



**Situation of Electrical and Electronic Waste in Hebron Governorate
Case Study (Idna, Beit Awa and Deir Samet).**

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Submitted to the College of Engineering

In partial fulfillment of the requirements for the

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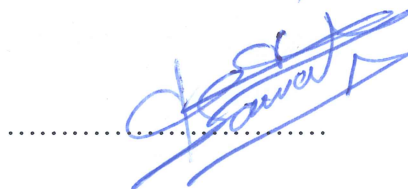
Palestine Polytechnic University
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Beit Awa and Deir Samet)

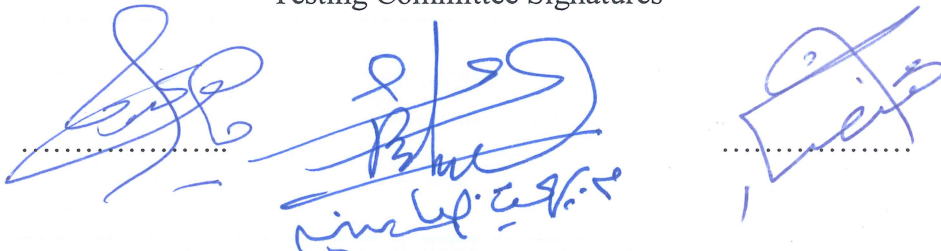
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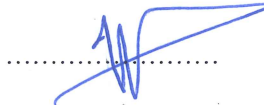
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Abstract

Hazardous waste poses major problems on the environment and also public health. In Palestine no considerable efforts were made for quantifying electrical and electronic HW. The study responds to a real need for spatial database, quantities and classification of EEW treated from Idna, Deir Samet and Beit Awa. The objectives of this project is to classify and situation of EEW deal with in Hebron Governorate case study (Idna, Beit Awa and Deir Samet). A scheme for processing geographic spatial data for obtaining the distribution of EEW in Idna, Beit Awa and Deir Samet, using GIS application. The quantity of the waste that deal with EEW were determined, with a view of environmental and health impacts of EEW. The research methodology is based on descriptive approach including preparing a questionnaire, field visits, data collection and analyzing. This study is based on the draft Palestinian HW List and Basel HW List.

The result of this study indicate that the total amount of the waste that deal with EEW from all sectors in Idna, Deir Samet and Beit Awa is 10 950 ton/Year. The main fraction of this EEW is domestic 5077 ton/year at a percent of 47% of 20% from Hebron west Bank. Domestic EEW is mainly from large housewares as code of (07-02-105/106 or 07-03-101/107), contains residue of hazardous substances, its generation rate is 2151 ton/year. Maps of the EEW distribution and land use in Idna, Deir Samet and Beit Awa are presented. EEW quantities and characteristics are tabulated in the form of GIS database, which are essential requirements for planning and implementing future EEW projects in Idna, Deir Samet and Beit Awa.

The study concluded that there is a need to treatment of EEW especially for large housewares to reduce the pollution of environment and risk of human. Also, there is a need for developing policies to manage EEW.

اهداء

الى من جرع الكأس فارغاً ليسقيني قطرة حبه

الى من كَلَمَ انامله لنا لحظة سعادة

الى من صد الاشواق عن دربي ليمهد لي طريق العلم

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الى من سرنا ونحن نشق الطريق معا نحو النجاح والابداع..... زملائي وزميلاتي

الى من ضحوا بحريتهم من اجل حرية غيرهم.....الاسرى والمعتقلين

الى من هو اكرم منا مكانة.....شهداء فلسطين

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الى من احتضنتني كل هذا الكم من السنين.....فلسطين الحبيبة

شكر وتقدير

(قل اعملوا فسيرى الله عملكم ورسوله والمؤمنون)

صدق الله العظيم

ألهي لا يطيب الليل الا بشكرك ولا يطيب النهار الا بطاعتك.. ولا تطيب اللحظات الا بشكرك..

ولا تطيب الآخرة الا بعفوك.. ولا تطيب الجنة الا برويتك

الله جل جلاله.....

لا بد لنا ونحن نخطو خطواتنا الأخيرة في الحياة الجامعية من وقفة نعود الى اعوام قضيناها في رحاب الجامعة مع أساتذتنا الكرام الذين قدموا لنا الكثير باذلين بذلك جهودا كبيرة في بناء جيل الغد لتبعث الأمة من جديد.....

وقبل ان نمضي نقدم أسمى آيات الشكر والامتنان والتقدير والمحببة لبي الذين حملوا اقدس رسالة في الحياة.....

الى الذين مهدوا لنا طريق العلم والمعرفة.....

الى جميع أساتذتنا الأفاضل.....

"كن عالما ... فان لم تستطع فكن متعلما , فان لم تستطع فأحب العلماء,
فان لم تستطع فلا تبغضهم"

ونخص بالتقدير والشكر الأب الروحي لتخصص هندسة تكنولوجيا البيئة والذي علمنا التفاؤل والمضي الى الامام, الى من ربانا وحافظ علينا, الى من وقف الى جانبنا عندما ضلنا الطريق.....

الدكتور حسن صوالحة.....الدكتور ماهر الجعبري.....

الذي نقول له بشراك قول رسول الله صلى الله عليه وسلم:

"ان الحوت في البحر, والطير في السماء, ليصلون على معلم الناس الخير"

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Terminologies

Abbreviation	Description
EEW	Electrical and Electrical Waste.
HW	Hazardous Waste.
EQA	Environmental Quality Authority.
EU.EEW	European Union of Electrical and Electrical Waste.
CRT	Cathode Ray Tube.
LCD	Liquid Crystal Display.
UNEP	United Nations Environment Program.
EWC	European Waste Catalogue.
EU	European Union.
RCRA	Resource Conservation and Recovery Act.
EPA	Environmental Protection Authority.
CFR	Council on Foreign Relations.
HS	Harmonized Commodity Description and Coding System.
ICT	Information and Communications Technology.
UNU	United Nations University.
Mt	Million metric tons.
IT	Information Technology.
ELO	European List of Wastes.
BFRs	Brominated Flame Retardants.
PCB	Polychlorinated Biphenyl.
PCT	Polychlorinated Terphenyl.
PCN	Polychlorinated Naphthalene.
PBB	Polybrominated Biphenyl.
GIS	Geographic Information Systems
LCD	Liquid Crystal Display

Chapter One

Introduction

1.1 General Background

Hebron is the largest city in the west bank with a total area 997 km². It is a high population around 711 223 people in 2017 [1]. Rapid urbanization, industrial development in the city accelerated the generation of hazardous and non-hazardous waste. HW is usually contains a harmful substance include heavy metal and carcinogenic for which pose real threats on human health and the environment. EEW contains hazardous and heavy metal that dangerous to human health and the environment because they contain 1000 toxic substances, including (arsenic, cadmium, chromium, copper, lead, nickel, beryllium, mercury, PVC) [2].

EEW is abundant in Hebron Governorate, especially in the area of Idna, Beit Awa and Deir Samet. The total amount of scrap and EEW collected in the town of Idna, Beit Awa and Deir Samet is 11000 tons per year [3]. About 80% from Occupied Territories of these wastes in the town are: remnants of old cars, refrigerators, all kinds of electrical and electronic appliances, electronic and electrical device and cables[3].

So that there are 25 large workshops for disposal of scrap and EEW, 60 medium sized workshop, 100 small-sized workshops, 200 workshops inside the houses and more than 200 street vendors. There are 1500 permanent employee in the workshops, 5,000 non-permanent and more than 100 children under the age of 18 years.

In recent years, the issue of HW, especially EEW, has become of great importance at all levels in Palestine and specifically in the Southern West Bank. Not only for the environmental implications of this sector, but also for its importance, economic and social impact. The sector is a major source of income for residents in Idna, Beit Awa and Deir Samet towns[3].

Local Palestinian Environmental Laws and regulations tackled this issue as given in the following laws[3]:

According to Environmental Law No. 7 of 1999, the EQA, which deal with the subject of HW in the Environment Law, is:

- Article 11: which deals with the responsibility of the EQA in relation to the issuance of a list of hazardous substances and wastes. The article states that the ministry shall issue in coordination with the competent authorities a list or a list of hazardous substances and wastes.
- Article 12: of the law on the restriction of the use of hazardous substances by regulations and instructions: no person shall manufacture, store, distribute, use , treat or dispose of any hazardous, liquid, solid or gaseous material or waste except in accordance with regulations and the changes determined by the Authority in coordination with the competent authorities.
- Article 13: prohibition of the importation of HW and restricting their passage through the Palestinian territories:
 - 1-HW is prohibited from passing through Palestinian lands, territorial waters or economic zones.
 - 2- Exclusive only with the special permission of the EQA.

In accordance with national environmental concerning EEW to the policies and strategies of the EQA in the disposal of large quantities of EEW, this project aims a classifying type of EEW and its distribution sites using the GIS program in Hebron Governorate including the quantities of EEW accumulated in Idna, Deir Samet and Beit Awa.

The project was divided into three parallel directions. The first direction was preparing a management of EEW in Idna, Deir Samet and Beit Awa. The second direction was design a questioners for EEW. The third direction was establishing a computerized GIS database of EEW in Idna, Deir Samet and Beit Awa.

1.2 Literature Review

Several studies reported a classification, management, recycling and disposal of EEW:

1-Deepali Sinha-Khetriwala, Philipp Kraeuchib, and Markus Schwaninger in 2005, A Comparison of Electronic and Electrical Waste recycling in Switzerland and in India. From the two case, it is clear that the electronic and electrical waste management systems in the two countries are very different based on the: electronic and electrical waste per capita, employment potential, occupational hazardous and emissions of toxics. These criteria were chosen because they feature prominently in discussions related to electronic and electrical waste[4].

2-As a result of the tenth meeting conference, under the Basel Convention, in 2013. A Methodological Guide for the Development of Inventories of HW and Other Wastes under the Basel Convention was published. Committee for administering the mechanism asked for promoting implementation and compliance with the Basel Convention to develop guidelines document of inventories of waste and HW in countries that don't have fact numbers of waste they produce from industrial sectors, in order to help these countries to take actions to manage their waste and to fulfill with the national obligations [5].

3-Xianbing Liu, Masaru Tanaka, Yasuhiro Matsui in 2006, Electrical and Electronic Waste Management in China: Progress and the Barriers to Overcome. The informal electrical and electronic waste recycling processes must be prohibited by legislation, laws and replaced by large scale facilities as soon as possible in China. Some research must be done in order to estimate and more precisely predict the amount of electronic and electrical waste that is likely to be deal with and then to quantify the cost and environmental impacts of the whole recycling system [6].

4- Ramzy Kahlhat, Junbeum Alenby, Eric Willams, Peng Zhang in 2008, Exploring Electronic and Electrical waste management systems in the United States. It is clear that the United States needs to implement new collection, recycle and reuse systems for electronic and electrical waste management. The three different levels of operation for waste collection and recycling systems. In the first system, the market generates cyclical

material flows. In the second system, regulations establish incentives without requiring a specific behavior. In the third system, regulations mandate a specific behavior. Based on this analysis, the proposed electronic and electrical market for returned deposit system combines the first two models by offering economic incentives established by law without enforcing redemption [7].

5- Maher Al-Jabari in 2014, Comparative Study of International and Regional Systems for the HW Classification and Listing. There is no reliable specific classification and coding system in Palestine for HW. His study analyzed and compared international and regional classification systems, including; the Basel Convention, the American Waste List, and the European Waste List. The study focused on legislation, definitions of waste, HW and their characteristics, coding systems. The American List characterizes HW based on their content (type). The European List has classified HW depending on the source that releases it [8].

6- Maher Al-Jabari in 2014, Establishing HW list, for a developing country: Palestinian case study. Aimed to establish a Palestinian HW classification system. Where it was based on the European classification system but for the Palestinian waste case, depending on the properties of the waste [9].

7-A national master plan was prepared by EL-Hamouz in 2010, the development of a national master plan for HW management for the Palestinian National Authority. This study intended to design an implementation plan on management aspects of HW. Also to fulfill obligations under the Basel Convention on trans boundary movement of HW including their minimizing environmentally sound management, activating the promotion of transfer and using of cleaner technologies. Author used the Basel convention for HW classification, this convention is not recommended for local HW classification since it focuses on trans boundary of waste. Also, this study classifies Chromium (III) as a HW, where it doesn't contain any one of the hazardous characteristics[10].

8- Mahamid I, Thawaba S in 2010, Multi-criteria and landfill site selection using GIS: a case study from Palestine. This paper aimed to determine a suitable landfill site with less impact on environment. GIS used as a tool for identify a potential site for an

appropriate landfill area for Ramallah Governorate. The vulnerability map for the area was created by using thematic maps and the result was compiled to the buffer zones around sensitive areas. By using multi-criteria analysis, a candidate site was allocated taking into consideration the sensitive areas in order to find out the best location for the expected regional landfill site [11].

1.3 Research Question Statement

1.3.1 Main Research Question

How to manage and recycle EEW in Hebron Governorate?

1.3.2 Sub Research Question

- 1-What are the types, categories and total quantities of EEW treated in Idna, Deir Samet and Beit Awa?
- 2-What types of hazardous materials present in the EEW?
- 3-What is the fate of the deal with EEW in Idna, Deir Samet and Beit Awa?
- 4-What are the general environmental and health impacts of EEW?

1.4 Objectives

The main goal of this project is to manage and classify the EEW treated in Hebron Governorate (Idna, Deir Samet and Beit Awa), in addition to developing and GIS database for classification EEW in Idna, Deir Samet and Beit Awa. The objectives are stated as follows:

- 1-To manage and quantify the deal with EEW in Idna, Deir Samet and Beit Awa in relation to their environmental and health impacts.
- 2- To develop a GIS database for EEW in Idna, Deir Samet and Beit Awa.
- 3-To establish EEW classification map for Idna, Deir Samet and Beit Awa.
- 4-To raise the awareness about the environmental health risks of EEW.

1.5 Methodology

In order to achieve the project objectives, the following methodology will be followed:

- 1- Establishing a database of the local EEW workshop in terms of their number, location and, size.
- 2-Field visits to the workshops to obtain required data on the quantities and classification of EEW this shall include personal interviews with the manager and employees together with distributing well-designed questionnaire for EEW.
- 3- Establishing a GIS database based on the location, size, quantity and classification of EEW in Hebron Governorate (Idna, Deir Samet and Beit Awa).

1.6 Significance of Project

EEW in Palestine has real health and environmental risks. After reviewing the current situation of the EEW and the available literature, it was found that this issue suffers from lack of attention as summarized in the following points:

- 1-Lack of data about quantities and classification of EEW treated in Idna, Deir Samet and Beit Awa.
- 2-Poor GIS distribution map for sectors in Idna, Deir Samet and Beit Awa.
- 3-Low of public awareness about the amount of EEW produced and its impact on the environmental, public health.
- 4-The absence of spatial database or GIS maps of EEW produced in Idna, Deir Samet and Beit Awa.
- 5-Limited environmental laws and regulations of HW in Palestine.

1.7 Budget

The total cost for implementing the project have been estimated and illustrated in the table 1.1 below:

Table 1.1: The total estimated cost for implementing the project.

Activity	Cost NIS
Local Transportation	200
Producing GIS Maps	200
Producing Statistical Data	100
Prepare and analyses a Questioner	300
Printing	400
Total 1200 NIS	

1.8 Action Plan

The project consisted of six tasks, which were planned to be completed in accordance with a specific time schedule. Table 1.2 illustrated the description of each of the six phases of the project and tasks involved in this semester:

Table 1.2: Phases and duration of the project.

Task	Duration				
	30/8	25/9	25/10	25/11	15/12
Problem Identification					
Establishing Background					
Literature Review					
EEW Classification					
Writing the Report					

Table 1.3 summarized the description of the phases of the project and tasks that will be carried out during the next semester:

Table 1.3: Phases and duration of the project for the next semester.

Task	Duration				
	25/1	25/2	25/3	25/4	1/5
Questionnaire Preparation					
Data Collection and Field Visits					
Data Analysis					
GIS Classification and Analyzing					
Writing the Report					

Chapter Tow

Literature Review

2.1 Introduction

Household, illegal trafficking, commercial and industrial wastes are the main source for EEW. They require an assessment to determine if they are HW or not. This helps in segregating wastes before disposal, to safely handle the HW. Before classification of waste, it must be categorized by the source of generation, i.e. municipal, industrial, and agricultural or others [12]. Furthermore, the hazardous characteristics of the waste should be studied (flammable, corrosive, reactive, carcinogenic and toxicity) [13]. This shall help in selecting the most appropriate classification system that covers all types of wastes. Figure 2.1 summarized identification of waste, waste categories and HW characteristics. Methodologies used for coding industrial HW is represented.

Through the induction, the general methodology for the preparation of the HW list has been developed as shown in Figure 2.1. The main steps and the key-words of this methodology can be summarized as follows [14]:

- 1-Identification the environmental laws, general definitions of waste and identify the authorities responsible for issuing the HW list.
- 2-The definition of hazardous characteristics shall be given in the environmental law. They generally include: toxicity, reactivity, flammability, and corrosively.....etc.
- 3- Waste separation legislation and expand definitions to classify waste and types of HW.
- 4-The model and shape are chosen for preparation of the HW list shall be selected based on the formulated definitions and the approved waste classifications.
- 5-Waste classification systems and HW lists are constructed according to the source or substance or mixed (source and substance).
- 6-The lists should also include an option to verify the hazardous of wastes that are not classified in the ready-made lists of HW.
- 7-An appropriate numbering and coding system shall be developed and adopted for the classification of HW.
- 8-A full official document shall be prepared.

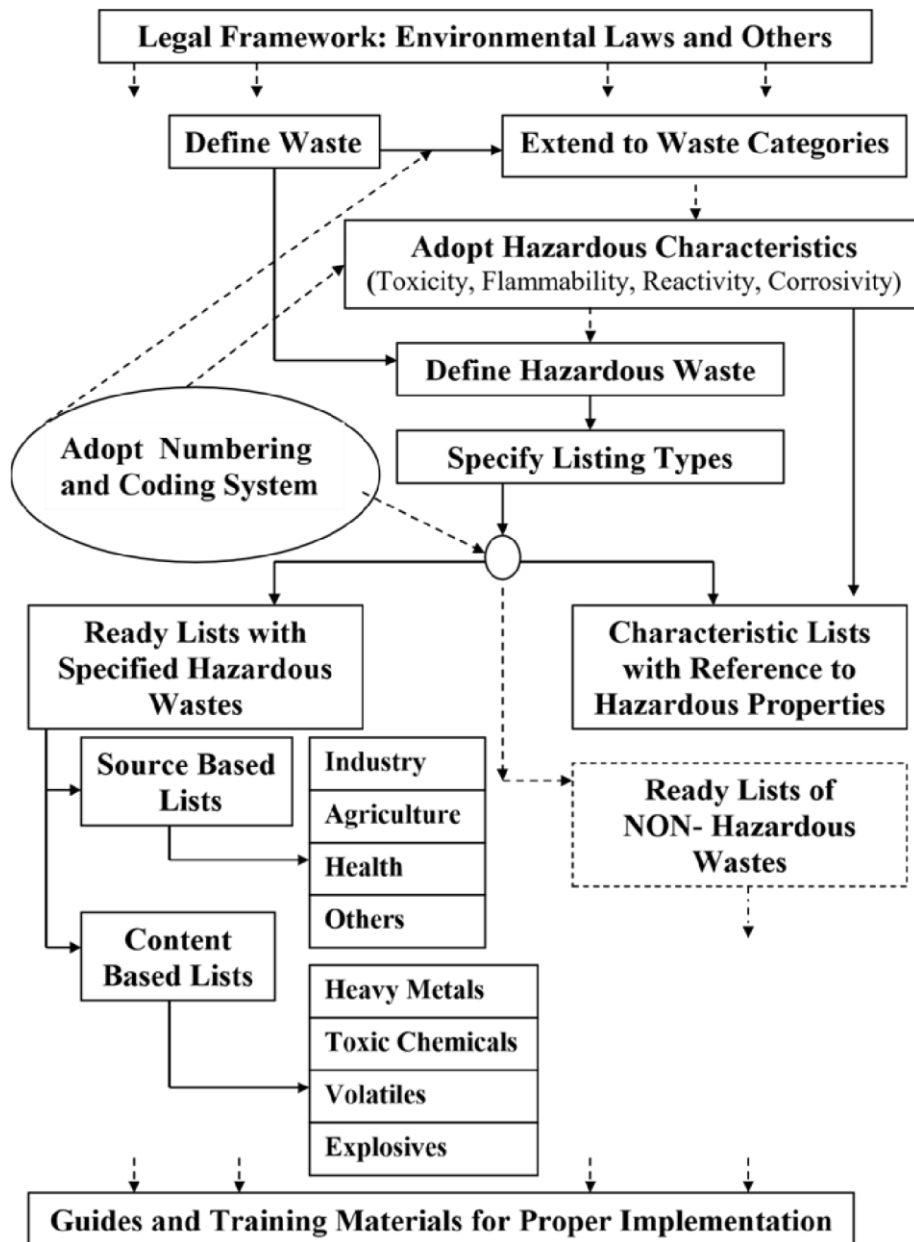


Figure 2.1: General Route for Establishing Waste Categorization System and HW Lists

[14].

2.2 Waste Definition

The waste problem is one of the insistent environmental issues in the world. The volume of waste is rapidly growing as a result of population growth and increased consumption of natural resources. This rapid growth of waste requires applying various strategies, policies and techniques for waste management. There are several definitions of waste. The most common one defines waste as “any substance or object which the holder disposes or is required to dispose of pursuant to the provisions of national law in force” [15]. The Basel Convention defines waste as “Wastes are substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law” [5]. Other defined waste as "any discarded, rejected, abandoned, unwanted or surplus matter, whether or not intended for sale or for recycling, reprocessing, recovery or purification by a separate operation from that which produced the matter; or" anything declared by regulation or by an environment protection policy to be a waste; whether of value or not "[16].

