakhl and El Khosous Region

They are the largest receiving area in the Qalubeya Governorate; beside waste collection, there are also many recyclers, equipment refurbishing facility (small shops), dealers, in addition to the other supporting businesses such as maintenance workshops and other commercial establishments.

El Baraguel

It is small area of very limited population 500 inhabitants that they work in the waste dealing business. It is directly connected to El Moatamadia as location and business.

El Moatamadia

It is located behind Ard El Lewa, Giza. Its population is estimated to be about 30,000 inhabitants that work in many businesses including the waste recycling. It is the third settlement in population, workforce and amount of waste to be handled after Manshiet Nasser in Moquattam and Ezbet El Nakhl.

Waste Transportation after Collection

The waste is transported to the transfer station after collection by either a donkey dragged cart or a small van; this depends on the collection area and how far it is from the transfer station. The following Figures show the transportation means used.

Means of Garbage Transport

Type of Labor Involved

Each collector engages 3 to 4 worker with him[4]; among theses 20 to 25% are children under the age (18 years as specified by Law 12 of child labor) and women are engaged mainly in the sorting and dismantling. The sorting is carried out in open air in the transfer station while the dismantling is carried closed room of average area 30 to 50 square meters, where at least 10 workers are employed in the dismantling process.

(4) Engineer Mounir Boshra (information collected during the survey)

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Type and Quantities of E- Waste from Each Area

The following Table shows the productivity of each area from the E-waste of different types as per the survey carried out by Engineer Mounir Boushra. The survey covered part of the market as indicated in the following:

Table 2: Collected Sample Percentages from Each Region

Region	Total Collectors	Visited Collectors	Sample Percentage
Tura	66	26	39%
Manshyt Naser	251	51	20%
El Baragel	82	30	37%
Helwan	39	19	49%
El Moaatmadya	109	34	31%
Qalubeya	137	47	34%
	684	**207**	**30%**

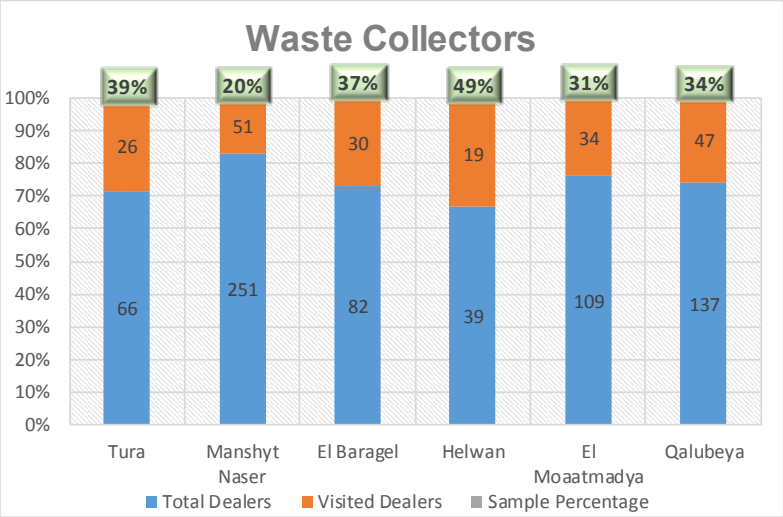

Figure 2: Waste Collectors that Contributed in the Survey

As shown from the Figure data was collected from different percentages of waste dealers and collectors in the different regions at an average of sample size 30%. The rest refused to contribute in the survey for different reasons such tax evasion, not to disclose information that might reach competitors and not to prevail their earning.

Table 3: Waste Production of Each Region in the Greater Cairo Area

Region	Total Waste (ton/y)	Plastic (equipment)	WEEE
Qalubeya	110	79	31
Manshyt Naser	92	81	11
El Moaatmadya	66	6	60
Tura	49	27	22
El Baragel	42	5	37
Helwan & 15 May	40	3	37
Total Amoint of Waste Produced	**399**	**201**	**198**

The numbers presented in the above Table reflects about 30% of the collected waste in the Greater Cairo area by the informal sector; this waste is mainly the house hold equipment within the collected garbage; it seems to be limited as compared to the WEEE produced in Egypt (372,000 ton/year)[5], as it does not include the e-waste produced by banks, governmental entities, schools,

(5) http://interactive.aljazeera.com/aje/2015/ewaste/index.htm

universities, hospitals, mobile companies, etc. These are huge amounts controlled by auctions, which are considered formal.

Informal Sector WEEE Production By Type

The following Figure elaborates more the capacity of each region and the type of waste produced. The Figure shows that, in total, the Qalubeya Governorate is the largest total waste producer, while Manshyt Nasser produces the largest amount of plastic as a bulk resulting from the EEE and other sources. El Moatamedia is the largest equipment collectors since it covers high class areas like Zamalek, Dokki and Mohandeseen.