2.3 Waste Categories

Waste can be classified according to its nature (organic or inorganic), or source of generation [9]. The second is better in classifying waste, due to its possibility of identifying the main contents of the waste and its source. There are several sources of waste include domestic or municipal, industry or manufacturing, construction or demolition, agricultural and medical or clinical waste about solid waste strategy 2010-2016 [2], [17].

Domestic or Municipal source of waste: they included items weather released from households such as food debris, used plastic bags, soda cans and plastic water bottles, hazardous cleaning agents...etc., or that produced from local communities (schools, offices, market places, restaurants and another public place) such as paper and plastics.

Industry/Manufacturing source of waste: It included waste produced from several industries manufacturing such as: glass, leather, textile, food, electronics, plastic and metals.

Construction/Demolition sources of waste: construction waste resulted from the construction of roads and building. Demolition waste came from pulling down of old buildings and structures to make space for new ones. Waste items included concrete debris, wood, huge package boxes and plastics from the building materials.

Agricultural sources of waste: this waste deal with by agricultural activities. These included horticulture, fruit growing, seed growing, and livestock breeding. Waste produced included empty pesticide containers, old silage wrap, out of date medicines, used tires and surplus milk and irrigation network.....etc.

Medical/Clinical sources of waste: it referred to waste that produced from health care facilities, such as: hospitals, clinics, surgical theaters, veterinary hospitals, and labs. They tend to be classified as HW rather than general waste. Waste listed in this group included: surgical items, pharmaceuticals, blood, body parts, wound dressing materials, needles, and syringes.

2.4 EEW

EEW defined by EU.EEW [EU, 2002a] as EEW.....including all components, sub-assemblies and consumables, which are part of the product at the time of discarding [18]. This includes equipment's which used or unwanted electronic and electrical products that have exceeded their shelf life such as computer equipment, monitors/TV, cell phones, batteries, stereos, etc. [19].

EEW are the largest segment of growth among household wastes, which have end of lifetime or duration of use and contain heavy metal that polluted and harm environment and human health. Due to their large size and containment of harmful substances, most of these EEW are categorized as HW [20].

The management and situation of EEW is one of the important issues that need to be addressed. They should be placed on the leader of priorities of any ministry or institution. EEW dangerous or potentially harmful to our health and the environment [21].

2.5 EEW Characteristics

The rapid of urbanization, the high dependent of electronic and electrical goods in everyday life and drop in prices has created huge market of EEW. Global quantities of EEW are increasing across the globe. There is a drop in the lifespan of electronic and electrical goods and illegal trans boundary movement of EEW. Due to the insufficient data in many countries. The flow of EEW is not quantified. Furthermore, such assessments are expensive and very complex [22].

The EEW contains several hazardous materials including heavy metals such as lead, copper and zinc. Attempts to reduce the amount of hazardous material have been made. For instance, the substitute of CRT monitors with LCD will decrease the lead in EEW. However, LCD displays will have mercury, indium, zinc and tin. Rechargeable batteries contain nickel metal hydride (NiMeH), lithium ion, nickel cadmium (Ni-Cd).EEW contains a hazardous material including heavy metals (like cadmium, mercury, leads, etc.) [22].

Mercury is used in switches and relays, gas discharge lamps and batteries. Batteries with mercury and rechargeable batteries with cadmium, lithium and lead are of concern from environmental point of view. Lead acid batteries are commonly used in mobile phones, portable (notebook/laptop) computers, portable power tools, video cameras.....etc. Iron and steel account for nearly half of the total weight of EEW. Plastics represent about 21% of EEW and nonferrous metals represent about 13% [22].

An older polychrome CRT contain 2-3 Kg of lead, whereas a more CRT usually less than one Kg of lead. PVC is the widely used plastic in electronic and electrical goods which are known to emit dioxins and furans during combustion at temperature less than 1200C [22].

The default age for electronic and electrical devices is the safe time range for using this device, which, if exceeded, becomes unusable or is unsafe and enters the electronic and electrical device after its expiry date in the EEW circuit. Table 2.1 explains the presumed lifespan of some electronic and electrical devices. There are many electronic and electrical devices containing toxic elements such as computer battery and mobile phones as shown in Table 2.2. The global growth of EEW in several countries are shown in Table 2.3[23].

Table 2.1: Life Time of Electronic and Electrical Devices [23].

Device type	Age of use(Year)
Photographic equipment (televisions)	13 - 15
Audio devices (portable player)	13 - 15
Information Devices (Wireless Phones)	2 – 4
Computer Printers	3 – 5
Phone, Answering Machine	2 – 3
Fax and laptop devices	2 – 5

Table 2.2: Types of Elements in Computer Batteries and Mobile Phones (Nokia) [23].

Device	Element	Percentage in the sample (weight of metal /weight of all metals) %	Standard Deviation in the sample (weight of metal /weight of all metals)
Computer Battery	Ni	53.25	5.046
	Zn	11.13	0.885
	Ti	3.14	0.697
	Pb	0.35	0.614
	Fe	25.7	2.3
	Au	4.26	1.016
	Sn	1.99	0.449
Mobile Phone	Fe	54.95	17.849
	Cr	10.90	6.136
	Zn	6.62	10.241
	Sn	1.81	3.135
	Sb	1.17	2.023
	Mo	0.29	0.454
	Ti	11.17	11.614
	Cu	7.11	8.397
	Au	1.37	1.344
	Ni	3.38	3.733
	Pd	1.15	1.054

Table: 2.3: Global Growth of EEW[24].

Country	EEW available market in 2012 (10 ⁶ tons)	Annual estimated EEW in 2013 (10 ⁶ tons)	EEW per inhabitant (kg/captia)	Estimated EEW in 2020	Increase between 2013 and 2020	Domestic generation (10 ⁶ tons)	EEW export (10 ⁶ tons)	EEW import (10 ⁶ tons)
EU-28	9800	10205	19.6	11430	12%	9.8	1.9–3.9	-
United States	9350	9359	29.3	10050	7%	6.6–9.4	3.3–5.6	-
China	12405	6033	4.4	12066	98%	3.1	-	2.0–6.0
Japan	3300	3022	23.8	3200	5%	3.1	0.62	-
India	3026	2751	2.2	6755	145%	0.36	-	0.85–4.2
Germany	1752	1696	21.9	1974	16%	-	-	-
Russia	1599	1556	10.9	2000	28%	-	-	-
Brazil	1850	1530	7.1	1850	20%	-	-	-
France	1520	1224	21.6	1625	32%	-	-	-
Italy	1124	1154	19.3	1343	16%	-	-	-
Korea	959	961.3	19.2	1050	9%	-	-	-
Turkey	726	661	8.8	800	21%	-	-	-
Netherland	432	394	23.3	421	6%	-	-	-
Romania	217	157	7.9	227	44%	-	-	-
Norway	175	127	25.8	136	7%	-	-	-

2.6 Methodology for Classification and Listing of EEW

There are no common methodologies through the world for classifying and listing of EEW as hazardous and non-hazardous. But, there was a public path that countries followed through harmonizing it according to their waste characteristics and source.

There are various methodologies for classification of EEW:

2.6.1 Basel Convention

Basel Convention was the first international agreement for controlling the exportation of HW. This agreement was about control the movement of these wastes and their disposal on borders. It was sponsored by UNEP [5].

The main objectives of the convention are [5], [8]:

- 1-To reduce deal with HW that transported across the borders.
- 2-To encourage the disposal of these wastes as soon as possible to their original locations.
- 3-To prevent shipping HW to countries that had lack of legal, policies and strategies deal with HW disposal.

The Convention faced a various number of problems such as [5]: failure to adopt a total ban trading of waste and ignored the economic disparities between industrialized and developing countries. In addition of these problems, poor policies in many developing countries to control its borders and prevent illegal trifling of waste from entering their countries.

Waste is classified using two lists of waste categories [2]. Then, it determined a list of hazardous characteristics, which included detailed and defined properties with specific codes (H₁-H₁₃) [5], [2]. These characteristics can be summarized under the four main characteristics as follows [5]:

- 1-Flammable: Containing for example, Flammable liquids (H₃).
- 2-Biological Toxicity: Containing for example, Poisonous (Acute) (H_{6.1}).
- 3-Corrosive (H₈).
- 4-Reactive: Containing for example, explosive (H₁).

Categories of waste to be controlled include two lists (based on source or content) [5]:

- Waste streams which are categorized based on their source. They include 18 categories (coded Y₁ to Y₁₈), covered wastes from various economic sectors. For example, agriculture wastes (Y₄).
- Wastes having hazardous constituents which include 27 categories. For example, wastes containing heavy metals or their compounds (Y₁₉-Y₃₁).

The convention excludes from its scope radioactive wastes and wastes deal with from the normal operation of ships [8]; as they are subject to other international control systems.

2.6.2 European Waste Categorization and HW Listing

EWC and HW list were used for sorting all kinds of wastes including HW [24]. It considered as an adopted waste classification system through the EU. They were form the basis for all national and international waste reporting legal obligations, such as those related with waste permits, national waste database and the transport of waste [25].

The EWC was developed by the EU. It provided a standard framework for comparison of waste statistics through all member states, and harmonized the designations for all types of waste in the EU [2]. The catalog mainly classified waste according to the source of generation. Each waste type is given a six-digit code made up of three 'two digits' sub-codes [12].

European method for coding and identification of HW [12], [25]:

- H₁ 'Explosive': substances were more sensitive to shocks or friction or which may explode under the effect of flame.
- H₂ 'Oxidizing': substances with highly exothermic reactions when it contact with other substances, particularly flammable substances.
- H_{3-A} 'Highly flammable'

- Liquid substances had a flash point below 21°C (including extremely flammable liquids),
 - Substances in contact with air at ambient temperature without any application of energy which may become hot and caught fire. Also, substances in contact with water or damp air evolved highly flammable gasses in dangerous quantities.
 - Solid substances which may ignite after a short contact with a source of ignition still burning or consuming after elimination of the source of ignition.
 - Gaseous substances which are flammable in air at normal pressure.
- H_{3-B} ‘Flammable’: liquid substances had a flash point equal to or greater than 21°C and less than or equal to 55°C.
 - H₄ ‘Irritant’: non-corrosive substances which, through repeated contact with the skin or mucous membrane, can cause inflammation.
 - H₅ ‘Harmful’: substances which, if they are inhaled or ingested or if they penetrate the skin, may involve limited health risks.
 - H₆ ‘Toxic’: substances (including highly toxic substances) which, if they are inhaled or ingested, or if they penetrate the skin, may involve serious, acute or chronic health risks and even death.
 - H₇ ‘Carcinogenic’: substances which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence.
 - H₈ ‘Corrosive’: substances which may destroy living tissue on contacts.
 - H₉ ‘Infectious’: substances containing viable micro-organisms or their toxins which may cause disease in man or other living organisms.
 - H₁₀ ‘Teratogenic’: substances which, if they are inhaled or ingested or if they penetrate the skin, may induce non-hereditary congenital malformations or increase their incidence.
 - H₁₁ ‘Mutagenic’: substances which, if they are inhaled or ingested or if they penetrate the skin, may induce hereditary genetic defects or increase their incidence.
 - H₁₂ Substances which release toxic or highly toxic gasses by contact with water, air or an acid.
 - H₁₃ Substances capable by any means, after disposal, of residual substance, e.g. a leachate, which holds any of the characteristics listed above.
 - H₁₄ ‘Ecotoxic’: substances which present or may present immediate or postponed risks for one or more sectors of the environment.

Where waste has been classified into two categories as follow [5]:

- First class: listed waste that is hazardous.
- Second class: waste contained hazardous component with hazardous characteristic or any other waste that has the hazardous characteristic.

Table 2.4 illustrated EWC classification chapters which were divided into 20 chapters, where a further split into 111 sub-chapters based on sources or components of waste as follow [5]:

Table 2.4: EWC HW Chapters [5].

Chapter	Type of waste included
Chapters 1 – 12 and 17-19	Waste from industrial, commercial and medical waste.
Chapters 13 - 15	Waste of specific material like oil and solvent ...etc.
Chapter 20	Waste of municipality
Chapter 16	Separated waste

Figure 2.2 summarized how EWC coded HW, where each type of waste included six digit code (XX YY ZZ). XX represented chapters from 01-20, YY illustrated subchapter ranging from 01-maximal 14 and ZZ represented listing from 01-n/99 for other waste. Sometimes it used * like this (XX YY ZZ) *, where (*) means HW.

There is an example of how water-based developer and activator solutions deal with from photographic industry is coded in EWC [26]:

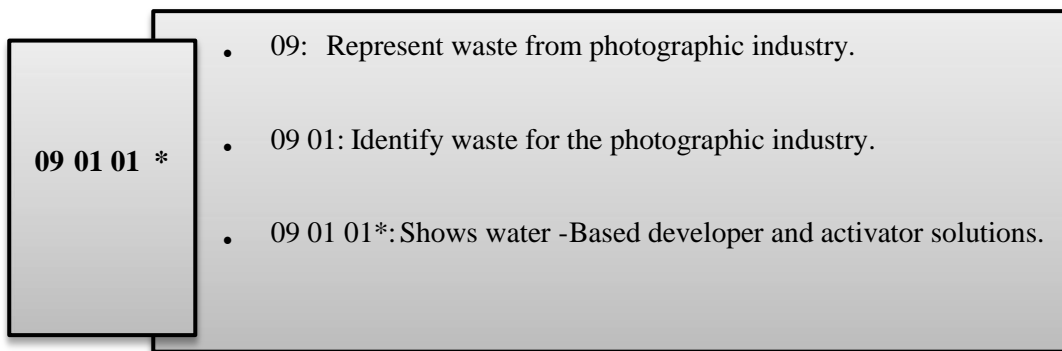


Figure 2.2: Water-based developer and activator solutions deal with from photographic industry code in EWC adapted [26].

The following general steps must be taken to identify the correct code for waste from the list [26]:

Step 1: At the beginning identify where in chapters 01 to 12 or 17 to 20 the waste is produced. Try to identify the appropriate six-digit code for the waste, excluding codes ending with 99.

Step 2: If the suitable waste code cannot be found in chapters 01 to 12 or 17 to 20, the next step is to examine chapters 13, 14 and 15.

Step 3: If none of these waste codes suitably describes the waste, try to find whether the waste is described in chapter 16.

Step 4: If the appropriate code still cannot be found, choose a 99 code from the suitable chapter in step 1.

2.6.3 American Waste Categorization and HW Listing

RCRA gave EPA the authority to control HW from the time of generation until disposal. RCRA set forth a framework for the management of non-hazardous solid wastes. Updates and adjustments were done on RCRA in 1986. It qualified EPA to identify environmental issues such as HW deal with from underground tanks storing petroleum [26].

Under RCRA Subtitle C, Congress granted EPA the authority to regulate HW. The principle objective of HW regulation was the protection of the human health and the environment [27].

EPA has studied and listed as hundreds of specific industrial HW streams. These wastes were listed on four different lists, located in Title 40 of the CFR at Part 261 as follows [25]:

- The F-list (non-specific source wastes) - The F list defined as hazardous particular wastes from many common businesses, government, industrial or manufacturing processes. Because the processes producing these wastes can occur in different sectors, the F list wastes are known as waste from nonspecific sources.
- The K list (source-specific wastes) - The K list designated particular solid wastes from certain specific industries as hazardous.
- The P-list and the U-list (discarded commercial chemical products) - These two lists were same. Both lists were characterized as hazardous certain commercial chemical products when they are discarded or intended to be discarded. These listings consist of commercial chemical products having the generic names listed, off specification species, container residues, and spill residues. The difference is that the chemicals on the P list are identified as acute HW. While, those on the U list are identified as toxic wastes. Some chemicals on both lists may also be designated to have other properties.

EPA mentioned HW that have not been listed may still be considered a HW, if exhibited one of the four characteristics [25] defined in 40 CFR Part 261 (Subpart C) as follows:

- Ignitability (D001)
- Corrosively (D002)
- Reactivity (D003)
- Toxicity (D004 - D043).

The US coding system considered as a simple method, where it consisted of significant character that indicate list code followed by a number consists of three digits (e.g.: F001) [5].

Chapter Three

EEW Classification

3.1 Introduction

Currently, countries lack a uniform measurement system for EEW. However, there is already substantial data available for both developed and less-developed countries that relate to EEW statistics. In order to improve comparability between countries, a sound measurement framework is proposed that integrates and validates available harmonized statistical data and other non-statistical data sources into EEW statistics. This measurement framework is presented along with a classification of EEW. Though the classification is, at this stage, standalone, it links to multiple data sources and data formats, such as the HS and the EU EEW reporting. The parameters in the measurement framework and classification can also function as a backbone for data gathering and thus enable the measurement of these flows. The framework captures the most important elements of EEW and is relevant to all countries. Finally, indicators can be constructed from the framework, which can provide a useful overview of the size of the market for electronic and electrical products within a country, as well as its EEW arising and EEW treatment performance and serve as a resource for policy making. In addition to the full measuring framework, minimum requirements are proposed to collect and report on EEW statistics for countries that are embarking on this type of data gathering for the first time [23].

The worldwide use of ICT equipment and other electronic equipment is growing. Consequently, there is a growing amount of equipment that becomes waste after its time in use. This growth is expected to accelerate, since equipment lifespan decrease over time. Due to growing consumption and shorter lifespans, EEW is one of the fastest growing waste streams [27]. The UNU estimates that about 42 Mt of EEW was globally deal with in 2014 [28]. From this data, it is estimated that 6 Mt of this was Interrelated. The annual global consumption of new electrical and electronic equipment was around 58 Mt in 2012.

The consumption and use of EEW is probably most prevalent in the developed world, but developing countries show a rapid growth of consumption and use of EEW. Some less developed countries lack a waste treatment infrastructure and waste management laws and enforcement. As a result, the EEW in those countries will often be treated in suboptimal ways by the informal sector. This leads to severe consequences for the environment and human health. In order to treat EEW in an environmentally-sound manner, it needs to be regulated, a recycling infrastructure needs to be created or improved, and workers' health

and safety standards need to be implemented [29] [30]. Those conditions aid in the creation of green jobs, one of the conditions to eradicate poverty and simultaneously “green” the economy, according to the UNEP [31]. However, suboptimal treatment and illegal activities are not limited to low and middle-income countries. In developed countries as well, large flows of undocumented EEW are found that may be treated (illegally or semi-legal) with inferior standards [32], [33], [34].

In order to understand the dynamics of this complex waste stream, a framework is needed to capture EEW most essential features. Currently, there is too much discrepancy between official/governmental data and academic data. All available data should feed into such a system, preferably linking to statistical classifications and existing frameworks. Such a harmonized framework and measurement would help to interpret EEW related data and to compile EEW statistics that are comparable between countries worldwide.

Such a system should also address the practical challenges that inevitably occur during measurement. For example, part of the EEW stream will be registered as metal waste. The part that is EEW is not identifiable in registers and therefore difficult to assess. In addition, there is also trade in EEW between countries, and the statistics should also capture this. In the context of the partnership measuring ICT for development, a task group on measuring EEW was established to develop a framework for monitoring EEW based on internationally defined indicators and classifications that will help to develop EEW statistics. The framework document could ultimately provide guidance to both developed and developing countries to measure EEW more consistently.

3.2 EEW Classification

Before going into detail about the measurement framework, the issue of EEW classification will be discussed. There are many types of electronic and electrical products on the market, which makes it difficult to group them into sensible and practically useful categories. There are many classifications that can be used to describe EEW, and each of them is potentially valuable to form the basis of EEW statistics in the proposed measurement framework. However, there are several criteria to which the classification

should comply in order to effectively harmonize EEW measurement, and thus lead with sensible indicators. In general, the categories should not be defined too specifically around products that are not posing a threat to the environment, or that do not contain valuable materials, nor having a large market share, as this leads to too many irrelevant codes and consequently imposes an unnecessary administrative burden on respondents [23].

Moreover, there will be very few databases available to collect data from in the desired classification. On the other hand, the classification system should also not be too aggregated, as differences between countries will be difficult to interpret. For example, CRT monitors can be allocated to IT equipment, but other countries might allocate them to household appliances, whereas others can group them with screens. Another example is that microwaves can be either documented as small household appliances, or in other countries, as large household appliances. Consequently, those inconsistencies in reporting will affect data quality, and should be avoided, as they hamper the usability of the results for international benchmarking and effective policymaking [23].

3.3 Criteria for EEW Classifications

A classification system for WEEW statistics should categorize products by similar function, comparable material composition (in terms of hazardous substances and valuable materials) and related end-of-life attributes. In addition, products within the same category should have a homogeneous average weight and lifespan distribution, which can simplify quantitative assessment for similar products. Finally, large or environmentally relevant EEW products, for which a lot of data is potentially available, should be assigned separately. Currently, there is only one classification system that fulfils those criteria: the classification developed by the UNU [35]. This classification is referred to as the UNU-KEYS. The full list of the UNU-KEYS is presented in Annex 1. The 54 categories can be grouped into 10 primary categories, according to the original EU EEW. This link is shown in the fourth column in Annex 1.

3.3.1 European List of Wastes

The ELOW is the waste classification in the EU for administrative purposes (i.e. for permits and supervision in the field of waste generation and management). Many European, as well as some Caucasian and central Asian, countries use the ELOW as a central framework to gather data for waste statistics. Waste statistics reporting is typically done on an aggregated level, based on the type of waste. The ELOW defines 839 waste types, which are structured into 20 chapters mainly according to the source of the waste (i.e. the economic sector or process of origin). Each waste type is characterized by a six-digit code. The allocation of wastes to the defined waste types is laid out in the introduction of Decision 2000/532/EC and explained in a separate section. There are 13 ELOW codes that refer to EEW. They are subdivided into hazardous and non-hazardous waste, and listed in Annex 2 Fractions or components that can be deal with during treatment of EEW, such as metal scrap, plastics and lead glass, are not listed in this table [23].

Those codes describe EEW very generally and are merely useful to measure EEW that is registered as separately collected EEW. For compiling EEW statistics however, it lacks the ability to distinguish between different types of EEW, thus ignoring differences in environmental relevance and materials potential when recycled. Also, in practice, EEW is collected and registered under other ELOW codes, such as no separately-collected domestic waste or metal scrap [23].