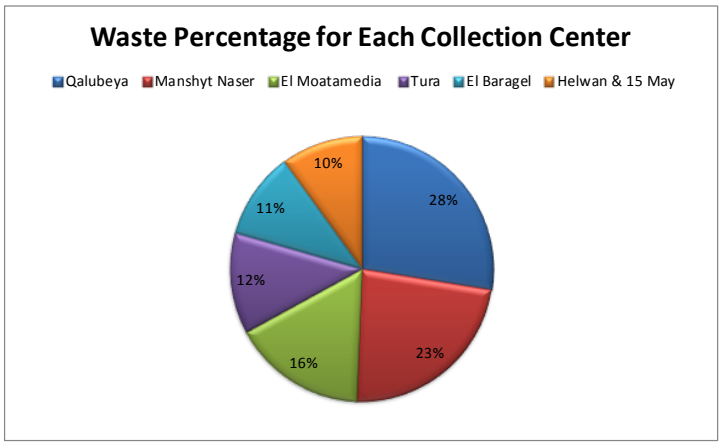

Figure 3: Total Waste Production in Percentage from Each Center in the GCA

As shown from the Figure, Qalyubia region produces 28% of the Greater Cairo total waste followed by Manshyt Nasser 23% and El Moatamedia is the third in the row that produces 16%. The three other regions are more or less producing the same percentages of 10 to 12%.

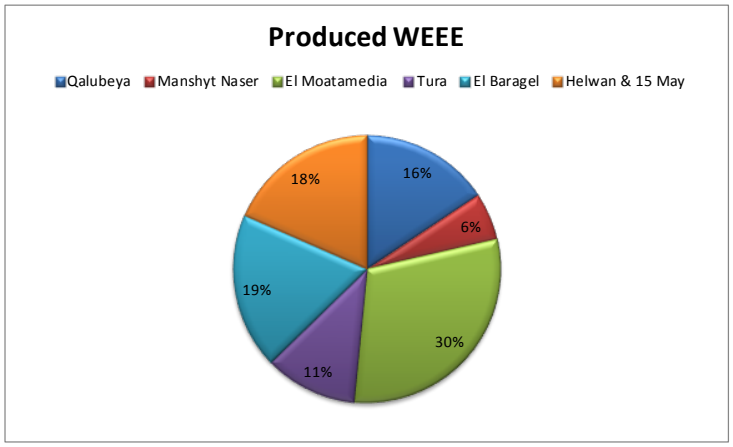

Figure 4: Percentages of WEEE from Each Region

Regarding the Total WEEE: As shown from the Figure, despite being the third in the total waste production, El Moatamedia produces the highest percentage of EEE, which is 30% of the total; it is followed by El Baraguel and then Helwan. The WEEE or E-waste in particular is divided into ten categories based on the European WEEE Directives 2002/96/EC[6] and 2012/19/EU[7] and is given in the following Table:

(6) European Parliament. Directive 200296//EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). Off. J. Eur. Union 2003, L37, 24–38.

(7) European Parliament. Directive 201219//EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE). Off. J. Eur. Union 2012, L197, 38–71.

Table 4: Waste Classification from Electrical and Electronic Equipment

No.	Category	Label
1	Large household appliances	Large HH
2	Small household appliances	Small HH
3	IT and telecommunications equipment	ICT
4	Consumer equipment	CE
5	Lighting equipment	Lighting
6	Electrical and electronic tools (with the exceptions of large-scale stationary industrial tools)	E & E tools
7	Toys, leisure and sport equipment	Toys
8	Medical devices (with the exception of all implanted and infected products)	Medical equipment
9	Monitoring and control instruments	M & C
10	Automatic dispensers	Dispensers

This equipment includes assorted fractions such as:

- Printed Circuits Boards (PCBs)
- Batteries
- CRT Monitors
- Motors
- Metal Frames
- Copper Wires
- LCD Monitors
- Base & Key boards

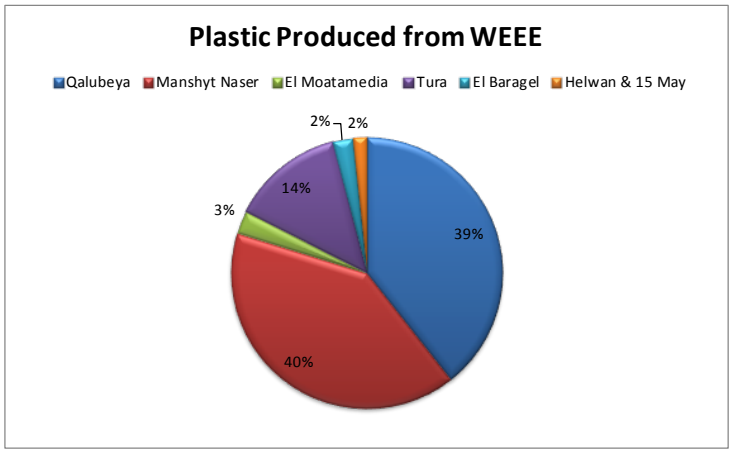

Figure 5: Percentage of Plastic Produced from WEEE

Since the plastic constitutes about 20% of E-waste equipment structure[8] in general, and 23% of the PCBs in particular[9]. It is produced in bulk mainly in Manshyt Nasser and in Qalyoubia. The plastic is the easiest fraction to process and to re-use.