3.3.2 Classification of EEW under the Basel Convention

Basel Convention defines waste as “substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law”. May be defines disposal as “any operation specified in Annex 3” to the Convention [28]. It is important to note that national provisions concerning the definition of waste may differ, and the same material that is regarded as waste in one country may be non-wasted in another country [23].

EEW is included in Annex 3 to the Convention with the following entry for HW [28]:

“A1180 Waste electrical and electronic assemblies or scrap containing components such as accumulators and other batteries included on list A, mercury-switches, glass from CRT and other activated glass and PCB capacitors, or contaminated with Annex 3 constituents (e.g. cadmium, mercury, lead, polychlorinated biphenyl) to an extent that they possess any of the characteristics contained in Annex 3 (note the related entry on list B, B₁₁₁₀)” [30].

EEW is also included in Annex 3 to the Convention with the following entry for non-hazardous wastes:

“B₁₁₁₀ Electrical and electronic assemblies:

- Electronic assemblies consisting only of metals or alloys;
- Waste electrical and electronic assemblies or scrap [36] (including PCB) no containing components such as accumulators and other batteries included on list A, mercury-switches, glass from CRT and other activated glass and PCB capacitors, or not contaminated with Annex 3 constituents (e.g., cadmium, mercury, lead, polychlorinated biphenyl) or from which these have been removed, to an extent that they do not possess any of the characteristics contained in Annex 3 (note the related entry on list A A₁₁₈₀);
- Electrical and electronic assemblies (including PCB, electronic components and wires) destined for direct reuse [30] and not for recycling or final disposal.” [31].

Equipment will often contain hazardous components, examples of which are indicated in entry A₁₁₈₀ of Annex 3. EEW should therefore be presumed to be HW, unless it can be shown that it does not contain such components and in particular [32].

(a) Lead-containing glass from CRTs and imaging lenses, which are assigned to Annex 3 entries A₁₁₈₀ or A₂₀₁₀ “glass from CRT and other activated glass”. This waste also belongs to category Y₃₁ in Annex 3, “Lead; lead compounds” and is likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃ included in Annex 3.

(b) Nickel-cadmium batteries and batteries containing mercury, which are assigned to Annex 3 entry A₁₁₇₀ “unsorted waste batteries...” This waste also belongs to category Y₂₆ in Annex 3, “Cadmium; cadmium compounds” or Y₂₉ “Mercury, mercury compounds” and is likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃.

(c) Selenium drums, which are assigned to Annex 3 entry A₁₀₂₀ “selenium; selenium compounds”. This waste also belongs to category Y₂₅ in Annex 3, “Selenium; selenium compounds” and is likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃.

(d) PCBs, which are assigned to Annex 3 entry A₁₁₈₀ “waste electronic and electrical assemblies.....”, and entry A₁₀₂₀ “antimony; antimony compounds” and “beryllium; beryllium compounds”. These assemblies contain brominated compounds and antimony oxides as flame retardants, lead in solder and beryllium in copper alloy connectors. They also belong in Annex 3, to categories Y₃₁, “Lead; lead compounds”, Y₂₀, “Beryllium, beryllium compounds” and Y₂₇ “Antimony, antimony compounds” and Y₄₅, organ halogen compounds other than substances referred to elsewhere in Annex 3. They are likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃.

(e) Fluorescent tubes and backlight lamps from LCD, which contain mercury and are assigned to Annex 3 entry A₁₀₃₀ “Mercury; mercury compounds”. This waste also belongs to category Y₂₉ in Annex 3, “Mercury; mercury compounds” and is likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃.

(f) BFRs, in particular BFRs that are persistent organic pollutants according to the Stockholm Convention, which can be assigned to Annex 3 entry A₃₁₈₀ “Wastes, substances and articles containing, consisting of or contaminated with PCB, PCT, PCN or PBB, or any other polybrominated analogues of these compounds, at a concentration of 50 mg/kg or more.” This waste also belongs to category Y₄₅ in Annex 3, organ halogen compounds other than substances referred to elsewhere in Annex 3 and to category Y₂₇ “Antimony, antimony compounds” and is likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃.

(g) Other components containing or contaminated with mercury, such as mercury switches, contacts and thermometers, which are assigned to Annex 3 Entry A₁₀₁₀, A₁₀₃₀ or A₁₁₈₀. This waste also belongs to category Y₂₉ in Annex 3, “Mercury; mercury compounds” and is likely to possess hazardous characteristics H_{6.1}, H₁₁, H₁₂ and H₁₃.

(h) Waste oils/liquids, which are assigned to Annex 3 entry A₄₀₆₀ “Waste oil/water, hydrocarbons/water mixtures, emulsions”. The waste belongs to category Y₈ in Annex 3, “Waste mineral oils unfit for their originally intended use” or Y₉ in Annex 3, “Waste oil/water, hydrocarbons/water mixtures, emulsions”, and is likely to possess hazardous characteristics H₃, H₁₁, H₁₂ and H₁₃.

(I) Components containing asbestos, such as in wires, cooking stoves and heaters, which are assigned to Annex 3 entry A₂₀₅₀. The waste belongs to category Y₃₆ in Annex 3, “Asbestos (dust and fibers)” and is likely to possess hazardous characteristic H₁₁.

(J) Waste metal cables coated or insulated with plastics under A₁₁₉₀.

3.3.3 Classification of EEW under the Palestinian Code

The Palestinian Environmental Law No. 7 of 1999. Reference to waste classification in the definition of solid waste (non-hazardous waste) refers to activities that produce waste, such as household, commercial, agricultural, industrial waste, construction waste and sludge from water treatment plants, and a similar signal within the solid waste management and handling system , While the medical waste management and handling system presents different classifications (from a medical perspective: radiological, chemical, toxic, and biological), pathological waste and disinfectant Anatomical waste) and wastes with content Heavy metals, compact packaging, mixed waste [17].

The sectoral environment strategy provides examples of hazardous waste classification, which include "electronic waste, hazardous agricultural waste, medical waste (including laboratory waste), and carcasses of animals infected with animal or human diseases or any contaminants contaminated with infectious diseases due to these wastes, such as animal waste, hazardous industrial waste, used batteries, asbestos wastes, etc., which is the best example of the National Strategy for Solid Waste Management 2010 . The hazardous waste inventory report is partially due to the Basel Convention (Y classifications for waste) [17]. The classification of EEW under the Palestinian Code show in the Annex 4.

Chapter Four

Inventory of EEW in Idna, Deir Samet and Beit Awa

Abstract

The objective of this project is to evaluate and classify the EEW that is treated in Idna, Deir Samet and Beit Awa. The study responds to a real need, since there are no actual data about quantities, qualities or management ways on EEW produced from workshops in Idna, Deir Samet and Beit Awa. The research methodology is based on descriptive approach including questionnaire, field visits, data collection, and analyzing. This study is based on the draft Palestinian HW List and Basel HW List.

The results of this study indicate that the total amount of the deal with EEW from all workshops in Idna, Deir Samet and Beit Awa is 10 950 ton/year. The main fraction of this EEW is waste coming from the occupied territories estimated as 8760 ton/year at a percent 80%. EEW is mainly deal with from domestic waste at a percent 47% of 20% from Hebron West Bank, contains refrigerators and washing machines. Its generation rate is 5077 ton/year. The study concluded that there is a need to build capacities within the workshops sector on proper handling of waste, and there is a need to develop policies to manage electronic and electrical hazardous wastes.

4.1 Introduction

According to the international standards, wastes are substances or objects which are disposed of, or any excess or reject material that is no longer useful and intended to discard, [10], [17]. EEW is a part of such wastes which are capable of having a harmful effect on human health and the environment [37]. According to the United States EPA “a waste may be considered hazardous if it exhibits certain hazardous properties (characteristics) or if it is included on a specific list of wastes EPA has determined are hazardous (listing a waste as hazardous) because we found them to pose substantial present or potentially hazardous to human health or the environment” [26] .

Before the waste has been classified, it must be defined and characterized by the source of generation, whether it is municipal, industrial, and agricultural or others [12]. Also, characterized to their hazardous characteristics (flammable, corrosive, reactive and toxicity) [13]. These helped in choosing the best classification system that covers all types of waste. Waste can be classified according to its nature (organic or inorganic), or its source of generation [14] . The second is better in classifying waste, due to its possibility of identifying the main contents of the waste and the main production of it.

There are no common methodologies among the world for classifying and listing of hazardous and non-hazardous waste. However, there is a general path that countries follow by harmonizing it according to their waste characteristics and sources.

4.2 Sectors characteristics

In calculating the deal with electrical and electronic waste of Idna , Deir Samet and Beit Awa, visits were made to a sample of large workshop sectors except for small in-house workshops because they never collected waste and sent it to large workshops. This means that they do not perform any chemical or physical processes. Table 4.1 illustrated the estimated amount of EEW (commercial, industrial and domestic) for each workshops sector in Idna, Deir Samet and Beit Awa. The total number of workshops that cooperated with the research team is 40 large workshop, were 29 workshop from all workshop sectors

have been visited. Idna workshop especially in region Waid Resha occupied the largest proportion of the workshop in the case study. Based on visited workshop production size.

Table 4.1: The estimated amount of EEW (commercial, industrial and domestic) for each 29 workshops in Idna,Deir Samet and Beit Awa.

Type of EEW	Amount of EEW			Total EEW (ton/year)
	Commercial (ton/year)	Industrial (ton/year)	Domestic (ton/year)	
Large Housewares	-	-	2151	2151
Small Housewares	-	-	1841	1841
Media and Communication Equipment	1639	-	-	1639
Consumer Equipment	511	-	-	511
Lighting Equipment	502	359	574	1435
Construction Tools	-	1636	-	1636
Children Tools	-	-	511	511
Sports Machines	511	-	-	511
Automatic Services	715	-	-	715
Sum	3878	1995	5077	10 950

4.3 Sources of EEW

EEW is abundant in Hebron Governorate, especially in the area of Idna, Beit Awa and Deir Samet. The total amount of scrap and EEW collected in the town of Idna, Beit Awa and Deir Samet is 10950 tons per year. EEW be a closed (complete equipment) or open (parts of complete equipment), in this study about 27.6% of EEW has open equipment and 20.7% of EEW has complete equipment. About 9560 ton/year at a percent of 80% from occupied territories 1948 of these wastes in the town are: remnants of old cars, refrigerators, all kinds of electrical appliances, electronic devices and cables, these waste that come from occupied territories is closed (complete devices).

So that there are 40 large workshops for disposal of scrap and EEW, 60 medium sized workshop, 100 small-sized workshops, 200 workshops inside the houses and more than 200 street vendors. There are 1500 permanent employee in the workshops, 5,000 non-permanent and more than 100 children under the age of 18 years. Most of the employees who work in the workshops have a general secondary certificate at the percent 62%. 49% of all the workshops in Idna, Deir Samet and Beit Awa have practical experience in dealing with EEW 5-10 years.

Figure 4.1 shows the distribution of workshops in terms of sizes (large, medium, small and in the streets). Figure 4.2 shows the numbers of employees in all workshops, whether permanent or temporary or children under 18 years. The EEW that comes from occupied territories 1948 is 9650 ton/year at a percent of 80% and 3390 ton/year at a percent 20% from Hebron West Bank. Figure 4.3 shows the amount of EEW that comes from occupied territories and Hebron West Bank.

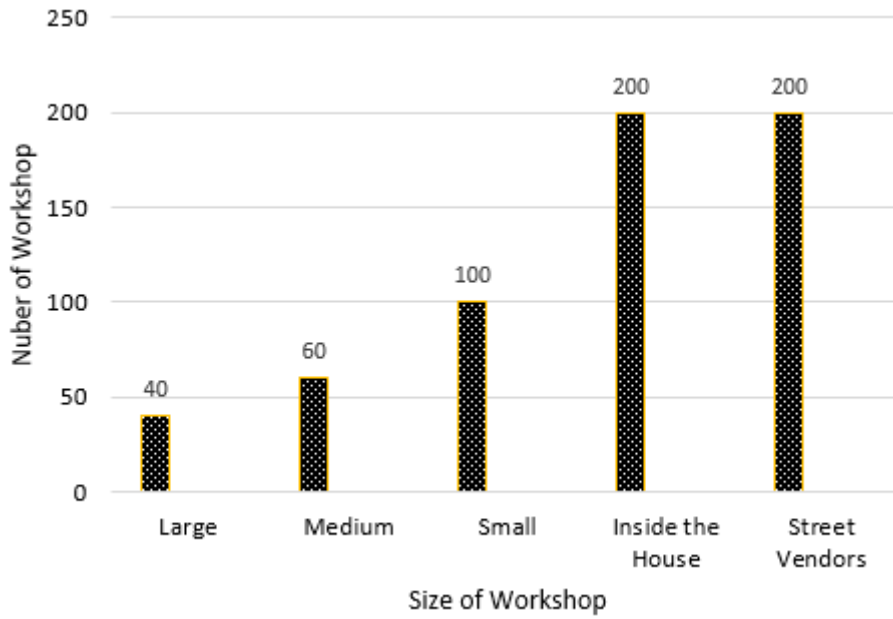


Figure 4.1: Shows the size of all workshops.

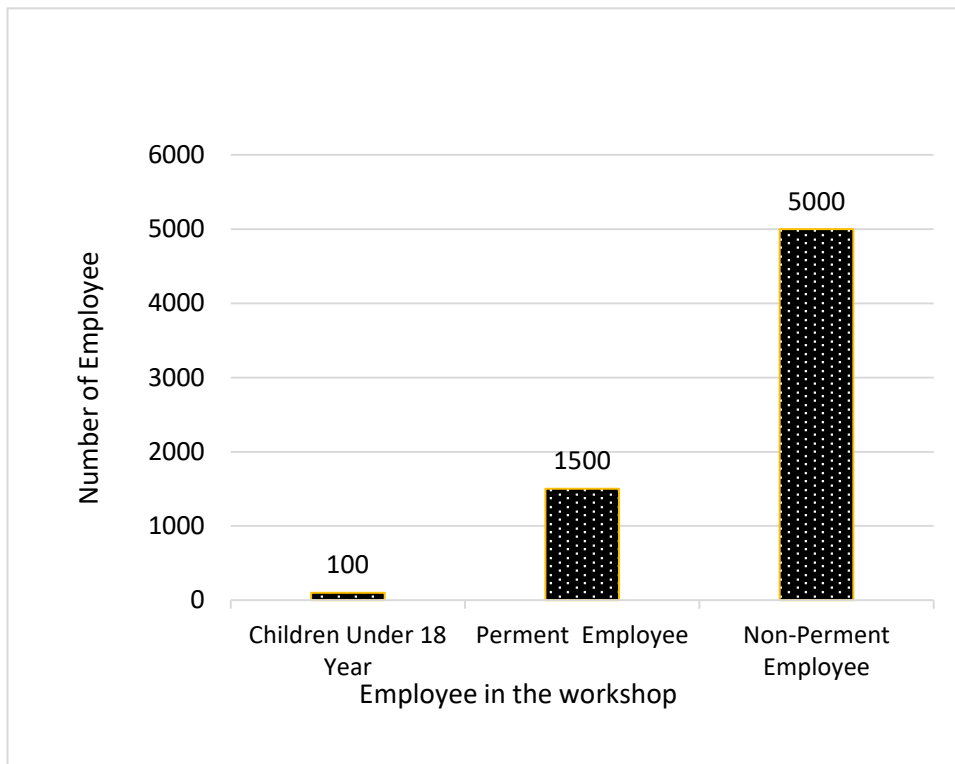


Figure 4.2: Shows the numbers of employees in all workshops.

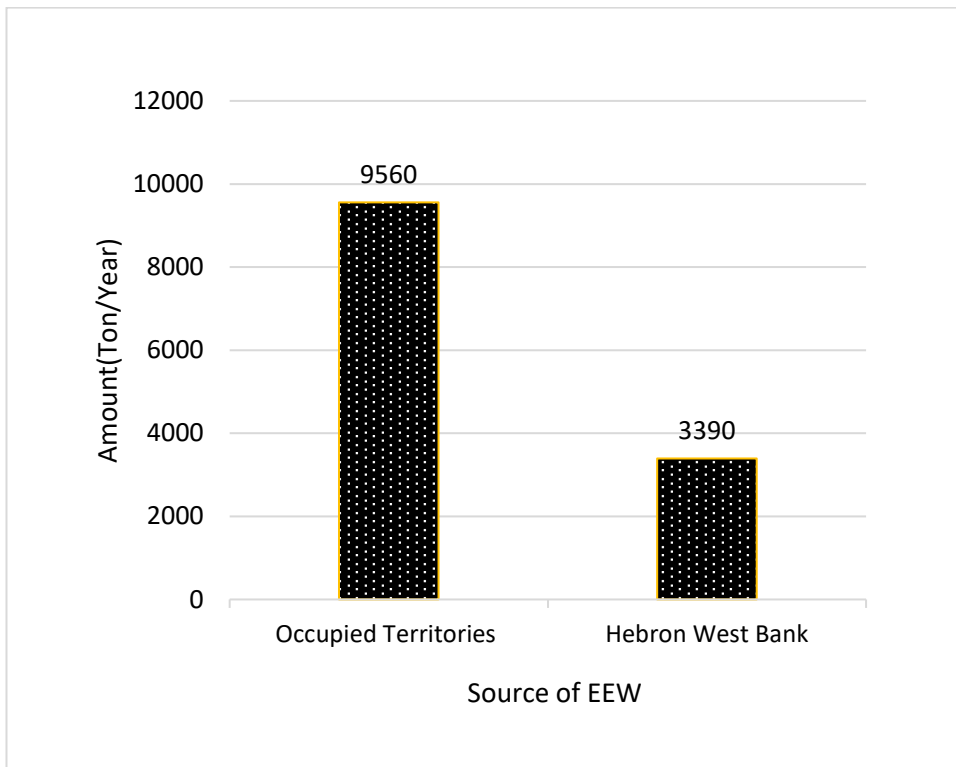


Figure 4.3: Amount of EEW that comes from Occupied Territories and Hebron West Bank.

4.4 Quantities of the Waste that deal with EEW

EEW has a percent of 48% of all waste that comes from the workshop. Electronic waste has a generation rate of (6417 ton/year) at a percent of 58.6% and electrical waste has a generation rate of (4161ton/year) at a percent of 38%. Electrical and Electronic waste categorized according to its source (commercial, industrial and domestic) as illustrated in Table 4.1. Commercial EEW deal with from media and communication equipment, consumer equipment, lighting equipment's, sport machines and automatic services. Industrial EEW deal with from lighting equipment's and construction tools .Domestic EEW deal with from large housewares, small housewares, lighting equipment's and children tools. The amount of the industrial EEW was less than the domestic EEW because most of houses and company use electrical and electronic equipment's. Also, high proportion of domestic EEW was sold to scrap owners.

Table 4.1 illustrates a total of (10 950 ton/year) of EEW are generate from all workshops. The large housewares equipment's represents the largest amount of domestic EEW (2151 ton/year) especially that generate from refrigerators, washing machines, air conditioners, blenders and vacuum cleaners, due to development of technology and end of life of electrical and electronic equipment's .

Large housewares appliances sector especially refrigerators and washing machines represented the largest amount of domestic EEW. It consists of large amounts of (Lead, Mercury, Polychlorobiphenyls and Arsenic). Media and Communication Equipment sector has generate large amount of commercial EEW, deal with from computers, telephones, cameras and stamps, as illustrated in table 4.1.

The washing machine represent the largest amount of large housewares (1333 ton/year) at a percent of 62%, refrigerators represent (645 ton/year) at a percent of 30%, air conditioners represent (108 ton/year) at a percent of 5% and other large housewares equipment represent (65 ton/year) at a percent of 3%. Figure 4.4 represent the quantities of each type of large housewares equipment's.

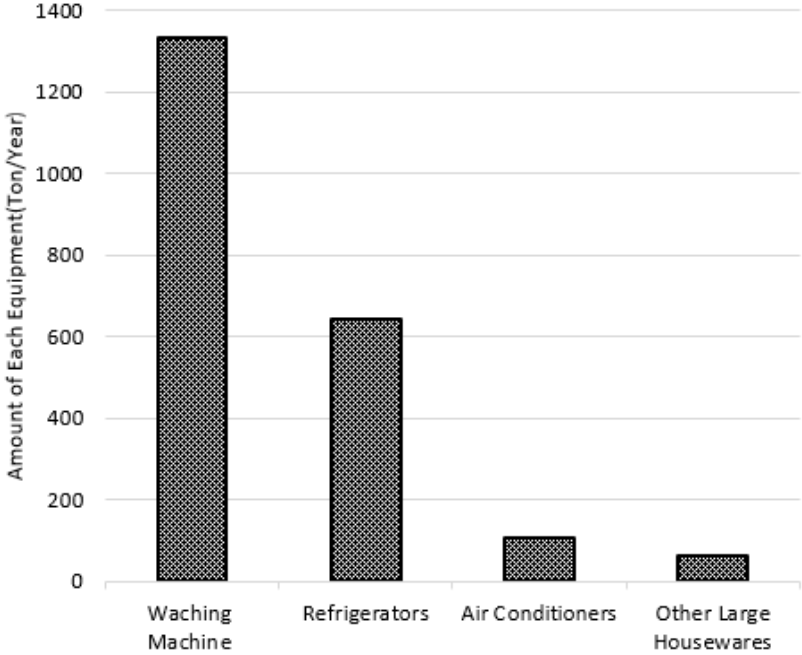


Figure 4.4: Quantities of each type of Large Housewares Equipment's.

Figure 4.5 represents the percentages of EEW in Idna, Deir Samet and Beit Awa. Figure 4.5 indicates that the largest EEW amount is domestic (5077 ton/year), which accounts a percent of 47% of total EEW produced; this requires reuse of electrical and electronic appliances to reduce electrical and electronic waste .The amounts of commercial and industrial EEW are 3878 ton/year at a percent of 35% and 1995 ton/year at a percent of 18%, respectively.

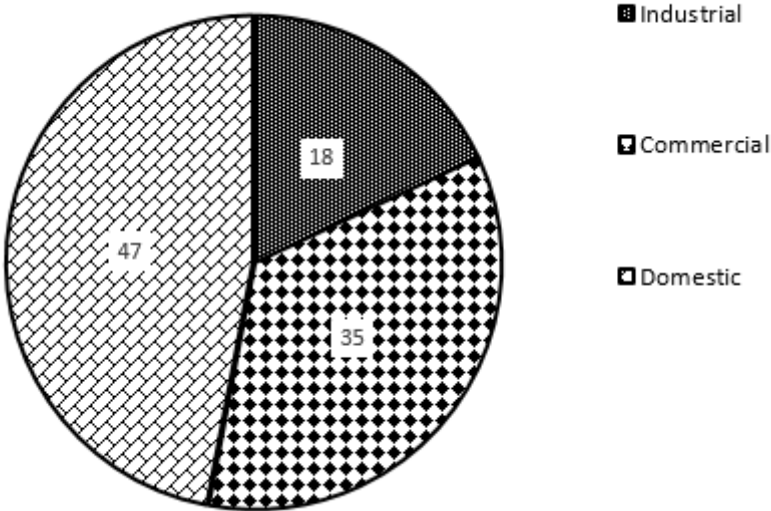


Figure 4.5: Percentages of EEW in Idna, Deir Samet and Beit Awa.

The EEW handling in Idna, Deir Samet and Beit Awa workshops sectors (large housewares, small housewares, media and communication equipment, consumer equipment, lighting equipment, construction tools, children tools, sports machines and automatic services), shows a clear lack of any standard or compliant management that deal with EEW . Proper separation, classification and packaging/ labeling or storage is done by the owners in all workshop sectors. Solid EEW is disposed of mixed with the municipal waste without any environmental safety measures.

4.5 Average EEW Production by Type of waste Generation

Figure 4.6 illustrates average EEW produced (ton per year) by type of waste Generation. Out of all waste as represents in figure 4.6, large housewares is the one that produces largest amount of EEW per year (2151 ton/year) compared to waste. Small housewares and media and communication equipment followed by domestic uses also produce relatively large amounts of EEW. Using the average production of EEW per each waste generation, the estimated amount of EEW produced in Idna, Deir Samet and Beit Awa was calculated. The estimated amount of EEW produced from the Idna, Deir Samet and Beit Awa of is 10 950 ton/year; distributed as follows: 17 % by small housewares, 20 % by large housewares, 15 % by media and communication equipment, 5 % by consumer equipment, 13 % by lighting equipment, 15 % by construction tools, 4 % by children toys, 4 % by sport machines and 7 % by automatic services.

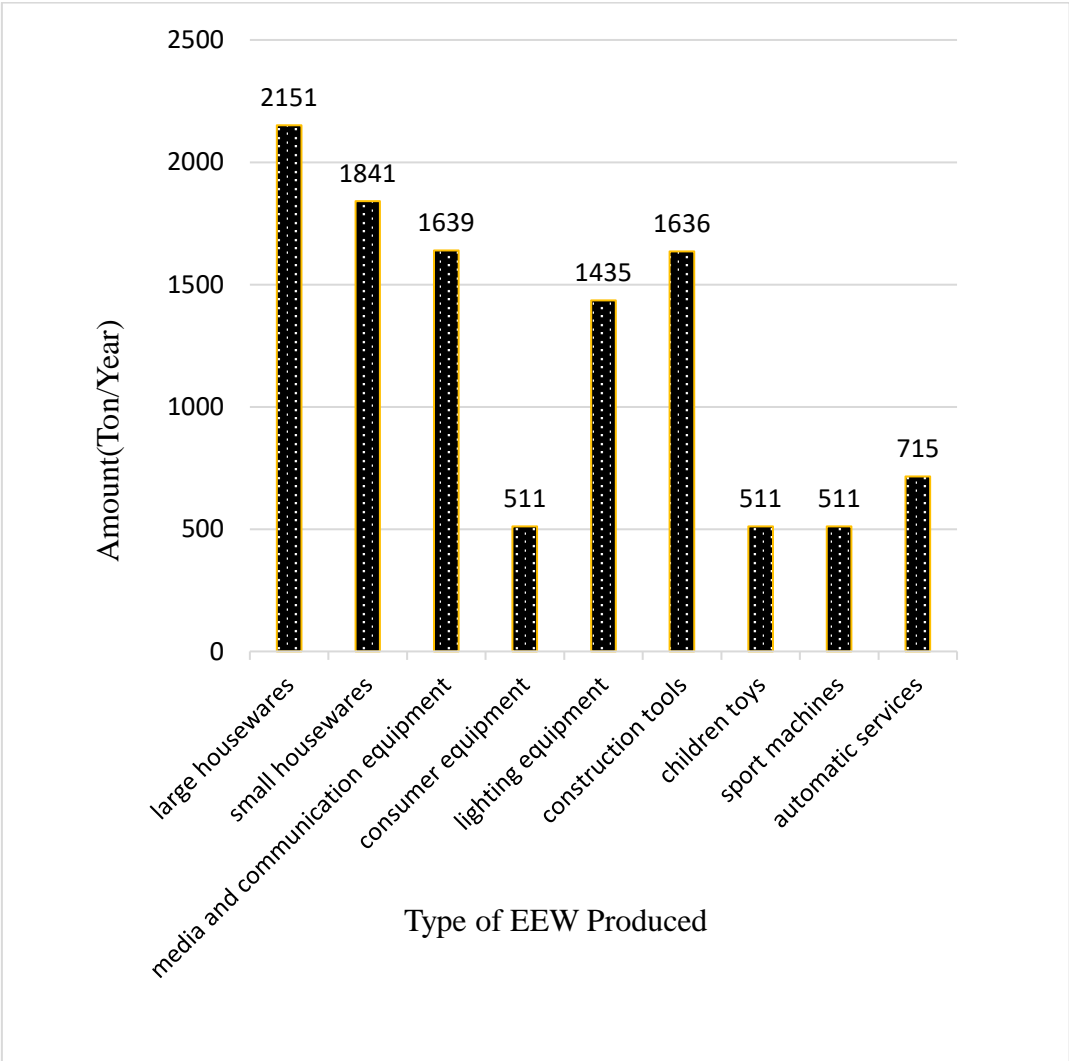


Figure 4.6: Average EEW produced (ton per year) by type of waste produced.

4.6 Hazardous Characteristics of waste that deal with EEW

Waste considered as HW if they exhibit any of the four characteristics (ignitability, corrosively, reactivity, and toxicity), as EPA's regulations stated in the Code of Federal Regulations (40 CFR) [26], [38] . These wastes are unstable under abnormal conditions; they react violently with water and form potentially explosive mixtures, or generate toxic gasses. They pose a danger to human health or the environment. Also, they are harmful or fatal when ingested or absorbed. They should be treated or separated before disposal.

The fact that most EEW contain elements like lead, mercury, arsenic, cadmium, selenium, hexavalent chromium and flame retardants beyond threshold quantities in EEW classifies them as hazardous waste. The washing machine and refrigerator Waste in Idna, Deir Samet and Beit Awa report also described toxic or hazardous materials present washing machine and refrigerator and estimated the aggregate tonnage of such substances being disposed annually, primarily in workshops. Lead, mercury, nickel, brominated flame-retardant, polychloridebiphenyls and arsenic present in this equipment could pose hazards if they are released when the equipment is recycled, incinerated or disposed in landfills. Table 4.2 shows the hazardous substance in EEW especially for washing machine and refrigerators equipment.

Table 4.2: Hazardous Substance in EEW especially for washing machine and refrigerators [40].

Hazardous Substance	Use	Risk
Antimony trioxide	use is as a flame retardant synergist in plastics etc.	Limited evidence of a carcinogenic effect
Mercury	It is estimated that 22 % of the yearly world consumption of mercury is used in electrical and electronic equipment. It is basically used in thermostats, (position) sensors, relays and switches (e.g. on printed circuit boards and in Measuring equipment) and Discharge lamps. It is used in data transmission, telecommunications, and Mobile phones batteries.	Very toxic to aquatic organisms and may cause long term effects in the Aquatic environment. Effects in humans are mainly affecting the central nervous system effects as well As the kidney. Toxic by inhalation
Polychlorobiphenyls	PCBs were extensively used in electrical equipment such as capacitors and transformers. Small capacitors include motor start Capacitors and ballast capacitors. Motor start capacitors are used with single phase motors to provide starting torque; these capacitors can be found also in household electrical appliances including refrigerators, cookers, washing machines,	Very toxic to aquatic organisms and may cause long term effects in the aquatic environment
Arsenic	Microwaves - circuit boards Electron – reflector	In case of exposure to doses It is low for long periods There is an imbalance in communication between Cells also cause problems in Growth and heart disease Cancer and diabetes
Nickel	Rechargeable batteries Shipping	If the dose is high For cancerous diseases
Decabromodiphenyl ether (DBDE)	Used as a flame retardant in Electrical and electronic plastics.	Potential for forming Brominated dibenzodioxins or furans in uncontrolled thermal processes
Octabromodiphenyl ether(OBDE)	Flame retardant in plastics used for electrical and electronic equipment	Possible risk of harm to the unborn child
Lead	Used in batteries, solders, alloying element for machining metals, printed circuit boards	Processing of metallic lead may give rise to lead compounds, which are all, classified as dangerous Substances. May cause harm to the unborn child Harmful by inhalation or harmful if swallowed

4.6.1 Lead

Lead as a hazardous substance in electrical and electronic equipment has been well documented in published material. Given the amount of historical research on the toxicity of lead on human health and the environment, it is understandable why many studies have been conducted on lead as a hazardous component of electronic equipment. The major uses for lead in electronic components include tin-lead solder, CRT in monitors, cabling, earlier batteries, PCBs and fluorescent tubes. Large quantities of lead-acid batteries are used in emergency power supplies for larger telecom network infrastructure (e.g. central office switches), but these products are outside the scope of this study [39].

The largest source of lead in electronics is found in tin-lead solder (usually in the ratio 60/40 tin-lead), which connects many component parts together. Lead is used in this capacity because of its good conductivity, high corrosion resistance, cost-effectiveness and low melting point. Quantified, the amount of lead used as connecting materials is about 50 g/m² of PCBs [40]. The lead in washer and refrigerators has a processing of metallic lead may give rise to lead compounds, which are all, classified as dangerous substances. May cause harm to the unborn child Harmful by inhalation/harmful if swallowed.

4.6.2 Mercury

It is estimated that 22 % of the yearly world consumption of mercury is used in electrical and electronic equipment. It is basically used in thermostats, (position) sensors, relays and switches (e.g. on printed circuit boards and in measuring equipment) and discharge lamps. It is used in data transmission, telecommunications, mobile phones batteries, and certain light sources. The mercury cause very toxic to aquatic organisms and may cause long term effects in the aquatic environment. Effects in humans are mainly affecting the central nervous system effects as well as the kidney and toxic by inhalation.

The main concern for managing mercury at its end-of-life in refrigerators and washing machine equipment is lamps that illuminate refrigerators and other flat panel display screens. The amount of mercury per screen is relatively small, averaging 0.12mg-50mg per screen [40]. Mercury-containing lamps and bulbs are quite energy-efficient and cost-effective and no practical substitute exists. Lamp manufacturers continue working to reduce the mercury content in each bulb or lamp, but it is expected that this use will

increase because of the lack of alternatives. The EU's EEW requires that substitutes for mercury be found for all uses in electronic equipment (for example, switches and lamps) with the exception of mercury lamps containing less than 5mg/lamp [40].

4.6.3 Brominated Flame-Retardant

Flame-retardants are found in the majority of washer and refrigerators equipment's for fire safety requirements. They are incorporated into printed circuit boards and cables among other things to prevent the development or spread of fires. PBBs (or polybrominated biphenyls) and PBDEs (polybrominated diphenyl ethers), two types of brominated flame-retardant, have been largely eliminated in several countries and replaced with TBBP-A (tetrabromobisphenol), a flame-retardant considered by some to be slightly less hazardous [40]. Potential for forming brominated dibenzodioxins or furans in uncontrolled thermal processes.

4.6.4 Polychlorinated Biphenyls

PCBs were extensively used in electrical equipment such as capacitors and transformers. Small capacitors include motor start capacitors and ballast capacitors. Motor start capacitors are used with single phase motors to provide starting torque; these capacitors can be found also in household electrical appliances including refrigerators, cookers, and washing machines. Polychlorinated Biphenyl is very toxic to aquatic organisms and may cause long term effects in the aquatic environment.

There is some uncertainty about where and when PCBs have been used in washing machine and refrigerators equipment. Others refer to PCB use in washing machine, while others cite PCB use as a possible flame-retardant in plastic cables. Although no PCB quantities were located in the literature, it should still be regarded as a substance to manage with precaution at its end-of-life. It is likely that products containing PCBs are now obsolete, have already been disposed of or are currently being stored [40].

4.7 The Generated EEW as HW Types and Codes

Table 4.3 summarizes waste generators and the generated waste types and classification code in Basel and table 4.4 as Palestinian code as well as the quantitative amount of the EEW as HW deal with In the Idna, Deir Samet and Beit Awa.

After field visits to a large number of workshop and estimation of the quantities of EEW that produced from each workshop Basel and Palestinian codes are adopted. Each workshop sector has a sub-chapter in the list, it represent types of HW that generates from these workshop and the codes of it. Table 4.3 and table 4.4 represents that is according to Palestinian HW list and Basel List.

Despite several studies on EEW classification in Palestinian Authority [41], [42]. These papers used the Palestinian code classification of EEW. Furthermore, this Palestinian code depend on sectors that generate HW; it combines HW produced from electrical and electronic equipment's sectors with the same code. In addition, this Palestinian code classify EEW based on the type of material, for example; Wastes from temperature exchange equipment , screens and monitors , lamps, large equipment's , small equipment's, small IT equipment and professional have the same code which is 07 in all chapters, so the large quantities in Netherlands is large equipment's .

The other paper used the Basel convention classification of EEW, Furthermore, this convention doesn't depend on sectors that generate HW; it combines HW produced from electrical and electronic equipment's sectors with the same code. In addition, this convention classify HW based on the type of material, for example; Wastes from TV, refrigerator, washing machine, air conditioners and computers.

Table 4.3: Hazardous waste amount and classification codes in Basel that deal with in Idna, Deir Samet and Beit Awa.

Component in Washing Machine and Refrigerators	Hazardous Waste
	Basel Code
Lead in CRT	A ₁₁₈₀ A ₂₀₁₀ Y ₃₁
PCBs	A ₁₁₈₀ Y ₃₁
Mercury in Lamps	A ₁₀₃₀ Y ₂₉
Brominated flame retardant	Y ₄₅
Polybrominated	Y ₄₅
Cables	A ₁₁₉₀

Table 4.4: Hazardous waste amount and classification codes in Palestinian that deal with in Idna, Deir Samet and Beit Awa.

Component in Washing Machine and Refrigerators	Hazardous Waste as Palestinian Code	
	Serial Number	EU Code
Component containing mercury	07-02-105	16 01 08*
Component containing PCBs	07-02-106	16 01 09*
Transforms and Capacitors containing PCBs	07-03-101	16 02 09*
Hazardous component removed from discarded equipment's	07-03-107	16 02 15*

4.8 GIS Spatial Distribution of the EEW in Idna, Deir Samet and Beit Awa.

4.8.1 Introduction

In Palestine, there is a lack of adequate infrastructure for EEW management and are still at early stages of developing relevant legislative frameworks [10]. Furthermore, little significant and accurate scientific information on national production of hazardous wastes (quantity and quality) as well as on treatment and disposal strategies is available [43].

GIS is an effective tool for studying the environment, reporting on environmental phenomena, and modeling how the environment is responding to natural and man-made factors. GIS visualize data about natural resources, hazard control, and pollution emissions, in order to analyze ecological footprints [44]. The traditions of GIS are strongly based on the maps, and even today it is common to introduce GIS through the ideas of representing of contents of maps in computer databases [45].

GIS technology provides the capability of spatial data and network system, for representation of real data in producing various types of maps. It plays an important role in decision making and planning process, it has very distinguishing, powerful functions. “The most distinguishing parts of a GIS are its functions for spatial analysis, i.e. operators that use spatial data to derive new geofomation” [46].

The main objective of this study is establishing a spatial database of quantities and characteristics of EEW in Idna, Deir Samet and Beit Awa. It contributes in the management of EEW through visual representation of the information via various maps. Also, highlight the areas that are more sensitive to contamination from these wastes. This paper responds to a real need for better management of the EEW sector in Palestine, which requires spatial database, quantities and classifications of EEW produced from various workshop sectors.

4.8.2 Methodology

4.8.2.1 Research Scope

The study area is Hebron Governorate, which is the largest city in the West Bank, with an area of about 997 km². It is located in the south-western part of the West Bank. The city of Hebron is bounded by Bani Na'im to the east, Halhoul to the north, Taffuh to the west, and Yatta to the south. It has a high population around 711 223 people [1], [47].

4.8.2.2 Study Limitation and Delamination

This study is limited geographically to Hebron Governorate, focused on the workshop in Idna, Deir Samet and Beit Awa. In addition of focusing on sectors that generate EEW from their large housewares, small housewares, media and communication equipment consumer equipment, lighting equipment , construction tools, children tools, sports machines and automatic services.

4.8.2.3 Data Collection and Digitization

Field visits are done to workshop that generate EEW. A study sample was selected from each sector studied, based on the type and size of workshop, production lines, and type of waste produced. The total number of workshop that cooperated with the research team is 40 workshops, were 29 workshops from sectors have been visited. In all field visits, information on the type of waste generation, source of waste, production lines and technology, quantitative/qualitative wastes produced, production size, safety of workshops and working conditions were collected. Characteristics and quantities of EEW collected from all workshops sectors were tabulated and related to each sector.

Table 4.5 illustrates type of data for GIS analysis. The first column specifics the spatial data as represented in table 4.5, such as workshops points, which are included in the base map .The workshop format file was obtained by the Environmental Quality Authority .

These data weren't accurate so updates have done on their attribute tables; also more workshops have been digitized and entered in the form of spatial data. The task of the work team is to digitize workshops and land use of the city, producing various maps such as: workshop distribution and land use maps. From the perspective of logical and use, the map layers include randomly areas, residential areas and agricultural areas.

For the purpose of this project ArcGIS software is used for establishing data base for the waste that deal with EEW in Idna, Deir Samet and Beit Awa. Also, it contributes in managing EEW in Idna, Deir Samet and Beit Awa. ArcGIS software allows users to explore and analyze the spatial data on computers. Its basic mapping functionality and advanced GIS capabilities allow the user to create maps, display the created maps, present the data and integrate them and finally see the data in new ways.

Table 4.5: Type of data for GIS analysis.

Type of Spatial Data
Spatial Data
EEW Distribution Map
• Street Centre Lines Network
• Workshop Sectors Shape file
Land use Map
• Randomly Areas
• Residential Areas
• Agricultural Areas

4.8.3 Results and Discussion

Hebron is a city that produces EEW in large quantities. There are about 40 large workshop of EEW, 60 medium-sized workshops, 100 small workshops and 200 in-house workshops in Idna, Deir Samet and Beit Awa. 47% of 20% from Hebron West Bank of EEW are household uses, 35% are commercial uses and 18% are randomly uses. Workshops are distributed randomly, within residential and agricultural areas.

Figure 4.7 shows the distribution map of workshops and land use map in Idna, figure 4.8 shows the distribution map of workshops and land use map in Deir Samet and figure 4.9 shows the distribution map of workshops and land use map in Beit Awa. These lands divided whether it is randomly, agricultural and residential. This has done in order to predict which areas are more subjected to EEW contamination. This has done in order to clarify the overlap between the workshops, and agricultural areas. This overlap puts a threat on the environment and human health. Idna is high percentage of workshops in randomly areas (Waid Resha), Deir Samet is high percentage of workshops in randomly areas and residential area and Beit Awa is high percentage of workshops in residential area.

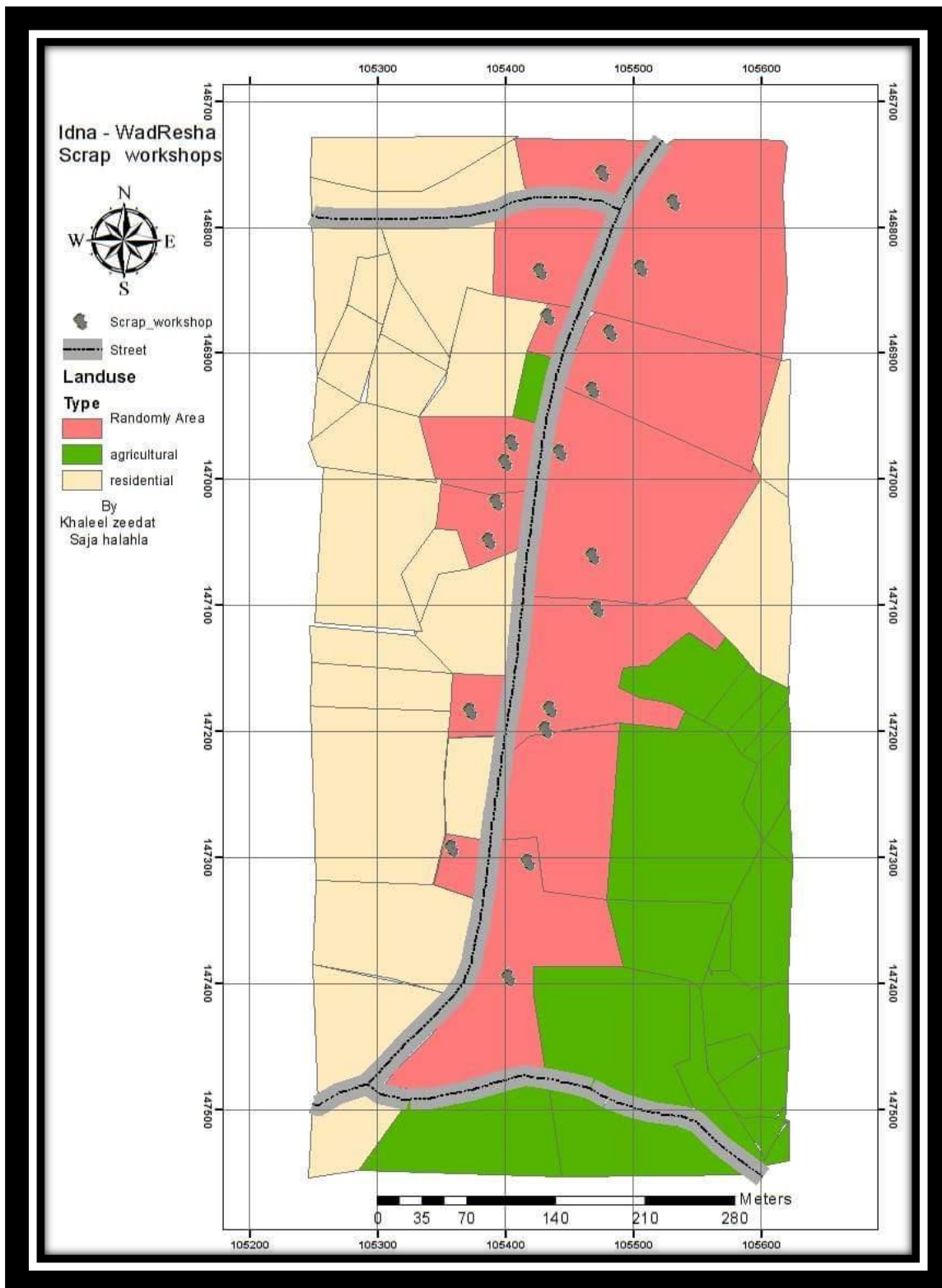


Figure 4.7: Distribution of Workshop and Land Use in Idna.