(8) Association of Plastics Manufacturers in Europe (APME). Plastics—A Material of Choice for the Electrical and Electronic Industry-Plastics Consumption and Recovery in Western Europe 1995; APME: Brussels, Belgium, 2004.

(9) The Composition of Valuable Substances in E-Waste. Available online: http://ewasteguide.info (accessed on 19 November 2013).

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Collection Methodology

The waste is collected through door-to-door gathering by informal collectors (Zabaleen) and by Robabikia collectors. The following Table shows more details of the collection process:

Table 5: Collection Methods

Collection System Analysis		
	Collection Method	
Region	Waste Collectors (Zabaleen)	Robabekeia
Tura	73%	27%
Manshyt Naser	92%	8%
El Baragel	23%	77%
15th of May - Helwan	21%	79%
El Moatamadya	21%	79%
Ezbet El Nakhl & Khosous	68%	32%

The Table shows that Zabaaleen collection results in large amount of plastic like in Manshyt Naser and Tura, while collection by Robabekeia results in more equipment as in Giza Governorate and Helwan. The following graph details the collection system:

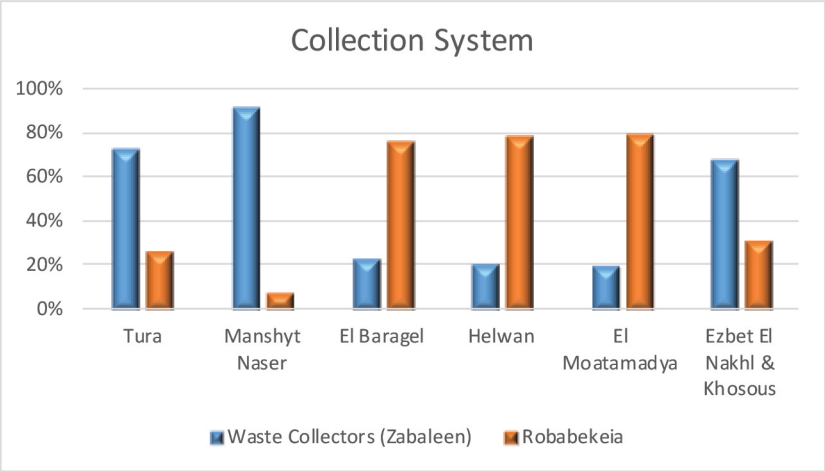

Figure 6: Distribution of the Collection System

The collected equipment includes a high percentage of WEEE. The following charts illustrate the percentages of waste collected by both Zabaaleen and Robabikia collectors.

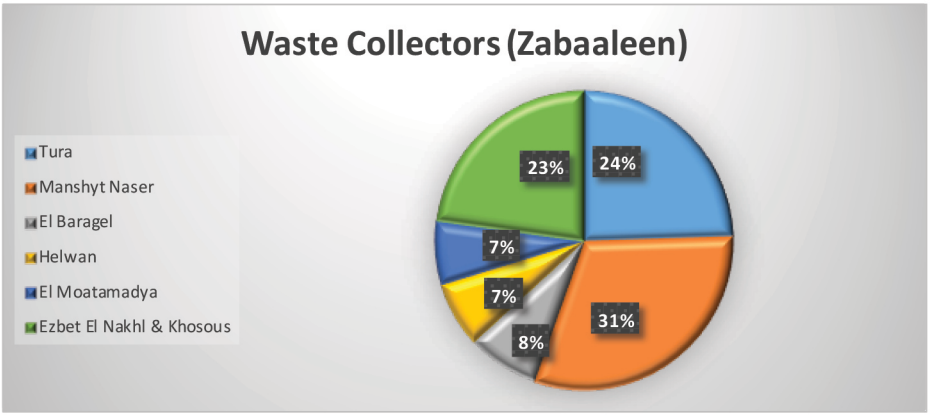

Figure 7: Waste Collection Distribution by Zabaaleen

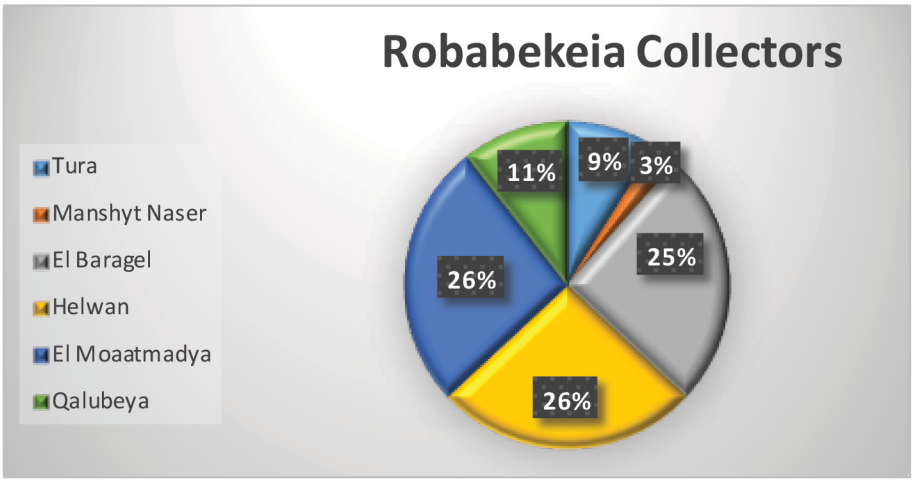

Figure 8: Waste Collection Distribution by Robabekeia Collectors

It is shown from the two figures above, that most of the waste that contains equipment is collected by robabekeia collectors from Tura, Helwan and El Baragel.