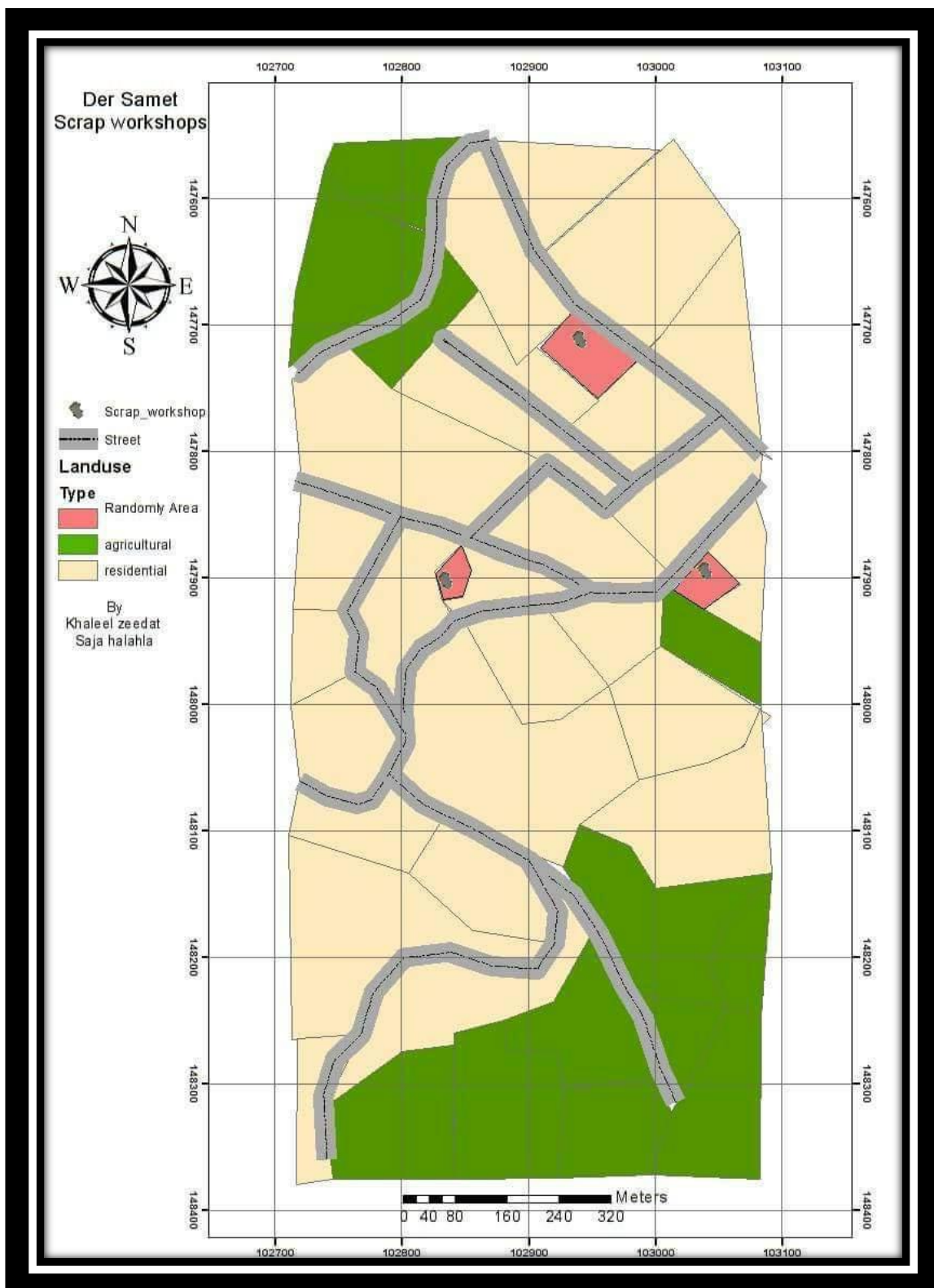


Figure 4.8: Distribution of Workshop and Land Use in Deir Samet.

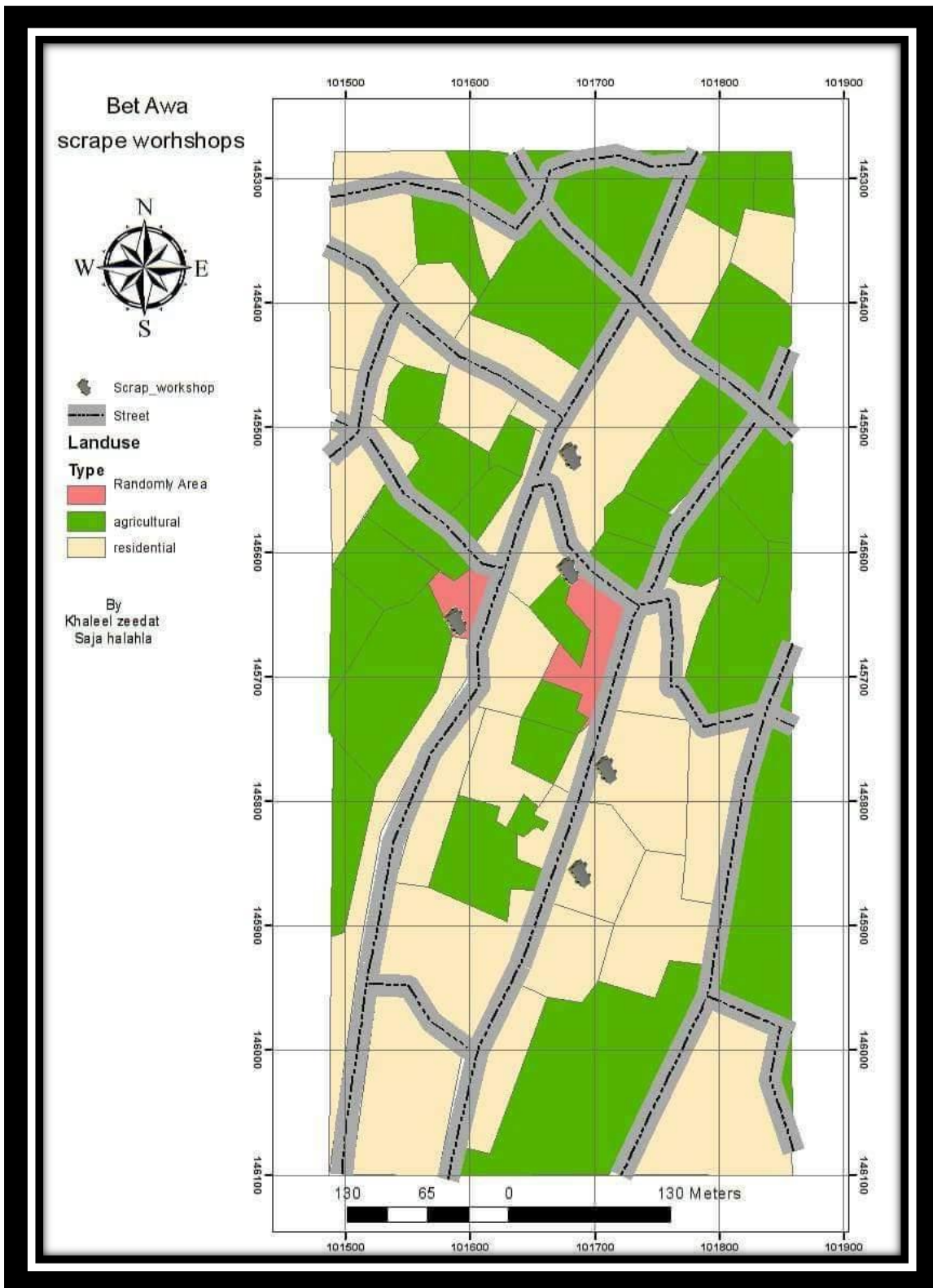


Figure 4.9: Distribution of Workshop and Land Use in Beit Awa.

Conclusion

The results of this study show that the total amount of deal with WEE from all workshop sectors in the city is 10 950 ton/year. The amount of EEW produced from all workshop sectors in Idna,Deir Samet and Beit Awa was extrapolated from the results. The main fraction of this EEW is domestic 5077 ton/year at a percent of 47% of 20% from Hebron West Bank . According to Palestinian HW list, the resulted HW from all workshop is mainly from large housewares equipment 07-02-105 /106 and 07-03-101/107 (which contains residues of or contaminated by dangerous substances) at a generation rate of 2151ton/year. The study indicates that there is a large amount of domestic EEW especially washing machine 1333 ton/year at a percent of 62% from large housewares , need to be separated and treated before disposal. The results indicate that there is no proper handling of HW, and no awareness of HW existence.

Chapter Five

WEE Disposal and Treatment

5.1 Introduction

The importance of EEW recycling has become more evident over the last few years. It is expected that quantities of EEW will increase rapidly in the near future. Actually, EEW constitutes large percent of municipal waste in Hebron Governorate. Idna, Deir Samet and Beit Awa has a yearly electronic and electrical scrap waste about 10 950 ton/year.

Due to their hazardous material contents, EEW may cause environmental problems during the waste management phase if it is not properly treated. Many countries in the world have drafted legislation to improve the reuse, recycling and other forms of recovery of such wastes to reduce disposal. The European Parliament has adopted on 13th February 2003 two directives, the Directive on the EEW [48] and the Directive on the Restriction of Hazardous Substances [49]. The Polish EEW legislation, requiring producers to start take back and recycle electronic and electrical appliances. The Polish EEW legislation and activity of recycling systems are expected to reduce the amount of EEW that reduce the overall impact of these products on the environment.

Recycling of EEW is an important subject not only from the point of waste treatment but also from the recovery of valuable materials. EEW is non-homogeneous and complex in terms of materials and components. In order to develop a cost effective and environmental friendly recycling system, it is important to identify and quantify valuable materials and hazardous substances to understand the physical characteristic of this waste stream [50].

Generally, EEW are composed of metal (40%), plastic (30%) and refractory oxides (30%) [51]. As shown in Figure 5.1, the typical metal scrap consists of copper (20%), iron (8%), tin (4%), nickel (2%), lead (2%), zinc (1%), silver (0.02%), gold (0.1%) and palladium (0.005%) [52].

The separation of EEW to the valuable material in Idna, Deir Samet and Beit Awa as a percent of 46.2%, recovery of some usable device at a percent of 12.8%, treatment of EEW as a percent of 5.1%, incineration of cables less than past at a percent of 5.1%, interment of EEW under earth surface at a percent of 7.7% and disposal of EEW into municipal containers at a percent of 23.1% of all workshops in Idna, Deir Samet and Beit Awa. Figure 5.2 shows process that used in workshop in Idna, Deir Samet and Beit Awa. The largest method used in workshop is separation of valuable material, after extraction of valuable material the amount of waste was estimated 6418 ton/year at a percent of 58.6%.

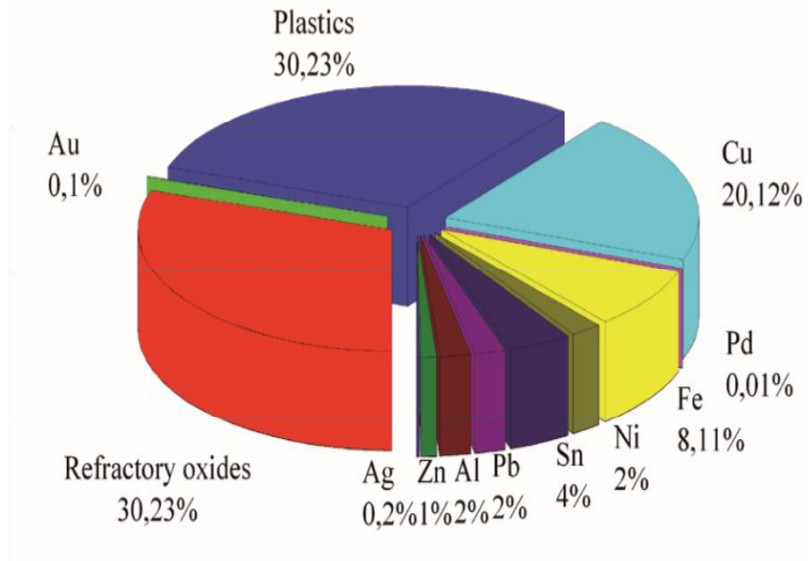


Figure 5.1: Characteristic Material Composition of EEW [52].

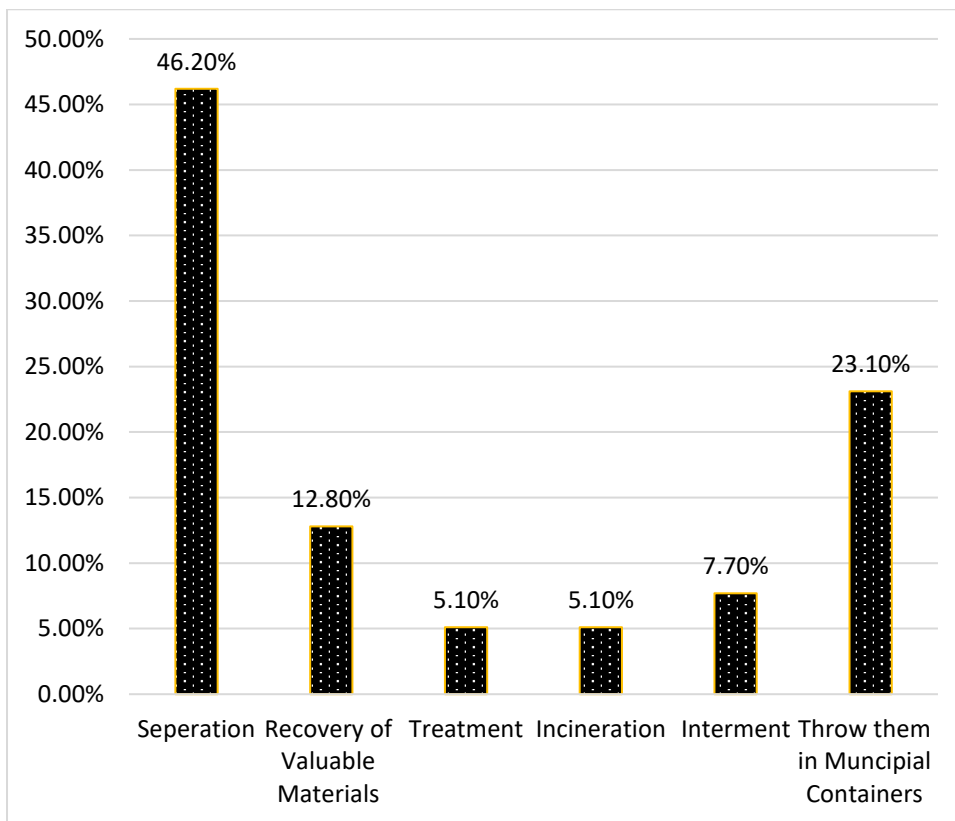


Figure 5.2: Process that Used in Workshop in Idna, Deir Samet and Beit Awa.

5.2 Processes for the recycling of EEW

Actually, existing processes for the recycling of electronic and electrical scrap focuses on separation of ferrous metals, nonferrous metals, and precious metals [53]. Incoming electronics and electrical are manually sorted to the product groups or directly transferred to another recycling entity. Products may be transferred if they are still functional, or exceed the recycler’s capacity, capabilities, or permits. Products accepted for processing are sorted and staged for disassembly [53].

In the workshops of the Idna, Deir Samet and Beit Awa 40% of the EEW is recycled as the amount of 4380 tons / year. The workshops are recycling all of: fluorescent lamps at a percent of 11%, dry batteries at a percent of 15.6%, liquid batteries at a percent of 15.6%, mobile phone at a percent of 13.4%, television at a percent of 11%, computer device at a percent of 20% and telephone at a percent of 13.4%. Figure 5.3 shows the percent of recycled equipment in the workshop of Idna, Deir Samet and Beit Awa.

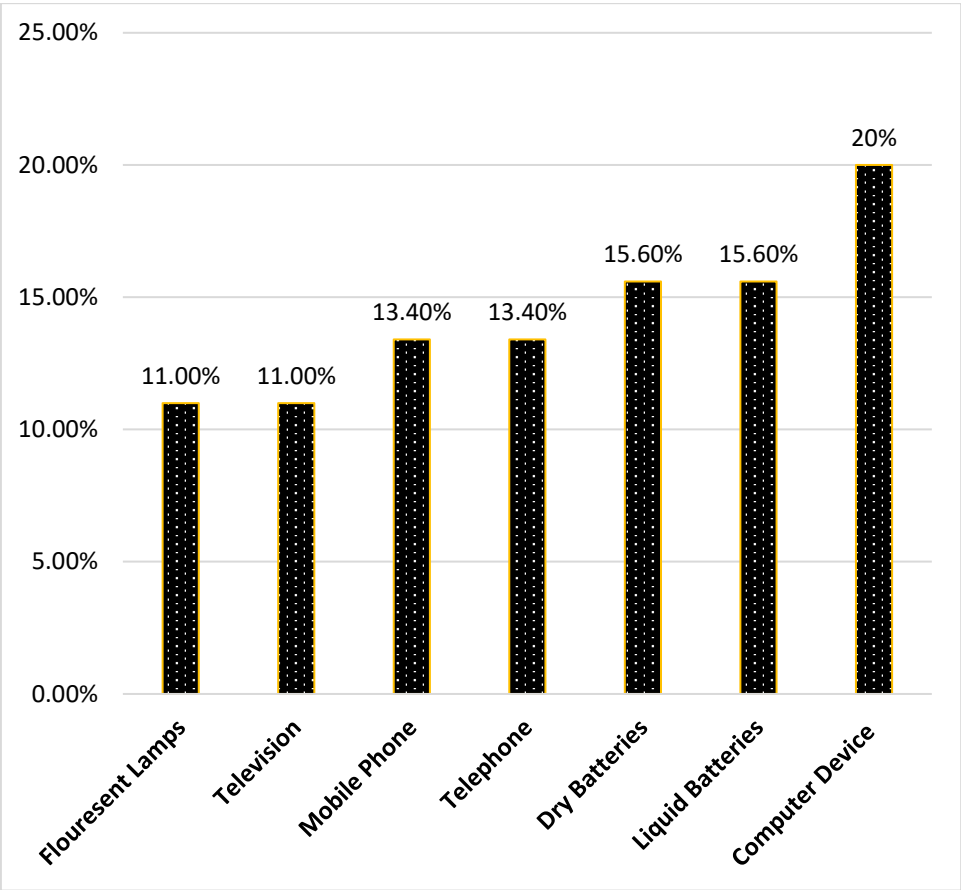


Figure 5.3: The Percent of Recycled Equipment in the Workshop of Idna, Deir Samet and Beit Awa.

5.2.1 Mechanical Separation

The different components and devices can be separated in a first mechanical step into various fractions such as metals (iron, copper, aluminum etc.), plastics, ceramics, paper, wood and devices such as capacitors, batteries, picture tubes, LCDs, PCBs... etc. These fractions can then be further treated. Plastics are disposed of because of the high halogen content and the metallic fractions are further treated in different metallurgical processes. PCBs can cause problems because the metallic and non-metallic phases are highly cross-linked [54].

After hand sorting and the removal of the contaminants (mercury switches, PCP containing capacitors etc.) the material undergoes a first size reduction step [55]. Material separation may be based on magnetic, electrostatic, density, visual, or other characteristics. A series of magnets may be used to remove ferrous metals from conveyors. The use of permanent magnets instead of traditional electromagnets can significantly reduce energy consumption [53]. Reprocessing, multiple passes through the shredder and magnets, may increase the ferrous metals recovered [56]. Following the removal of ferrous metals, pieces may be slowly conveyed past pickers to remove large pieces of designated materials such as glass or plastics. Size reduction may also include subsequent shredding, grinding, or hammer milling processes connected by conveyors [53]. The range of devices in usage depends strongly on the composition of the scrap.

5.2.2 Thermal Treatment

Pyro metallurgical processes include incineration of cables, smelting in a plasma arc furnace or blast furnace, cracking, sintering, melting and reactions in a gas phase at high temperatures [52]. Incineration is a common way of getting rid of plastic material and other organics to further concentrate the metals [57]. The crushed scrap can be burned in a furnace or in a molten bath to remove plastics, leaving a molten metallic residue. The plastic burns and the refractory oxides form a slag phase [54].