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The Current Dismantling/ Recycling Practices

- The informal sector is working in difficult conditions and many challenges due to[10]:
  - Lack of appropriate legislation
  - Lack of accreditation system for e-waste for private sector participation
  - The absence of effective take-back schemes
  - Lack of awareness about the threats and opportunities of the E-waste recycling
  - The lack of willing of consumers to give out their E-waste for free or affordable prices
  - Lack of qualified skills and professionals
  - Lack of appropriate infrastructure and technology for recycling
  - The high cost of the machinery used in recycling
  - The lack of incentive mechanism for tack back models
  - No specific entity that is responsible for managing E-waste recycling in Egypt

These challenges are reflected on the informal sector on all spheres; in particular, the dismantling where no protection measure to the workers or to the environment exist. The following describes typical dismantling steps carried out at the informal sector:

(10) Developing EPR Guidelines for Sustainable E-waste Management, Hoda Shakra Presentation, Unit manager, Green ICT program- IR division, March 2016

TV Dismantling

Step 1: Waste Classification

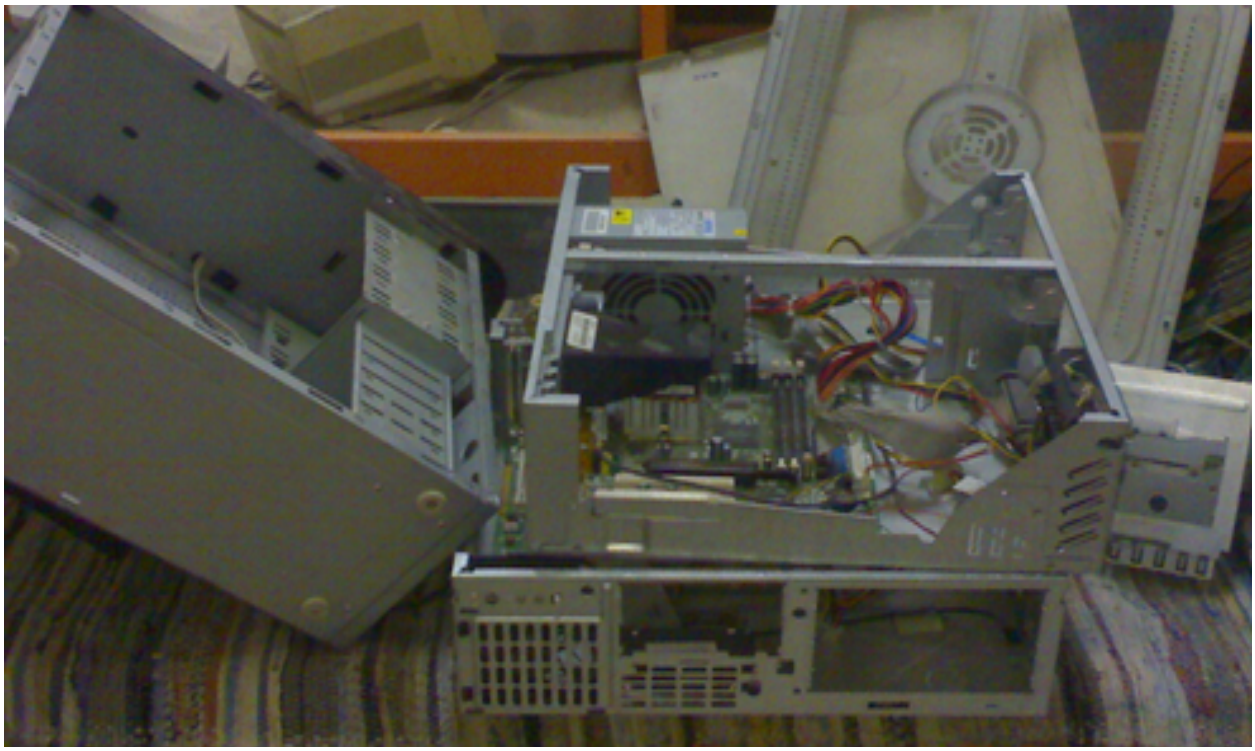
Classified Equipment (Computers) Ready for dismantling

Step 2: CRT Dismantling

CRT Dismantling

Dismantling the CRT Components including PCB

Step 3: Computer Case Dismantling



Computer Case Components Dismantling

Step 4: Bulk Components Dismantling

Computer PCB Bulk Component Dismantling (Aluminum Contactors, Capacitors, etc.)

As shown from the previous Figures that the dismantling process is carried out at no proper personal protection equipment (PPE). The dismantled fractions are grouped and packed for sale to specific dealers.

Copper Cables Burning

The copper is separated from the cables by burning, this produces intensive emissions including CO, CO2 and possible Dioxin and Furan that result from the plastic burning. The following Figures show this process. Most of the workers performing this activity are youth, underage children may be sometimes involved, and the burning process takes place in the transfer station.

Copper Wire Burning inside Informal Smelters

As shown from the Figure, child labor is used in the process.

Wire Stripping Machines in Informal Smelters

PCBs Processing

The dealers send the PCBs to families in rural areas[11] (could not be visited during the survey) of Giza governorate to extract the gold using a chemical process. They work unofficially under no protection to them or to the environmental, as they function inside their houses, which are normally of limited area; furthermore, the extraction process is inefficient, but the dealers are still using these families. Nobody knows about neither the deal between these families and the dealers nor the details of the process, which might expose these families to high risk especially women and children.

Dumped Hazardous Waste

Left overs resulting from the WEEE dismantling process such as BRF are dumped in the municipal dumping sites, while they should be dumped in the hazardous waste dumping facility in Nassereya at Alexandria Governorate, which is the only hazardous waste receiving facility. The ton of dumped waste cost about EGP 500 plus the cost of transport to Nassereya. This is a costly process that is why the dismantlers illegally dump these materials in the normal municipal dumping sites. This is of course an action that violates the Law Regulations. The amount of the resulted hazardous waste is indicated in the next Table, which shows that the dumped waste is about 50.8 ton/year among which is the BRF; this represents about 8% of the total WEEE.

Plastic Treatment

The separated plastic is treated on most of the sites using locally manufactured equipment:

- Plastic parts (hard plastic) are separated from the metallic parts either by splitting or by breaking
- No BRF exists in the recycled plastic as most of it is previously separated and dumped in the municipal waste dumping sites as mentioned before
- The part is checked for the possibility of reuse, if not, the hard plastic is crushed in a special crusher (shown in the next Figure)
- Plastics are separated by color and hardness. This process is called unification of color and raw material; collectors, dealers and owners of large workshops have experience in the identification of raw materials and the quality of their uses
- Broken Plastic is washed in tanks using hot water and caustic soda or potash is added to remove what might hang out of the dirt and fats / oils are then rinsed in cold water tanks; the product is then dried in open air or is sometimes dried by a centrifuge machine simply to expel water and it is dried using hot air
- Dried plastic is ready for reuse in injection mold machines to produce several products

(11) Information from dealers during the survey

The following Figure shows the locally manufactured used crusher:

Plastic Crushing Machine

CRT Processing

- The CRT is dismantled and checked for reuse; in case it is reusable, it is sold for refurbishers. In case it is non-useful, it is sold for glass producers where it is crushed, lead is removed and the glass is melted in high temperature furnaces.

9

Fractions Type, Quantities, Recycling Opportunities and the Destination of Each Fraction

The following Table shows the details of produced fractions from each collection area (transfer station) and the destination of each fraction; noting that the survey sample is only 30% of the existing market volume.

Table 6: Fractions Type, Recycling Opportunities and Destination of Each Fraction

Fraction Type	Quantity ton/year	Recycling Opportunities	Dealers/ User
Fractions produced from Manshyt Nasser			
Equipment	11.48		
Plastic fraction	2.28	Crushed ready for sale	Plastic Companies, which produce plastic chairs, house tools, cars plastic components, hard plastic components used as feed industry, etc.
PCBs of different types	2.6	Sold as it is	Sold to main dealer (Waheed Atito located at Mansheyet Nasser) for export
Ferrous metal	2.4	Sold as it is	Scrap dealers/ foundries that produce valves, feeding industry components, car industry components, cast iron pipes, etc.
Copper wires	0.6	Manually stripped	To foundries that produce bronze valves, house accessories, bearing bushes, car feeding industry, etc.
CRT glass	1.8	Sold as it is	
Batteries of different types	≈ 1.2	• Lead acid batteries sold as they are • Mobile batteries & Lap top batteries sold as they are	Lead smelters that produce car batteries, lead pipes, rolled lead sheets, lead oxide, etc. Dealers for export
Others (Dumped waste including hazardous BRF)	0.6		
Fractions produced from Qalubeya			
Equipment	31.29		
Plastic fraction	6.24	Crushed ready for sale	Plastic recyclers (see above)
PCBs of different types	≈ 7.2	Sold as it is	Sold to main dealer (Adel Abdel Malak at Ezbet El Nakhl) for export
Ferrous metal	≈ 6.6	Sold as it is	Scrap dealers/ foundries (see above)
Copper wires	1.65	Stripped	To foundries (see above)
CRT glass	4.92	Sold as it is	To either refurbishers or to glass manufacturers
Batteries of different types	≈ 3.24	• Lead acid batteries sold as they are • Mobile batteries & Laptop batteries sold as they are	Lead smelters (see above) Dealers for export
Others (Dumped waste including hazardous BRF)	≈1.44		