In smelting reactions a collector metal such as copper or lead can be used. But also impure alloys can be made by smelting the crude metal concentrates. Silver and gold containing scrap materials can be treated in a copper smelter, but silver as well as other noble metals are tied up in a process for a long period. The majority of secondary copper and a main part of the electronic and electrical scrap is processed pyrometallurgically in a copper smelter, which include steps as reduction and smelting of the material, blister or raw copper production in the converter, fire refining, electrolytic refining and processing of the anode mud. In a modern secondary copper smelter, many different kinds of copper containing materials are recycled. Besides copper, EEW materials contain nickel, lead, tin, zinc, iron, arsenic, antimony and precious metals amongst many others. The materials (e.g. electronic and electrical scrap) are fed into the process in different steps depending on their purity and physical state. Another possibility to recover base and noble metals from electronic and electrical scrap is the recovery via lead smelting processes [54].

5.2.3 Hydrometallurgical Treatment

In hydrometallurgical treatment the main steps are acid or caustic leaching of solid material. This process normally requires a small grain size to increase the metal yield. From the solutions the metals of interest are then isolated and concentrated via processes as solvent extraction, precipitation, cementation, ion exchange, filtration and distillation. Leaching solvents are mainly H_2SO_4 and H_2O_2 , HNO_3 , $NaOH$, HCl etc [54].

5.2.4 Electrochemical Treatment

Most of the electrochemical treatment methods are usually refining steps and they are carried out in aqueous electrolytes, sometimes in molten salts. Only a few processes can be found in literature which uses shredded scrap directly in electrolysis. Examples are the iodide electrolysis where an aqueous KI/KOH solution is used to recover gold, silver and palladium from plated or coated metal scrap. Another process considered, for example the removal of mercury switches and capacitors. Large metallurgical plants, e.g. copper or lead smelters, may be able to charge high amount of EEW but due to the decreasing quality and higher amount of plastic it will be more difficult in the future [48].

5.3 Discussion

All the mentioned methods have advantages and disadvantages. Using the mechanical separation there is an important advantage, that uncomplicated devices can be used to obtain different fractions. The disadvantages are noise and dust formation. The recycling steps depend on the material and because of the high shear forces the temperatures increase and gas emissions can occur due to pyrolysis and other reactions. The obtained fractions have to be treated further in other processes or have to be landfilled as it is done at present with plastic fractions.

In thermal treatment existing plants are available and high purity of metals can be obtained often more than one metal. Disadvantages are the waste gases and flue dusts. Hydrometallurgical methods also lead to high purity of the metals with the possibility to a selective leaching of the metals in various steps using different solvents. Disadvantages are the high volumes of leach solutions. Furthermore solutions can be corrosive and toxic. Metal losses occur due to composite materials. One problem is also the high amount of waste water.

5.4 Conclusions

Due to the directive on the EEW and the directive on the restriction of hazardous substances, the importance of EEW recycling has become more evident. Nowadays, the pyrometallurgical treatment in copper smelters is the common process for the recycling of electronic and electrical scrap. But the treatment of electronic and electrical scrap especially material with high contaminations or amount of plastic needs always a combination of different steps, i.e. mechanical, thermal and hydrometallurgical, whereas the environmental regulations have to be considered. But the costs of sampling and analysis of base and precious metal scrap are quite high and they are often higher than the economics of processing. Furthermore the quantity and composition of the scrap changes continuously and therefore also the market value. Environmental restrictions on processing and disposal of the scrap are to be considered. Large metallurgical plants, e.g. copper or

lead smelters, may be able to charge high amount of EEW but due to the decreasing quality and higher amount of plastic it will be more difficult in the future.

5.6 Recommendations

The recommendations of this study include:

- 1) There is a need to increase awareness of the risks of EEW.
- 2) There is a need to monitoring the workshops in Idna, Deir Samet and Beit Awa.
- 3) There is a need to observe occupational safety and health rules in the workshops.
- 4) There is a need to treatment of EEW.
- 5) There is a need for special guidance to deal with EEW and HW.
- 6) To apply the study standard and occupational concepts.
- 7) Search for the reuse of plastic waste.

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Appendix

EEW List Tables

Annex 1: Detailed description of the UNU product classification and its correlation to other EEW classifications.

UNU Key	Description	ANNEX III Of Recast EEW	Old EU-EEW
0001	Central Heating(household installed)	Large Equipment	Out of Scope
0002	Photovoltaic Panels (incl.converters)	Large Equipment	Out of Scope
0101	Professional Heating &Ventilation(excl.cooling equipment)	Large Equipment	01
0102	Dishwashers	Large Equipment	01
0103	Kitchen(f.i. large furnaces, ovens, cooking equipment)	Large Equipment	01
0104	Washing Machines(incl. combined dryers)	Large Equipment	01
0105	Dryers(wash dryers, centrifuges)	Large Equipment	01
0106	Household Heating & Ventilation(f.i. hoods, ventilators, space heaters)	Large Equipment	01
0108	Fridge(incl.combi-fridges)	Cooling and Freezing	01
0109	Freezers	Cooling and Freezing	01
0111	Air Conditioners(household installed and portable)	Cooling and Freezing	01
0112	Other Cooling(f.i. dehumidifiers, heat pump dryers)	Cooling and Freezing	01

0113	Professional Cooling(f.i. large air conditioners, cooling displays)	Cooling and Freezing	01
0114	Microwaves(incl.combined, excl.grills)	Small Equipment	01
0201	Other Small Household (f.i. small ventilators, iron, clocks, adapters)	Small Equipment	02
0202	Food(f.i. toaster, grills, food processing, frying pans)	Small Equipment	02
0203	Hot Water(f.i. coffee ,tea,water cookers)	Small Equipment	02
0204	Vacuum Cleaners (excl.professional)	Small Equipment	02

UNU Key	Description	ANNEX III Of Recast EEW	Old EU-EEW
0205	Personal Care(f.i. tooth brushes, hair dryers, razors)	Small Equipment	02
0301	Small IT (f.i. routers, mice, keyboards, external drives & accessories)	Small IT	03
0302	Desktop PCs (excl. monitors, accessories)	Small IT	03
0303	Laptops(incl. tablets)	Screens	03
0304	Printers(f.i. scanners, multifunctional, faxes)	Small IT	03
0305	Telecom (f.i. (cordless) phones, answering machines)	Small IT	03

0306	Mobile Phones (incl. smartphones, pagers)	Small IT	03
0307	Professional IT (f.i. servers, routers, data storage, copiers)	Large Equipment	03
0308	CRT Monitors	Screens	03
0309	Flat Display panel Monitors (LCD, LED)	Screens	03
0401	Small Consumers Electronic (f.i. headphones, remote controls)	Small Equipment	04
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	Small Equipment	04
0403	Music Instruments, Radio, HiFi(incl. audio sets)	Small Equipment	04
0404	Video (f.i. Video recorders, DVD , Blue Ray, set-top boxes)	Small Equipment	04
0405	Speakers	Small Equipment	04
0406	Cameras (f.i. camcorders, photo & digital still cameras)	Small Equipment	04
0407	CRT TVs	Small Equipment	04
0408	Flat Display Panel TVs (LCD, LED, Plasma)	Screens	04

UNU Key	Description	ANNEX III Of Recast EEW	Old EU-EEW
0501	Lamps (f.i. pocket, Christmas, excl.LED & incandescent)	Lamps	05
0502	Compact Fluorescent Lamps(incl. retrofit & non-retrofit)	Lamps	05
0503	Straight Tube Fluorescent Lamps	Lamps	05
0504	Special Lamps (f.i. professional mercury, high & low pressure sodium)	Lamps	05
0505	LED Lamps(incl.retrofit LED Lamps & household LED luminaires)	Lamps	05
0506	Household Luminaires (incl.household incandescent fittings)	Small Equipment	05
0507	Professional Luminaires (offices, public space, industry)	Small Equipment	05
0601	Household Tools(f.i. drills, saws, high pressure cleaners, lawn mowers)	Small Equipment	06
0602	Professional Tools(f.i. for welding, soldering milling)	Small Equipment	06
0701	Toys (f.i. car racing sets, electric trains, music toys, biking computers)	Small Equipment	07
0702	Game Consoles	Small IT	07

0703	Leisure (f.i. large exercise, sports equipment)	Large Equipment	07
0801	Household Medical(f.i. thermometers, blood pressure meters)	Small Equipment	08
0802	Professional Medical (f.i. hospital, dentist, diagnostics)	Large Equipment	08
0901	Household Monitoring & control (alarm , heat, smoke, excl.screens)	Small Equipment	09
0902	Professional Monitoring & control(f.i. laboratory, control panels)	Large Equipment	09

UNU Key	Description	ANNEX III Of Recast EEW	Old EU-EEW
1001	Non Cooled Dispensers(f.i. for vending, hot drinks, tickets, money)	Large Equipment	10
1002	Cooled Dispensers (f.i. vending, cold drinks)	Cooling and Freezing	10

Annex 2: ELOW codes that refer to hazardous and non-hazardous EEW.

EU Code	Main Sector
09 01 10	Single-use cameras without batteries
09 01 11*	Single-use cameras containing batteries included in 16 06 01, 16 06 02 or 16 06 03
09 01 12	Single-use cameras containing batteries other than those mentioned in 09 01 11
16 01 21*	Fluorescent tubes and other mercury-containing waste
16 01 23*	Discarded equipment containing chlorofluorocarbons
16 02 09*	Transformers and capacitors containing PCBs
16 02 11*	Discarded equipment containing chlorofluorocarbons, HCFC, HFC
16 02 12*	Discarded equipment containing free asbestos
16 02 13*	Discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12
16 02 14	Discarded equipment other than those mentioned in 16 02 09 to 16 02 13
20 01 35*	Discarded electrical and electronic equipment other than mentioned in 20 01 21 and 20 01 23 containing hazardous components
20 01 36	Discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35

Annex 3: Link between the UNU-KEYS and HS code.

UNUKEY	UNU Key Description	HS	HS Description
0101	Professional Heating & Ventilation (excl. cooling equipment)	845110	Dry-cleaning machines
0101	Professional Heating & Ventilation (excl. cooling equipment)	845130	Ironing machines and presses including fusing presses
0102	Dishwashers	842211	Dish washing machines (domestic)
0103	Kitchen (f.i. large furnaces, ovens, cooking equipment)	851660	Electric cooking, grilling & roasting equipment nes
0104	Washing Machines (incl. combined dryers)	845011	Automatic washing machines, of a dry capacity < 10 kg
0104	Washing Machines (incl. combined dryers)	845012	Washing machines nes, capacity <10 kg, built-in drier
0104	Washing Machines (incl. combined dryers)	845019	Household/laundry-type washing machines <10 kg, nes
0104	Washing Machines (incl. combined dryers)	845020	Household or laundry-type washing machines, cap >10kg
0105	Dryers (wash dryers, centrifuges)	842112	Clothes-dryers, centrifugal
0105	Dryers (wash dryers, centrifuges)	845121	Drying machines, capacity <10 kg, except washer-drier
0105	Dryers (wash dryers, centrifuges)	845129	Drying machines, nes
0106	Household Heating & Ventilation (f.i. hoods, ventilators, space heaters)	841460	Ventilating hoods having a maximum width < 120 cm
0106	Household Heating & Ventilation (f.i.	851621	Electric storage heating radiators

	hoods, ventilators, space heaters)		
0106	Household Heating & Ventilation (f.i. hoods, ventilators, space heaters)	851629	Electric space heating nes and soil heating apparatus
0108	Fridges (incl. combi-fridges)	841810	Combined refrigerator-freezers, fitted with separate external doors, electric/ other
0108	Fridges (incl. combi-fridges)	841821	Refrigerators, household compression type
0108	Fridges (incl. combi-fridges)	841822	Refrigerators, household absorption type, electric

0108	Fridges (incl. combi-fridges)	841829	Refrigerators, household type, including non-electric
0109	Freezers	841830	Freezers of the chest type, < 800 liter capacity
0109	Freezers	841840	Freezers of the upright type, < 900 liter capacity

0111	Air Conditioners (household installed and portable)	841510	Air conditioners window/wall types, self-contained
0111	Air Conditioners (household installed and portable)	841581	Air conditioners nes with reverse cycle refrigeration
0111	Air Conditioners (household installed and portable)	841582	Air conditioners nes, with refrigerating unit
0112	Other Cooling (f.i. dehumidifiers, heat pump dryers)	841861	Compression refrigeration equipment with heat exchang
0113	Professional Cooling (f.i. large air conditioners, cooling displays)	841583	Air conditioners nes, without refrigerating unit

0113	Professional Cooling (f.i. large air conditioners, cooling displays)	841850	Refrigerator/freezer chests/cabinets/showcases
0113	Professional Cooling (f.i. large air conditioners, cooling displays)	841869	Refrigerating or freezing equipment nes
0114	Microwaves (incl. combined, excl. grills)	851650	Microwave ovens
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	630110	Electric blankets of textile material
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	841451	Table, window, ceiling fans, electric motor <125 watts
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	842310	Personal weighing machines, baby & household scales
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	845210	Household type sewing machines
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	850930	Domestic kitchen waste disposers
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	850980	Domestic appliances, with electric motor, nes
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	851640	Electric smoothing irons
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910111	Wrist-watch, precious metal, battery, with hands

0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910112	Wrist-watch, precious metal, battery, opto/electric
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910119	Wrist-watch, precious metal, battery, other

0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910191	Pocket-watch, precious-metal case, battery
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910211	Wrist-watch, base-metal case, battery, with hands

0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910212	Wrist-watch, base-metal case, battery, opto/electric
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910219	Wrist-watch, base-metal case, battery, other
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910291	Pocket-watch, base-metal case, battery
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910310	Clocks with watch movements, battery (except vehicle)
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910390	Clocks with watch movements, nes (except vehicle)
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910511	Alarm clocks, battery or mains powered
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910521	Wall clocks, battery or mains powered
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910591	Clocks, nes, battery or mains powered
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910700	Time switches
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910811	Assembled battery watch movement, mechanical display
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910812	Assembled battery watch movement, opto-electric displa

0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910819	Assembled battery watch movements
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910820	Watch movements, complete and assembled, auto-winding
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910890	Watch movements, complete & assembled (excl. electrically operated), other ...

0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910911	Clock movements, complete and assembled, battery/alar
0201	Other Small Household (f.i. small ventilators, irons, clocks, adapters)	910919	Clock movements, complete and assembled, battery nes
0202	Food (f.i. toaster, grills, food processing, frying pans)	850940	Domestic food grinders, mixers, juice extractors
0202	Food (f.i. toaster, grills, food processing, frying pans)	851672	Electric toasters, domestic
0202	Food (f.i. toaster, grills, food processing, frying pans)	851679	Electro-thermic appliances, domestic, nes
0203	Hot Water (f.i. coffee, tea, water cookers)	851610	Electric instant, storage and immersion water heaters

0203	Hot Water (f.i. coffee, tea, water cookers)	851671	Electric coffee or tea makers, domestic
0204	Vacuum Cleaners (excl. professional)	850811	Vacuum cleaners, with self-contained electric motor, Of a power not > 1,500 W & having a dust bag/other receptacle capacity not > 20 l
0204	Vacuum Cleaners (excl. professional)	850819	Vacuum cleaners, with self-contained electric motor, other than of 8508.11

0204	Vacuum Cleaners (excl. professional)	850860	Other vacuum cleaners, not with self-contained electric motor
0204	Vacuum Cleaners (excl. professional)	850910	Domestic vacuum cleaners
0205	Personal Care (f.i. tooth brushes, hair dryers, razors)	851010	Shavers, with self-contained electric motor
0205	Personal Care (f.i. tooth brushes, hair dryers, razors)	851020	Hair clippers, with self-contained electric motor
0205	Personal Care (f.i. tooth brushes, hair dryers, razors)	851030	Hair-removing appl w/sel
0205	Personal Care (f.i. tooth brushes, hair dryers, razors)	851631	Electric hair dryers
0205	Personal Care (f.i. tooth brushes, hair dryers, razors)	851632	Electro-thermic hairdressing apparatus, nes
0205	Personal Care (f.i. tooth brushes, hair dryers, razors)	851633	Electro-thermic hand drying apparatus
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	846900	Typewriters other than printers of heading 84.43; word-processing machines.
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	846911	Word-processing machines
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	846912	Automatic typewriters
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	846920	Typewriters,electric,nes
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	846930	Typewriters,non-electric
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847010	Electronic calculators operable with internal power

0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847021	Electronic calculators, printing, external power
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847029	Electronic calculators, non-printing, external power
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847110	Analogue or hybrid computers

0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847170	Storage units
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847180	Units of auto data proce
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	847190	Automatic data processin
0301	Small IT (f.i. routers, mice, keyboards, external drives &accessoires)	854389	Electrical machines and
0302	Desktop PCs (excl. monitors, accessoires)	847141	Dig auto data proc w/cpu
0302	Desktop PCs (excl. monitors, accessoires)	847149	Dig auto data proc units
0302	Desktop PCs (excl. monitors, accessoires)	847150	Digital process units wh
0303	Laptops (incl. tablets)	847130	Portable digital data pr
0304	Printers (f.i. scanners, multifunctionals, faxes)	844331	Machines which perform two/more of the functions of printing, copying/ facsimile transmission, capable of connecting to an automatic data processing machine/to a network

0304	Printers (f.i. scanners, multifunctionals, faxes)	844332	Other printers, copying machines & facsimile machines, whether/not combined ,exclud the ones which perform two/more of the functions of printing, copying/facsimile transmission; capable of connecting to an automatic data processing machine/ to a network
0304	Printers (f.i. scanners, multifunctionals, faxes)	851721	Facsimiles machines
0304	Printers (f.i. scanners, multifunctionals, faxes)	851722	Teleprinters
0305	Telecom (f.i. (cordless) phones, answering machines)	851711	Line telephone sets,cord
0305	Telecom (f.i. (cordless) phones, answering machines)	851718	Other telephone sets, incl. telephones for cellular networks/for other wireless networks, other than 8517.11 & 8517.12
0305	Telecom (f.i. (cordless) phones, answering machines)	851719	Telephone sets, nes
0305	Telecom (f.i. (cordless) phones, answering machines)	851730	Telephonic or telegraphic switching apparatus
0305	Telecom (f.i. (cordless) phones, answering machines)	851750	Apparatus for carrier-cu
0305	Telecom (f.i. (cordless) phones, answering machines)	851769	Other apparatus for transmission/ reception of voice, images/other data, incl. apparatus for communication in a wired/wireless network (such as a local/wide area network) , other than 8517.61 & 8517.62

0305	Telecom (f.i. (cordless) phones, answering machines)	851780	Elect apparatus for line
0305	Telecom (f.i. (cordless) phones, answering machines)	852020	Telephone answering machines
0305	Telecom (f.i. (cordless) phones, answering machines)	852790	Radio reception apparatus nes
0305	Telecom (f.i. (cordless) phones, answering machines)	903040	Gain, /distortion and crosstalk meters, etc.
0306	Mobile Phones (incl. smartphones, pagers)	851712	Telephones for cellular networks/for other wireless networks, other than Line telephone sets with cordless handsets
0306	Mobile Phones (incl. smartphones, pagers)	851761	Base stations for transmission/ reception of voice, images/other data, incl. apparatus for communication in a wired/wireless network (such as a local/wide area network)
0306	Mobile Phones (incl. smartphones, pagers)	851950	Telephone answering machines
0306	Mobile Phones (incl. smartphones, pagers)	852520	Transmit-receive apparatus for radio, TV, etc.

0307	Professional IT (f.i. servers, routers, data storage, copiers)	844312	Sheet fed, office offset printers, sheet < 22x36 cm
0307	Professional IT (f.i. servers, routers, data storage, copiers)	844339	Other printers, copying machines & facsimile machines, whether/not combined , excl. 8443.31 & 8443.32

0307	Professional IT (f.i. servers, routers, data storage, copiers)	847040	Accounting machines
0307	Professional IT (f.i. servers, routers, data storage, copiers)	847050	Cash registers
0307	Professional IT (f.i. servers, routers, data storage, copiers)	847090	Postage franking, ticket-issuing machines, etc.
0307	Professional IT (f.i. servers, routers, data storage, copiers)	900911	Electrostatic photo-copyers, direct process

0307	Professional IT (f.i. servers, routers, data storage, copiers)	900912	Electrostatic photo-copyers, indirect process
0307	Professional IT (f.i. servers, routers, data storage, copiers)	900921	Photo-copying equipment with an optical system, nes
0307	Professional IT (f.i. servers, routers, data storage, copiers)	900922	Contact type photo-copying apparatus, nes
0307	Professional IT (f.i. servers, routers, data storage, copiers)	900930	Thermo-copying apparatus
0308	Cathode Ray Tube Monitors	852821	Color video monitors
0308	Cathode Ray Tube Monitors	852822	B & w video monitors
0308	Cathode Ray Tube Monitors	852841	Cathode-ray tube monitors , of a kind solely/principally used in an automatic data processing system of heading 84.71
0308	Cathode Ray Tube Monitors	852849	Other cathode-ray tube monitors , not of a kind solely/principally used in an automatic data processing system of heading 84.71

0309	Flat Display Panel Monitors (LCD, LED)	852851	Other monitors, of a kind solely/ principally used in an automatic data processing system of heading 84.71
0309	Flat Display Panel Monitors (LCD, LED)	852859	Other monitors, not of a kind solely/ principally used in an automatic data processing system of heading 84.71
0309	Flat Display Panel Monitors (LCD, LED)	853120	Indicator panels incorporating electronic displays
0401	Small Consumer Electronics (f.i. headphones, remote controls)	851810	Microphones and stands thereof
0401	Small Consumer Electronics (f.i. headphones, remote controls)	851830	Headphones, earphones, combinations
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852712	Pocket-size radio-casset
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852713	Radio apparatus w/sound
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852719	Radio receivers, portable, nonrecording
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852731	Radio-telephony receiver, with sound reproduce/record
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852732	Radio-telephony etc receivers, nes
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852739	Radio-broadcast receivers nes
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852791	Other reception apparatus for radiobroadcasting, combined with sound recording/reproducing apparatus.

0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852792	Other reception apparatus for radiobroadcasting, not combined with sound recording/reproducing apparatus but combined with a clock.
0402	Portable Audio & Video (f.i. MP3, e-readers, car navigation)	852799	Other reception apparatus for radiobroadcasting, excl. 8527.91 & 8527.92
0403	Music Instruments, Radio, HiFi (incl. audio sets)	847210	Office duplicating machines
0403	Music Instruments, Radio, HiFi (incl. audio sets)	847230	Machinery for processing mail of all kinds
0403	Music Instruments, Radio, HiFi (incl. audio sets)	847290	Office machines, nes
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851762	Machines for the reception, conversion & transmission/regeneration of voice, images/other data, incl. switching & routing apparatus
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851840	Audio-frequency electric amplifiers
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851850	Electric sound amplifier sets
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851910	Coin or disc-operated record-players
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851920	Apparatus operated by coins, banknotes, bank cards, tokens/by other means of payment
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851921	Record-players without built-in loudspeaker, nes
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851929	Record-players with loudspeakers, nes

	audio sets)		
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851930	Turntables (record-decks)
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851931	Turntables with automatic record changing mechanism
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851939	Turntables, without record changers
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851940	Transcribing machines

0403	Music Instruments, Radio, HiFi (incl. audio sets)	851981	Other sound recording/reproducing apparatus, using magnetic, optical/ semiconductor media, other than 8519.20, 8519.30, 8519.50
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851989	Other sound recording/reproducing apparatus, other n.e.s. in Ch. 85.19
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851992	Pocket-size cassette-player
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851993	Sound repr app, cassette
0403	Music Instruments, Radio, HiFi (incl. audio sets)	851999	Sound reproducing apparatus, nonrecording, nes
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852010	Dictating machine requiring external power source
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852032	Magnetic tape rec digit
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852033	Magnetic tape rec casset

	audio sets)		
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852039	Non-cassette audio tape recorders, sound reproducing
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852090	Audio recording equipment without sound reproduction
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852721	Radio receivers, external power, sound reproduce/record
0403	Music Instruments, Radio, HiFi (incl. audio sets)	852729	Radio receivers, external power, not sound reproducer
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852110	Video recording/reproducing apparatus, magnetic tape
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852190	Video record/reproduction apparatus not magnetic tape
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852530	Television cameras
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852560	Transmission apparatus for radiobroadcasting/television incorporating reception apparatus
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852830	Video projectors
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852861	Projectors, Of a kind solely/principally used in an automatic data processing system of heading 84.71
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	852869	Projectors, not of a kind solely/principally used in an automatic data processing system of heading 84.71

0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900661	Photographic discharge lamp flashlight apparatus
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900669	Photographic flashlight apparatus, nes
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900711	Cinematographic cameras for film <16mm wide
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900719	Cinematographic cameras for film >16mm wide
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900720	Cinematographic projector
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900810	Slide projectors
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900830	Image projectors, except slide/microform
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	900840	Photographic enlargers and reducers, other than cine
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	901010	Equipment for automatic development of photo film
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	901050	App & equip for ph. labor
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	901060	Projection screens
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	903130	Profile projectors, nes
0404	Video (f.i. Video recorders, DVD, Blue Ray, set-top boxes)	903149	Optical instruments and
0405	Speakers	851821	Single loudspeakers, mounted in enclosure

0405	Speakers	851822	Multiple loudspeakers, mounted in single enclosure
0406	Cameras (f.i. camcorders, foto& digital still cameras)	852540	Still image video camera
0406	Cameras (f.i. camcorders, foto& digital still cameras)	852580	Television cameras, digital cameras & video camera recorders
0407	Cathode Ray Tube TVs	852812	Color television receive
0407	Cathode Ray Tube TVs	852813	B & W television receive

0408	Flat Display Panel TVs (LCD, LED, Plasma)	852872	Other colour reception apparatus for television, whether/not incorporating radio-broadcast receivers/sound/video recording/reproducing apparatus,
0501	Lamps (f.i. pocket, christmas, excl. LED & incandescent)	851310	Portable battery and magneto-electric lamps
0503	Straight Tube Fluorescent Lamps	853941	Arc-lamps
0503	Straight Tube Fluorescent Lamps	853949	Ultra-violet or infra-red
0504	Special Lamps (f.i. professional mercury, high & low pressure sodium)	853931	Fluorescent lamps, hot cathode
0504	Special Lamps (f.i. professional mercury, high & low pressure sodium)	853932	Mercury or sodium vapour
0504	Special Lamps (f.i. professional mercury, high & low pressure sodium)	853939	Discharge lamps, other than ultra-violet lamps, nes
0506	Household Luminaires (incl. household incandescent fittings)	851210	Lighting/signaling equipment as used on bicycles
0506	Household Luminaires (incl. household incandescent fittings)	940510	Chandeliers, other electric ceiling or wall lights

0506	Household Luminaires (incl. household incandescent fittings)	940520	Electric table, desk, bedside and floor lamps
0506	Household Luminaires (incl. household incandescent fittings)	940530	Lighting sets of a kind used for Christmas trees
0507	Professional Luminaires (offices, public space, industry)	940540	Electric lamps, lighting fittings, nes
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	846721	Drills of all kinds, for working in the hand, with self-contained elec. mot ...
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	846722	Saws for working in the hand, with self-contained elec. motor
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	846729	Tools for working in the hand, with self-contained elec. motor (excl. drill ...
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	850810	Drills, hand-held, with self-contained electric motor
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	850820	Saws, hand-held, with self-contained electric motor
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	850880	Tools, hand-held, with electric motor, not drills/saw

0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	850920	Domestic floor polishers
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	851511	Electric soldering irons and guns
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	851519	Electric brazing, soldering machines and apparatus ne
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	851521	Electric resistance welding equipment, automatic

0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	851529	Electric resistance welding equipment, non-automatic
0601	Household Tools (f.i. drills, saws, high pressure cleaners, lawn mowers)	851531	Automatic electric plasma, other arc welding equipment
0602	Professional Tools (f.i. for welding, soldering, milling)	843311	Mowers, powered, lawn, with horizontal cutting device
0602	Professional Tools (f.i. for welding, soldering, milling)	843319	Mowers, powered, lawn, nes
0701	Toys (f.i. car racing sets, electric trains, music toys, biking computers)	950300	Tricycles, scooters, pedal cars & similar wheeled toys; dolls' carriages; dolls; other toys; reduced-size (
0701	Toys (f.i. car racing sets, electric trains, music toys, biking computers)	950310	Electric trains, train sets, etc
0701	Toys (f.i. car racing sets, electric trains, music toys, biking computers)	950350	Toy musical instruments, apparatus
0701	Toys (f.i. car racing sets, electric trains, music toys, biking computers)	950490	Articles for funfair, table and parlour games, nes
0702	Game Consoles	950410	Video games used with a television receiver
0703	Leisure (f.i. large exercise, sports equipment)	920710	Keyboard instruments electrical/ requiring amplifier
0703	Leisure (f.i. large exercise, sports equipment)	920790	Musical instruments nes, electric/ requiring amplifier
0801	Household Medical (f.i. thermometers, blood pressure meters)	902140	Hearing aids, except parts and accessories
0802	Professional Medical (f.i. hospital, dentist, diagnostics)	901811	Electro-cardiographs
0802	Professional Medical (f.i. hospital, dentist, diagnostics)	901812	Ultrasonic scanning appr

0802	Professional Medical (f.i. hospital, dentist, diagnostics)	901813	Magnetic resonance image
0802	Professional Medical (f.i. hospital, dentist, diagnostics)	901814	Scintigraphy apparatus

0802	Professional Medical (f.i. hospital, dentist, diagnostics)	901819	Electro-diagnostic apparatus, nes
0802	Professional Medical (f.i. hospital, dentist, diagnostics)	901841	Dental drill engines
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	853110	Burglar or fire alarms and similar apparatus
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	853180	Electric sound or visual signaling apparatus, nes
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	854340	Electric fence energizer
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	854370	Other machines & apparatus for electrical machines & apparatus, other than machines & apparatus for electroplating/ electrolysis/ electrophoresis/signal generators/ particle accelerators.
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	901730	Micrometers, calipers and gauges
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902410	Machines for testing mechanical properties of metals
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902480	Machines for testing mechanical properties nes
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902519	Thermometers, except liquid filled

0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902580	Hydrometer, pyrometer, hygrometer, alone or combined
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902610	Equipment to measure or check liquid flow or level
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902620	Equipment to measure or check pressure
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902680	Equipment to measure, check gas/ liquid properties nes
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902710	Gas/smoke analysis apparatus
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	902780	Equipment for physical or chemical analysis, nes
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	903020	Cathode-ray oscilloscopes, oscillography
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	903033	Other instruments & apparatus, for measuring/checking voltage, current, resistance/power, without a recording device, other than 9030.31 & 9030.32,

0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	903039	Ammeters, voltmeters, ohm meters, etc, non-recording
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	903089	Electrical measurement instruments nes
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	903180	Measuring or checking equipment, nes
0901	Household Monitoring & Control (alarm, heat, smoke, excl. screens)	903210	Thermostats
0902	Professional Monitoring & Control (f.i. laboratory, control panels)	901510	Rangefinders

0902	Professional Monitoring & Control (f.i. laboratory, control panels)	901520	Theodolites and tachometers
0902	Professional Monitoring & Control (f.i. laboratory, control panels)	901530	Surveying levels
0902	Professional Monitoring & Control (f.i. laboratory, control panels)	901540	Photogrammetrically surveying instruments, appliances
0902	Professional Monitoring & Control (f.i. laboratory, control panels)	901580	Surveying, etc instruments nes
1001	Non Cooled Dispensers (f.i. for vending, hot drinks, tickets, money)	847629	Autombev-vendngmach ne
1001	Non Cooled Dispensers (f.i. for vending, hot drinks, tickets, money)	847689	Automatic vending mach n
1002	Cooled Dispensers (f.i. for vending, cold drinks)	847621	Autbev-vend m heat/refr
1002	Cooled Dispensers (f.i. for vending, cold drinks)	847681	Automv-vendngmach h/refr

Annex 4: Classification of EEW under the Palestinian Code.

Serial	EU Code	Main Sector
Number		Sub Sector – Wastes
_07		Chapter Seven - Wastes from Other Sources
_07-02		Sub-Chapter Two - Wastes from Maintenance Services
		end-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)
_07-02-101	16 01 03	end-of-life tires
_07-02-102	16 01 04*	end-of-life vehicles
_07-02-103	16 01 06	end-of-life vehicles, containing neither liquids nor other hazardous components
_07-02-104	16 01 07*	oil filters
_07-02-105	16 01 08*	components containing mercury
_07-02-106	16 01 09*	components containing PCBs
_07-02-107	16 01 10*	explosive components (for example air bags)
_07-02-108	16 01 11*	brake pads containing asbestos
_07-02-109	16 01 12	brake pads other than those mentioned in 16 01 11
_07-02-110	16 01 13*	brake fluids

_07-02-111	16 01 14*	antifreeze fluids containing dangerous substances
_07-02-112	16 01 15	antifreeze fluids other than those mentioned in 16 01 14
_07-02-113	16 01 16	tanks for liquefied gas
_07-02-114	16 01 17	ferrous metal
_07-02-115	16 01 18	non-ferrous metal
_07-02-116	16 01 19	Plastic
_07-02-117	16 01 20	Glass
_07-02-118	16 01 21*	hazardous components other than those mentioned in 16 01 07 to 16 01 11 and 16 01 13 and 16 01 14
_07-02-119	16 01 22	components not otherwise specified
_07-02-120	16 01 99	wastes not otherwise specified
		batteries and accumulators
_07-02-121	16 06 01*	lead batteries
_07-02-122	16 06 02*	Ni-Cd batteries
_07-02-123	16 06 03*	mercury-containing batteries
_07-02-124	16 06 04	alkaline batteries (except 16 06 03)
_07-02-125	16 06 05	other batteries and accumulators
_07-02-126	16 06 06*	separately collected electrolyte from batteries and accumulators
		wastes from transport tank, storage tank and barrel cleaning (except 05 and 13)
_07-02-127	16 07 08*	wastes containing oil

_07-02-128	16 07 09*	wastes containing other dangerous substances
_07-02-129	16 07 99	wastes not otherwise specified
		spent catalysts
_07-02-130	16 08 01	spent catalysts containing gold, silver, rhenium, rhodium, palladium, iridium or platinum (except 16 08 07)
_07-02-131	16 08 02*	spent catalysts containing dangerous transition metals or dangerous transition metal compounds
_07-02-132	16 08 03	spent catalysts containing transition metals or transition metal compounds not otherwise specified
_07-02-133	16 08 04	spent fluid catalytic cracking catalysts (except 16 08 07)
_07-02-134	16 08 05*	spent catalysts containing phosphoric acid
_07-02-135	16 08 06*	spent liquids used as catalysts
_07-02-136	16 08 07*	spent catalysts contaminated with dangerous substances
		waste linings and refractories
_07-02-137	16 11 01*	carbon-based linings and refractories from metallurgical processes containing dangerous substances
_07-02-138	16 11 02	carbon-based linings and refractories from metallurgical processes other than those mentioned in 16 11 01
_07-02-139	16 11 03*	other linings and refractories from metallurgical processes containing dangerous substances

_07-02-140	16 11 04	other linings and refractories from metallurgical processes other than those mentioned in 16 11 03
_07-02-141	16 11 05*	linings and refractories from non-metallurgical processes containing dangerous substances
_07-02-142	16 11 06	linings and refractories from non-metallurgical processes other than those mentioned in 16 11 05
		wastes from the preparation of water intended for human consumption or water for industrial use
_07-02-143	19 09 01	solid waste from primary filtration and screenings
_07-02-144	19 09 02	sludge from water clarification
_07-02-145	19 09 03	sludge's from decarbonation
_07-02-146	19 09 04	spent activated carbon
_07-02-147	19 09 05	saturated or spent ion exchange resins
_07-02-148	19 09 06	solutions and sludge's from regeneration of ion exchangers
_07-02-149	19 09 99	wastes not otherwise specified

Annex 5: EPA Toxic Hazardous Waste List Tables.

EPA HW No.	Contaminant	<u>CAS No. ²</u>	<u>Regulatory Level (mg/L)</u>
D004	Arsenic	7440-38-2	5.0
D005	Barium	7440-39-3	100.0
D018	Benzene	71-43-2	0.5
D006	Cadmium	7440-43-9	1.0
D019	Carbon tetrachloride	56-23-5	0.5
D020	Chlordane	57-74-9	0.03
D021	Chlorobenzene	108-90-7	100.0
D022	Chloroform	67-66-3	6.0
D007	Chromium	7440-47-3	5.0
D023	IV o-Cresol	95-48-7	200.0
D024	m-Cresol p-	108-39-4	200.0
D025	Cresol	106-44-5	200.0
D026	Cresol		200.0
D016	2,4-D	94-75-7	10.0
D027	1,4-Dichlorobenzene	106-46-7	7.5
D028	1,2-Dichloroethane	107-06-2	0.5
D029	1,1-Dichloroethylene	75-35-4	0.7
D030	2,4-Dinitrotoluene	121-14-2	0.13
D012	Endrin	72-20-8	0.02
D031	Heptachlor (and its epoxide)	76-44-8	0.008
D032	Hexachlorobenzene	118-74-1	0.13
D033	Hexachlorobutadiene	87-68-3	0.5
D034	Hexachloroethane	67-72-1	3.0
D008	Lead	7439-92-1	5.0
D013	Lindane	58-89-9	0.4
D009	Mercury	7439-97-6	0.2
D014	Methoxychlor	72-43-5	10.0
D035	Methyl ethyl ketone	78-93-3	200.0
D036	Nitrobenzene	98-95-3	2.0
D037	Pentachlorophenol	87-86-5	100.0
D038	Pyridine	110-86-1	5.0
D010	Selenium	7782-49-2	1.0
D011	Silver	7440-22-4	5.0
D039	Tetrachloroethyl-ene	127-18-4	0.7
D015	Toxaphene	8001-35-2	0.5
D040	Trichloroethyl-ene	79-01-6	0.5
D041	2,4,5-Trichlorophenol	95-95-4	400.0
D042	2,4,6-Trichlorophenol	88-06-2	2.0
D017	2,4,5-TP (Silvex)	93-72-1	1.0

Annex 6: Questionnaire that Design.

بسم الله الرحمن الرحيم



جامعة بوليتكنك فلسطين
كلية الهندسة
هندسة تكنولوجيا البيئة

(استمارة استبيان)

تحية طيبة وبعد،،،

انطلاقاً من دور البحث العلمي في معرفة كميات وتصنيفات وأنواع النفايات الالكترونية والكهربائية وتوزيعها في قرى إذنا ودير سامت وبيت عوا، بالإضافة الى عمل توعية بيئية بخصوص مخاطر التعامل مع النفايات الالكترونية والكهربائية، يقوم فريق البحث بعمل بحث ضمن مشروع التخرج لنيل درجة البكالوريوس من قسم هندسة تكنولوجيا البيئة بعنوان:

"جمع بيانات حول إدارة النفايات الالكترونية والكهربائية في محافظة الخليل".

يأمل الباحثون من حضرتكم التكرم بالاجابة على فقرات الاستبانة بدقة وموضوعية،لما لرأيكم من أهمية في تحقيق هدف الدراسة بنجاح ، علما ان البيانات التي سيتم جمعها ستعامل بسرية تامة وتستخدم لاغراض البحث العلمي فقط.

شاكركم لكم حسن تعاونكم

الباحثون: سجي حلاحلة

خليل زيدات

إشراف: د.حسن صوالحة

د.ماهر الجعبري

القسم الأول

يرجى التكرم بالإجابة عن الأسئلة التالية:

1. معلومات عامة

اسم المشغل:

موقع المشغل:

مساحة المشغل:

2. المؤهل العلمي:

الثانوية العامة

دبلوم (كلية متوسطة)

بكالوريوس

دراسات عليا

غير ذلك يرجى تحديده.....

3. الخبرة العلمية في التعامل مع الالكترونيات

أقل من 5 سنوات

5-10 سنوات

10-15 سنة

15-20 سنة

أكثر من 20 سنة

4. حدد مصادر النفايات الالكترونية والكهربائية القادمة الى المشغل؟

مناطق الضفة الغربية (النسبة المئوية

الاراضي المحتلة عام 1948 (النسبة المئوية

5. حدد مصادر النفايات الالكترونية والكهربائية القادمة الى المشغل من مناطق الضفة الغربية؟

تجاري

صناعي

منزلي

جميع ما ذكر

6. ما طبيعة النفايات الالكترونية والكهربائية؟

مفتوحة (أجزاء من أجهزة كاملة مثل ماتور غسالة)

مغلقة (أجزاء كاملة مثل الغسالة)

الاثنان معا

7. من وجهة نظرك ما كميات النفايات الالكترونية والكهربائية الاجمالية الداخلة الى المشغل بشكل يومي؟

1001-3000 كغم

1-1000 كغم

5001-10000 كغم

3001-5000 كغم

أكثر من 10000 كغم

8. من وجهة نظرك ما نسبة النفايات الالكترونية والكهربائية القادمة الى المشغل من الخردات بشكل عام؟

20-40%

10-20%

60-90%

40-60%

100%

9. من وجهة نظرك ما نسبة المخلفات بعد استخراج المواد القيمة من النفايات الالكترونية والكهربائية؟

20-40%

10-20%

60-90%

40-60%

100%

10. ما نسبة النفايات الالكترونية

20-40%

10-20%

60-90%

40-60%

100%

11. ما نسبة النفايات الكهربائية

20-40%

10-20%

60-90%

40-60%

100%

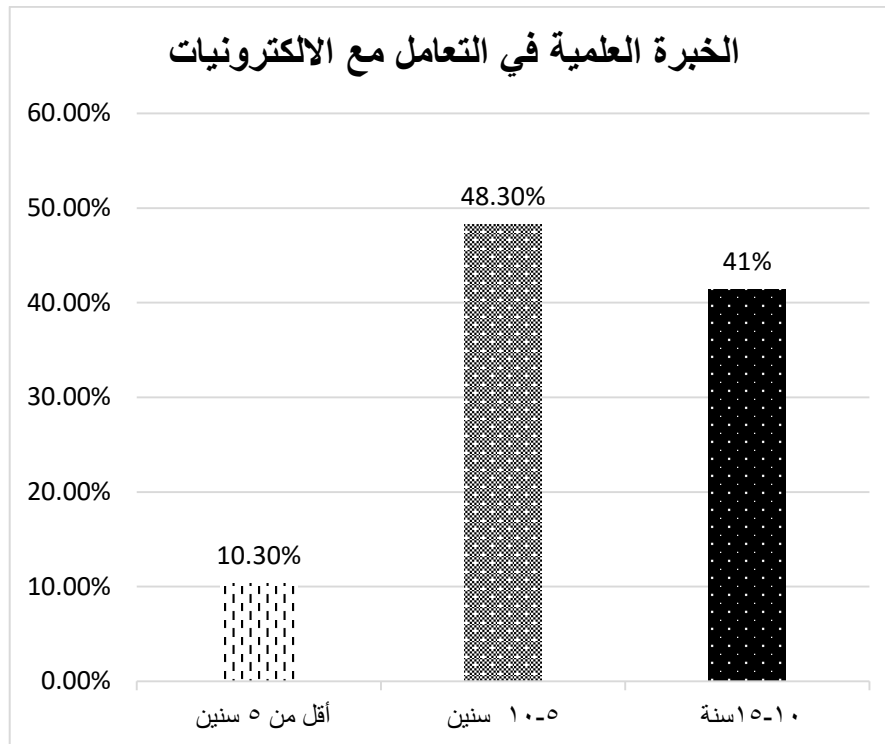
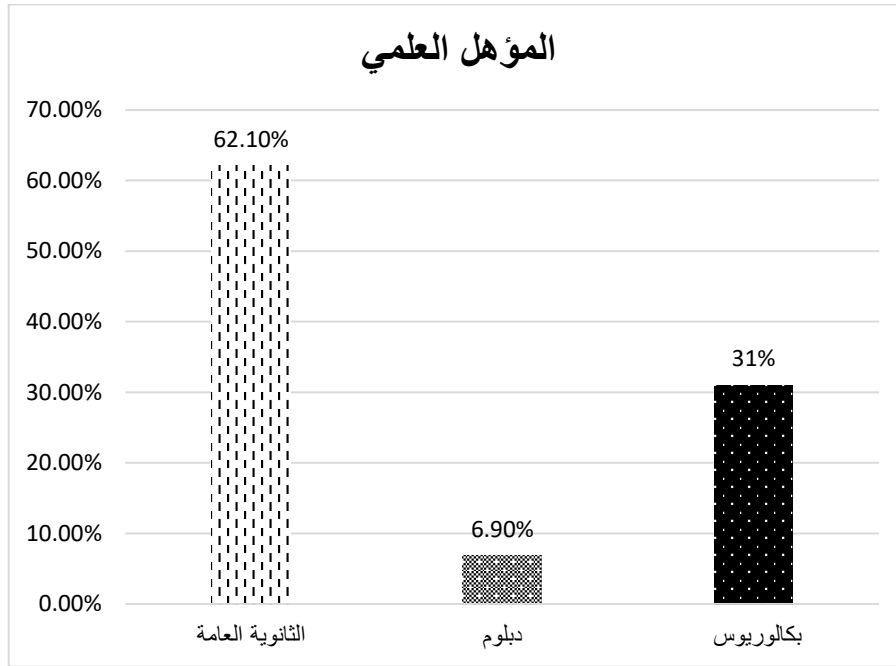
القسم الثاني