Fraction Type	Quantity ton/year	Recycling Opportunities	Dealers/ User
Fractions produced from El Moatamedia			
Equipment	60.12		
Plastic fraction	12	Crushed ready for sale	Plastic recyclers (see above)
PCBs of different types	13.8	Sold as it is	Sold to main dealer for export
Ferrous metal	12.6	Sold as it is	Scrap dealers/ foundries (see above)
Copper wires	3.12	Stripped	To foundries (see above)
CRT glass	9.48	Sold as it is	
Batteries of different types	6.24	• Lead acid batteries sold as they are • Mobile batteries & Laptop batteries sold as they are	Lead smelters (see above) Dealers for export
Others (Dumped waste including hazardous BRF)	2.88		Plastic recyclers
Fractions produced from Tura			
Equipment	22.32		
Plastic fraction	4.44	Crushed ready for sale	Plastic recyclers (see above)
PCBs of different types	5.04	Sold as it is	Sold to main dealer (at Mansheyt Naser) for export
Ferrous metal	3.36	Sold as it is	Scrap dealers/ foundries (see above)
Copper wires	1.2	Stripped	To foundries (see above)
CRT glass	3.6	Sold as it is	
Batteries of different types	≈ - 2.4	• Lead acid batteries sold as they are • Mobile batteries & Laptop batteries sold as they are	Lead smelters (see above) Dealers for export
Others (Dumped waste including hazardous BRF)	≈ 2.28		
Fractions produced from El Baragel			
Equipment	37.44		
Plastic fraction	7.5	Crushed ready for sale	Plastic recyclers (see above)
PCBs of different types	8.4	Sold as it is	Sold to main dealer for export
Ferrous metal	5.64	Sold as it is	Scrap dealers/ foundries (see above)
Copper wires	1.92	Stripped	To foundries (see above)

Fraction Type	Quantity ton/year	Recycling Opportunities	Dealers/ User
CRT glass	6.0	Sold as it is	
Batteries of different types	4.02	• Lead acid batteries sold as they are • Mobile batteries & Laptop batteries sold as they are	Lead smelters (see above) Dealers for export
Others (Dumped waste including hazardous BRF)	3.96		
Fractions produced from Helwan/15th of May			
Equipment	36.72		
Plastic fraction	7.2	Crushed ready for sale	Plastic recyclers (see above)
PCBs of different types	8.4	Sold as it is	Sold to main dealer for export
Ferrous metal	5.4	Sold as it is	Scrap dealers/ foundries (see above)
Copper wires	1.8	Stripped	To foundries (see above)
CRT glass	6.0	Sold as it is	
Batteries of different types	3.84	• Lead acid batteries sold as they are • Mobile batteries & Laptop batteries sold as they are	Lead smelters (see above) Dealers for export
Others (Dumped waste including hazardous BRF)	4.08		

The previous Table shows that the plastic fractions are the ones that are recycled in place, while the other fractions are sold to main dealers or recycling companies for further processing.

The following Table gathers the type of fractions and the amount produced from the GCA according to a sample size of 30%.

Table 7: Total Fractions and Types produced from the GCA

Type of Fraction	Quantity ton/year (Sample Size 30%)	Corrected Quantity ton/year	Main Dealer	Remarks
Plastic fraction	39.66	132.2	Plastic recycling companies	This amount is produced from the WEEE only; a larger amount is resulting from the municipal waste
PCBs of different types	45.456	151.52	• Waheed Atito - Manshyt Nasser • Adel Malak - Ezbet El Nakhl Qalubeya • Ammar Qalubeya is a main exporter of the PCBs	These dealers may sell the PCBs to the formal sector such as EERC, RECYCLOBIKIA & ITG
Ferrous metal	36.0	120.0	• Scrap dealers • Foundries	Scrap dealers compile large quantities to supply the foundries
Copper wires	10.5	35.0	• Scrap dealers (they compile large quantities to supply the foundries) • Copper foundries	
CRT glass	28.2	94.0	• Glass recyclers	
Batteries of different types	21.0	70.00	• Lead acid batteries go to the lead smelters • The lithium batteries go to main exporters	
Others (Dumped waste including hazardous BRF)	15.24	50.8	Currently dumped in the dumping sites	This quantity includes hazardous materials such as fire retardant; it should be dumped in a hazardous waste dumping facility

10

Amount of Locally used Fractions against the Exported Quantity

The amount of locally used fractions against the exported is calculated from the previous data (Item 9). The exported fractions are mainly the PCBs and the Lithium batteries. These ratios are shown in the next Table:

Table 8: Amount of Locally used Fractions / Exported Quantities

Type of fraction	Amount in KG/month	Ratio = Exported:Locally Used	Percentage of the Total Produced Fractions
PCBs	12627	of the PCB s are exported 100%	25%
Lithium batteries	2500	of the Lithium batteries are exported 100%	5%

In reference to the previous Table, the exhibited figures are approximate since the surveyed sample is 30% of the market size, which may not reflect the actual volume of the whole market. All PCBs and Lithium batteries are exported through main exporters for further processing. The PCBs are refined abroad for precious and base metals extraction, while the Lithium batteries are further processed there. These fractions are exported due to the fact that the refining process is not developed in Egypt; in addition, the proper refining needs special equipment of high investment cost.

11

Proposed Steps and the Methodology required to assist the Informal Sector to be Formal

The survey included opinion poll about being transferred to formal entity; many of them preferred to stay working as informal. This is due to:

- Tax evasion
- Most of them see that no benefits or law protection from being formal
- Most of them do not want to expose their business to others

Survey Results

The following charts show the results of poll.

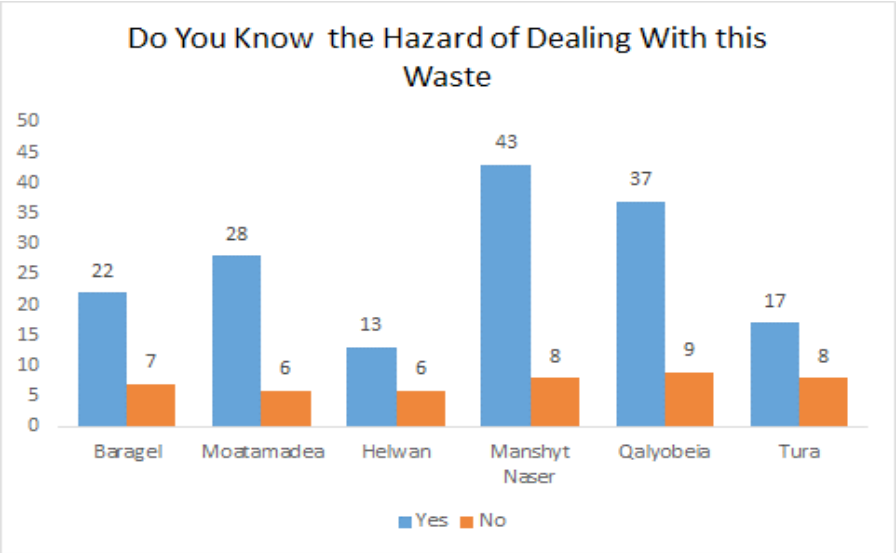


Figure 9: Survey about the Hazard of the Waste

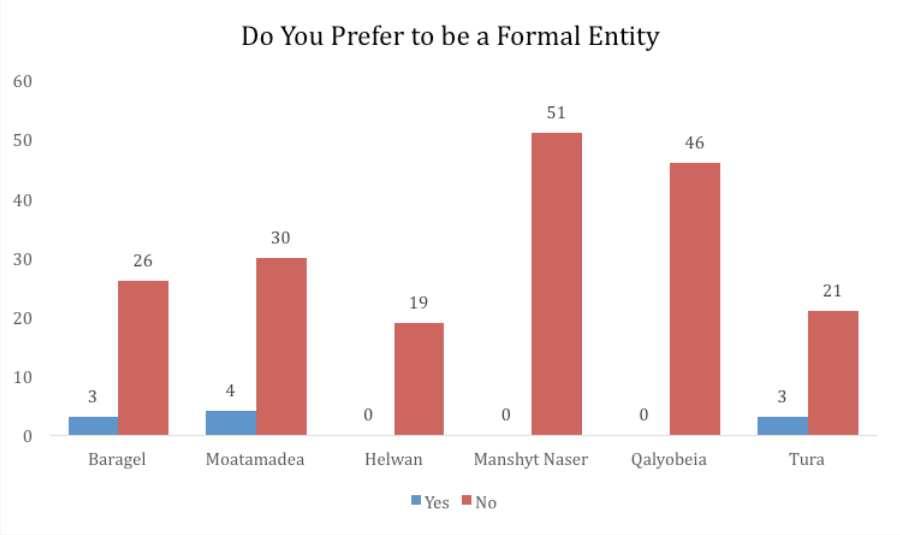


Figure 10: Survey Results about Being Formal

As shown from the previous Figures, the workers in the informal sector are not aware about the hazards of dealing with the waste; further, most of them do not want to be belonging to a formal sector.

12

Proposed Steps to transform the Informal to Formal Sector

Following are suggestions for solutions and alternatives that can be applicable for the sector transformation; this should be in coordination and extensive discussion with the competent authorities, small WEEE collectors, workshop owners, dismantlers, for example:

- The owners of these workshops and companies
- Egyptian and international NGOs of concern
- Current and potential donors
- Government bodies responsible for the environment and communications such as the Ministries of Environment and Communications
- Electronics and telecommunications companies
- Trade unions operating in the recycling and electronic industries and export areas

12-1 At the technical level

The sector requires the following:

- Establishing of bourse for waste, as well as for used electronic devices.
- Establishing of regional centers for processing and recycling of this waste and to provide sites for / alternative to display their wares in the form of organized markets.

12-2 At the administrative level

It's necessary to create an independent administrative authority to oversee the trading, processing and recycling and export of electronic waste at the level of the Arab Republic of Egypt in general and the Greater Cairo area, in particular, or to be part of the central administration for solid waste management; independently or in cooperation with the competent administrative official, one NGO should be established (one of the currently established NGO could be assigned) having the following specifications:

- Influential among the waste collectors, workshops and the traders of the informal sector
- With strong links with the concerned governmental authorities such as the Ministry of Environment and Ministry of Communications
- Managerial competencies (of organizational and legal aspects) and expertise commensurate with Work required of them
- Previous administration experience in revolving loan (small and micro)
- Strong presence of social dimensions (Taking into account the children's and women's employment problems) and environmental requirements (considering handling of hazardous waste, environment and the health of the workplace)

12-3 On the financial level

The sector should be provided with lending services (revolving loan) to the members of the official union or NGO, which should plan to convert the informal sector to formal traders and workshops.

12-4 At the legal level

The NGO shall supervise the transformation procedure of the informal sector to formal traders and workshops of WEEE management program and provides legal support for them by facilitating their access to the legal approvals necessary to obtaining commercial registers and tax cards. Further, the NGO should help to facilitate the development of these workers in the formal image.

12-5 At the social level

The NGO shall raise public awareness about dealing with electronics consumer and appreciating the seriousness of this matter in the absence of proper handling of these wastes on public health, by necessity of dealing with formal registered companies.

12-6 At the institutional level

Choose one or more of the Egyptian NGOs with expertise in the area of WEEE management and who have a strong influence with the traders and owners of workshops (This can be done in collaboration with the Association or more international civil associations willing to work in Egypt in this field who have sufficient experience) to provide training services for industrial health and safety, methods of dismantling, recovery of precious materials processing and marketing, as well as the health and social insurance services for employees. They can also assist in establishing a union for workers in this area to protect these workers from the monopoly of the big traders, to secure sustainability of their work, as well as to help to put them on official business map.

12-7 On the environmental level

On the environmental level, it is required to implement standards for places of storage, processing and recycling of electronic waste. Occupational health of workers should be promoted by continuous inspection of work places and impose fines in case of environmental law for violation.

13

Informal Sector Needs Assessment

Following is an elaboration of the needs of the informal sector after identifying the current situation at all levels and the discussion of her weakness points:

13-1 At the technical level

Following is a discussion of the current situation of the informal sector regarding dealing with the WEEE by tracking the wastes cycle from the beginning.

Waste Collection

The current situation

The WEEE is generated from:

The residential areas

The WEE is collected from:

- Household garbage as they are separated through the garbage sorting process done by the traditional scavengers to recycle or resell
- Home appliances sold to ROBABIKYA traders (they sell the waste to another traders or maintenance workshops to repair them or use as spare parts)

Commercial or industrial institutions

- The used or damaged electronic devices are sold through auctions according to the generated quantity and the administrative and legal system in these institutions

The needs

In order to organize the WEEE management, a system that includes trading centers to deal with the waste (a chain of receiving sites) specially the generated from the residential areas; this allows the trading of waste with reasonable prices –according to its value (can be recycled or contains valuable materials), as the wastes and the damaged devices shall be collected and sorted according to their material and their contents. The environmental and health and safety dimensions shall be considered when dealing with waste even during preparation for export.

WEEE Storage

The current situation

The waste is stored as a primary storage in:

- Houses of residential areas before selling or getting rid of the other household wastes
- Warehouses in commercial and industrial installations

Waste is stored after collection as follows:

- Opened or semi closed areas
- Closed and built stores belong to large traders and the traders that have formal commercial registers and taxes cards

The needs

Awareness of the importance of storage of the electronic waste regarding the technical, environmental and health issues by sorting, packaging and initiating a data base and records to facilitates the trading process as well as facilitate the identification of the size and quantity of materials including precious, rare and base metals that can be retrieved from the waste.

WEEE Treatment

The current situation

Now the damaged and consumed electronic devices are treated as the following:

- Stored and sold as they are for traders or for maintenance workshops to be used as spare parts
- Dismantled and selling components to repair workshops. The smashed parts are sold to scrap dealers or for workshops to be recycled specially the plastic parts or the metal parts
- Dismantle special fractions such as the boards for sale to exporters after packaging
- Try to refine some elements of fraction to obtain precious metals such as gold and platinum

The needs

- Providing training courses and information guidelines for the most appropriate means of recovery of precious metals from the consumed or smashed electronics
- Provide the necessary equipment for the recovery of precious metals at a reasonable cost and through a small lending programs
- Provide PPEs and industrial safety equipment that is used to protect workers

Fractions Export

The current situation

The PCBs are collected by large dealers and then sold to exporter, which compile large amount to be properly packed and prepared for export through local customs codes that allow export.

The needs

Outsourcing the fractions refining outside Egypt in clusters, i.e. many of them should act in group to gather the required feasible amount, which is 50 ton/month and share the cost of this process in order to realize a profit.

2017

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