فيما يلي مجموعة من العبارات يرجى قراءة العبارة واختيار الاجابة المناسبة لكل عبارة بما يتناسب مع ما هو مطبق في مشغلكم:

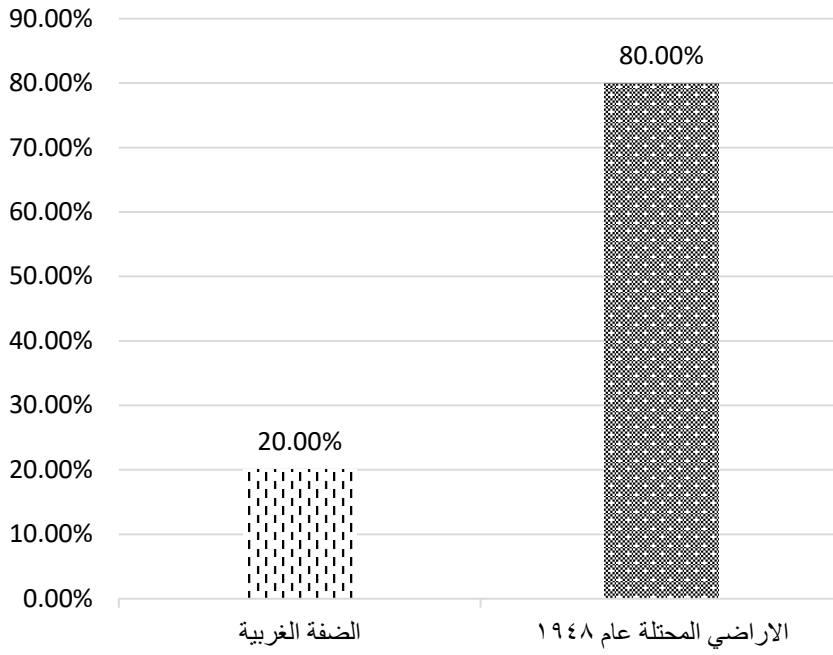
الرقم	البيان	موافق بشدة	موافق	محايد	معارض	معارض بشدة
1.	جميع النفايات القادمة الى المشغل نفايات الكترونية وكهربائية.					
2.	تحتوي النفايات في المشغل على ادوات منزلية كبيرة (ثلاجات، غسالات، جلايات...).					
3.	تحتوي النفايات في المشغل على ادوات منزلية صغيرة (مكنسة، خلاط، ميكرويف..).					
4.	تحتوي النفايات في المشغل على معدات الاعلام والاتصال (حواسيب، هواتف...).					
5.	تحتوي النفايات في المشغل على معدات استهلاكية (ساعات، آلات موسيقية...).					
6.	تحتوي النفايات في المشغل على معدات اضاءة (المصابيح بأنواعها).					
7.	تحتوي النفايات في المشغل على ادوات بناء (منشار، مثقاب، صاروخ...).					
8.	تحتوي النفايات في المشغل على ألعاب اطفال.					
9.	تحتوي النفايات في المشغل على آلات رياضية .					
10.	تحتوي النفايات في المشغل على اجهزة اوتوماتيكية خدمتية (آلات عد النقود...).					
11.	جميع النفايات الالكترونية والكهربائية القادمة الى المشغل يتم تدويرها .					
12.	يتم التعامل مع المخلفات عن طريق الفرز في مشغلكم					

الرقم	البيان	موافق بشدة	موافق	محايد	معارض	معارض بشدة
13.	يتم التعامل مع المخلفات عن طريق الاسترجاع في مشغلكم					
14.	يتم التعامل مع المخلفات عن طريق المعالجة في مشغلكم					
15.	يتم التخلص من المخلفات عن طريق الحرق في مشغلكم					
16.	يتم التخلص من المخلفات عن طريق الدفن الصحي					
17.	يتم التخلص من المخلفات في حاويات البلدية					
18.	يتم تدوير مصابيح الفلورسنت					
19.	يتم تدوير البطاريات الجافة					
20.	يتم تدوير البطاريات السائلة					
21.	يتم تدوير التلفون النقال					
22.	يتم تدوير التلفاز					
23.	يتم تدوير جهاز الحاسوب					
24.	هل يتم تدوير الهاتف					
25.	لديك معرفة بتصنيف المخلفات الخطرة.					
26.	لديكم ارشادات خاصة للتعامل مع المخلفات الخطرة بشكل سليم.					
27.	النفائات الالكترونية خطيرة على البيئة					
28.	النفائات الالكترونية خطيرة على صحة الانسان					
29.	تعرض احدكم لاحد المواد الكيميائية نتيجة العمل في المشغل					
30.	تقوم المؤسسات الرسمية بتقديم خدمات لكم .					
31.	هنالك اية رقابة من قبل المؤسسات الرسمية.					
32.	تذهب المعادن بعد فرزها الى اسرائيل مباشرة					
33.	تذهب المعادن بعد فرزها الى الضفة					

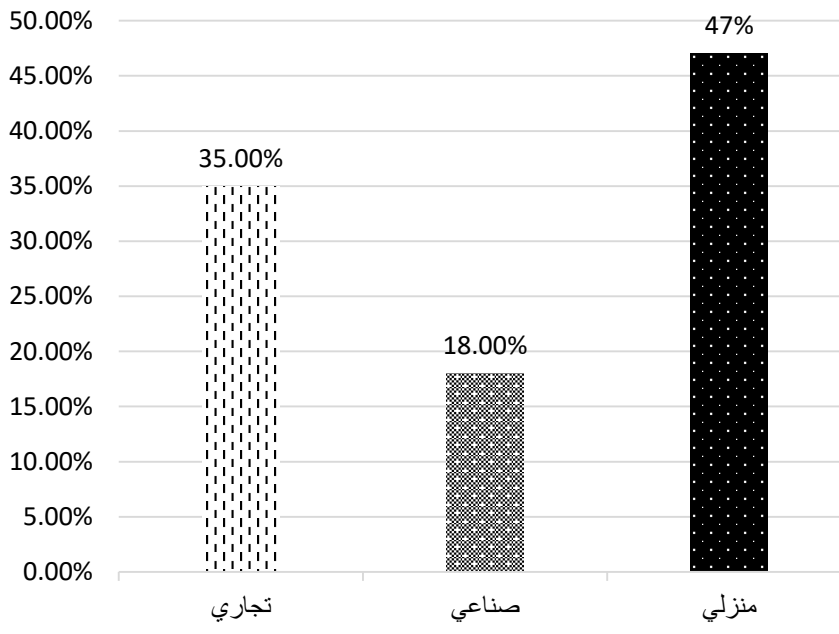
Annex 7: Graphics for the questionnaire analysis.

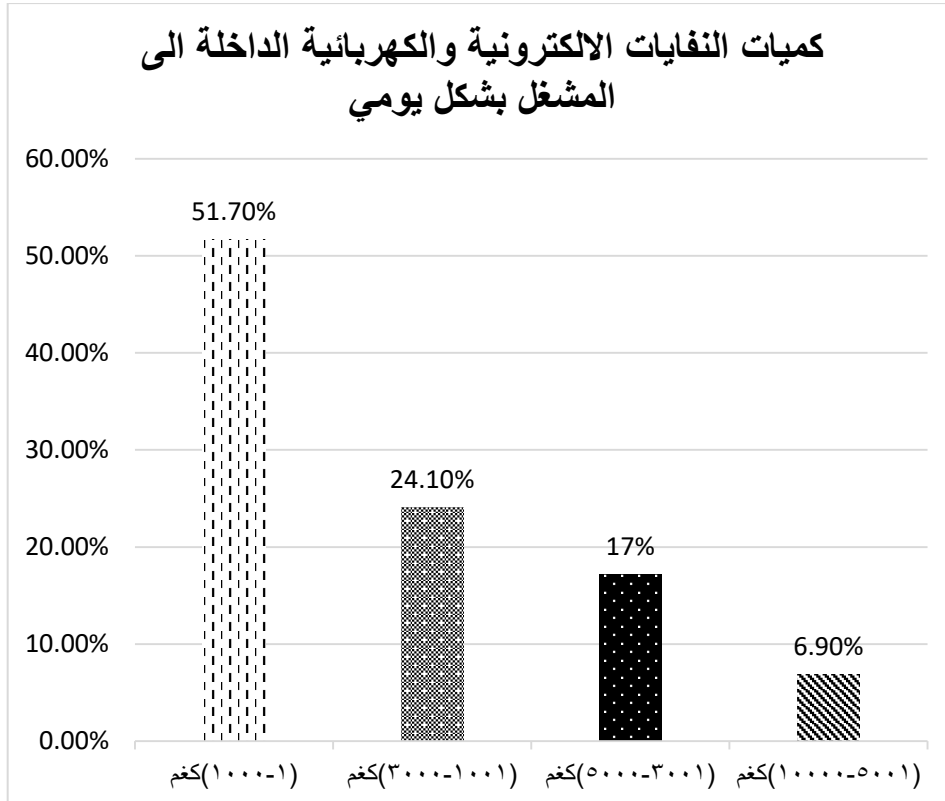
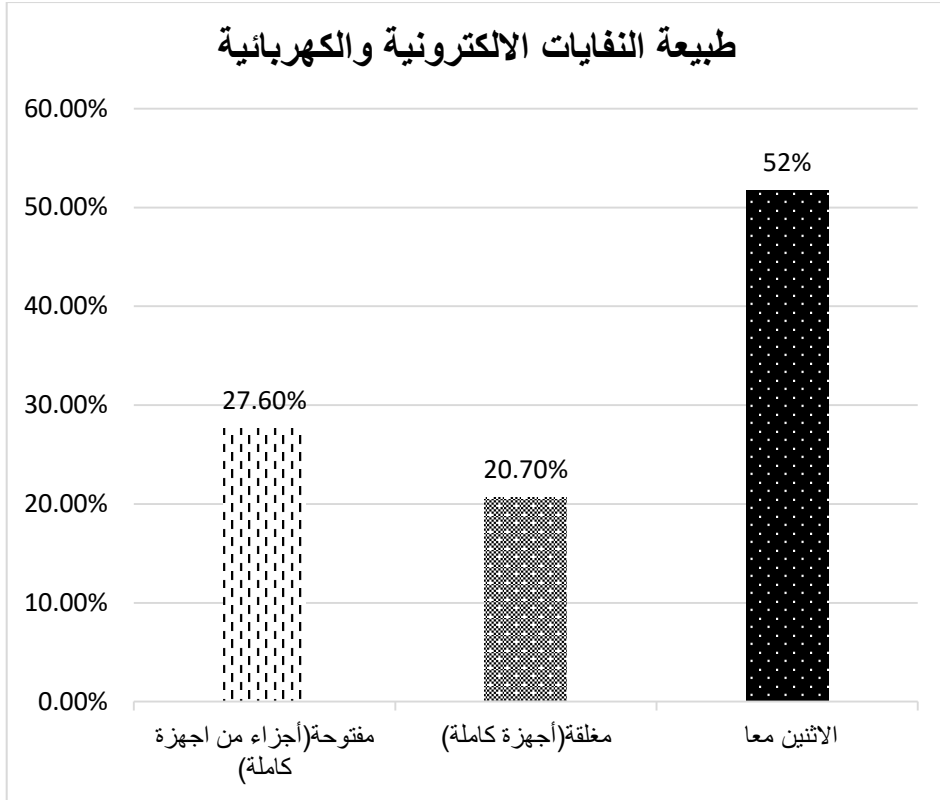


مصادر النفايات الالكترونية والكهربائية القادمة الى المشغل

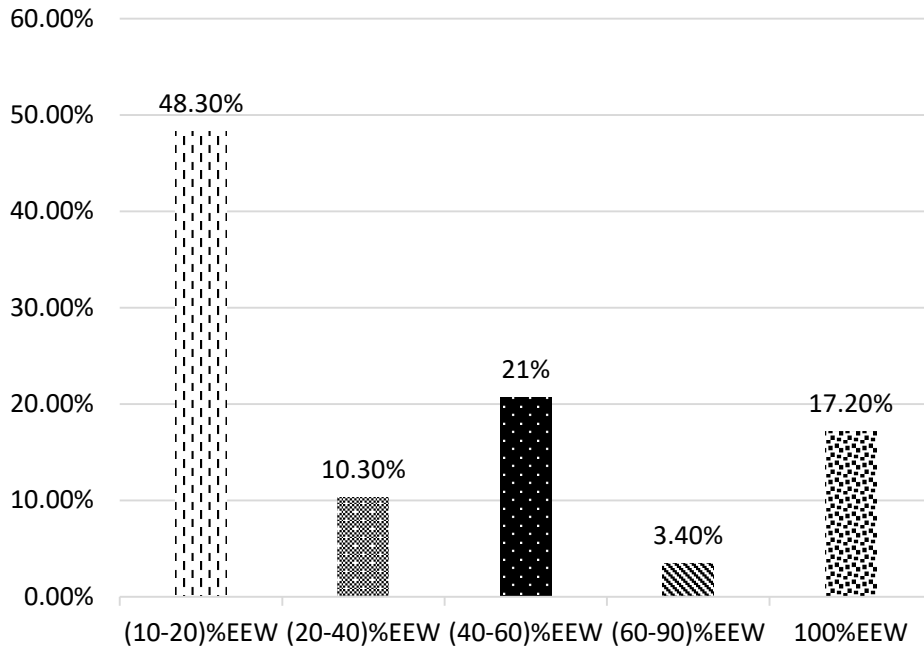


مصادر النفايات الالكترونية والكهربائية القادمة من مناطق الضفة الغربية

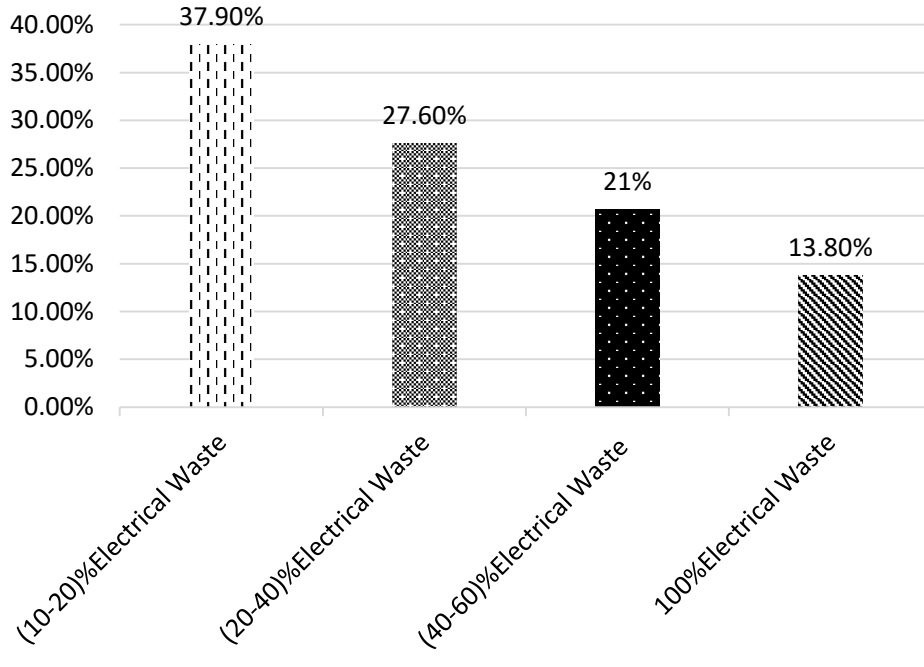


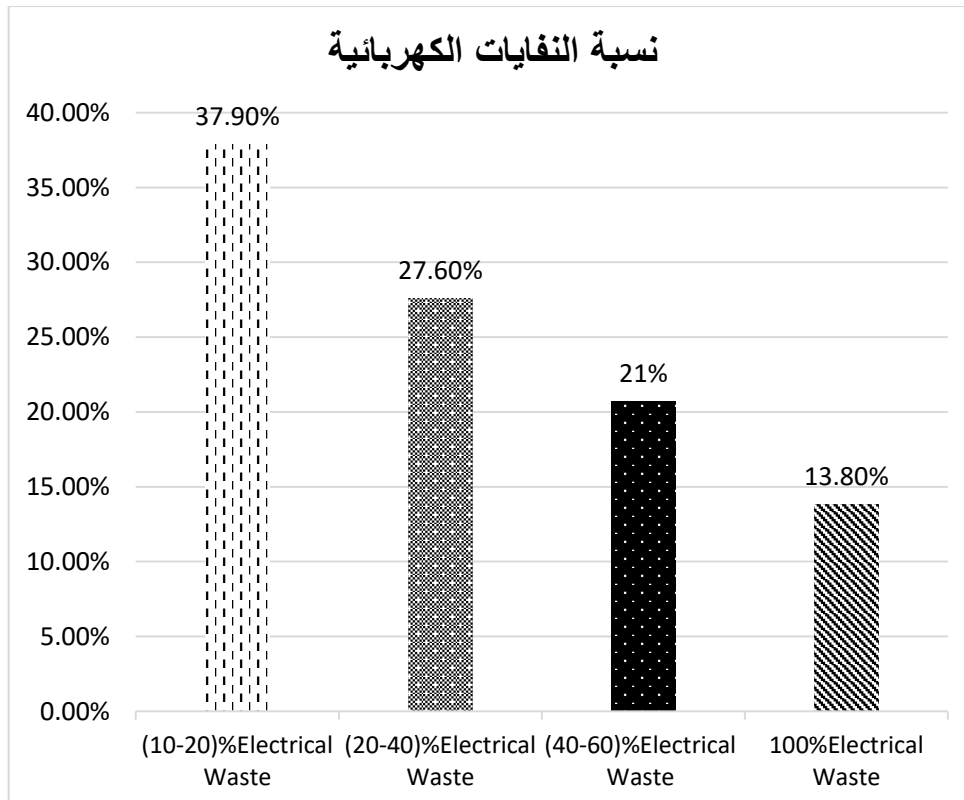
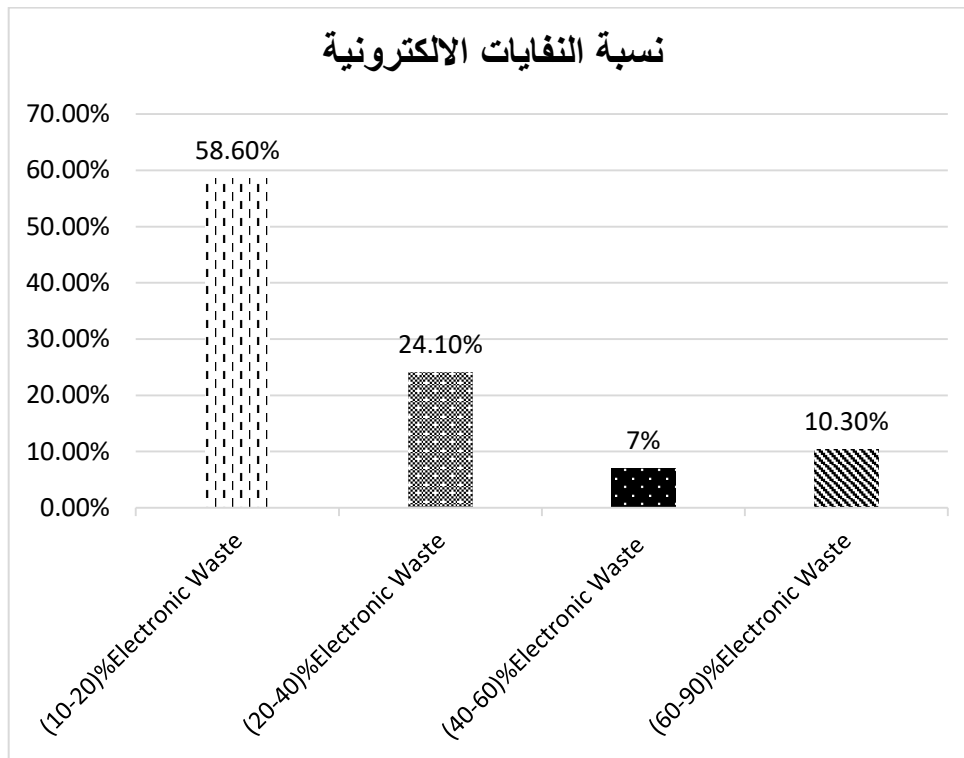


نسبة النفايات الالكترونية والكهربائية القادمة الى
المشغل من الخردات

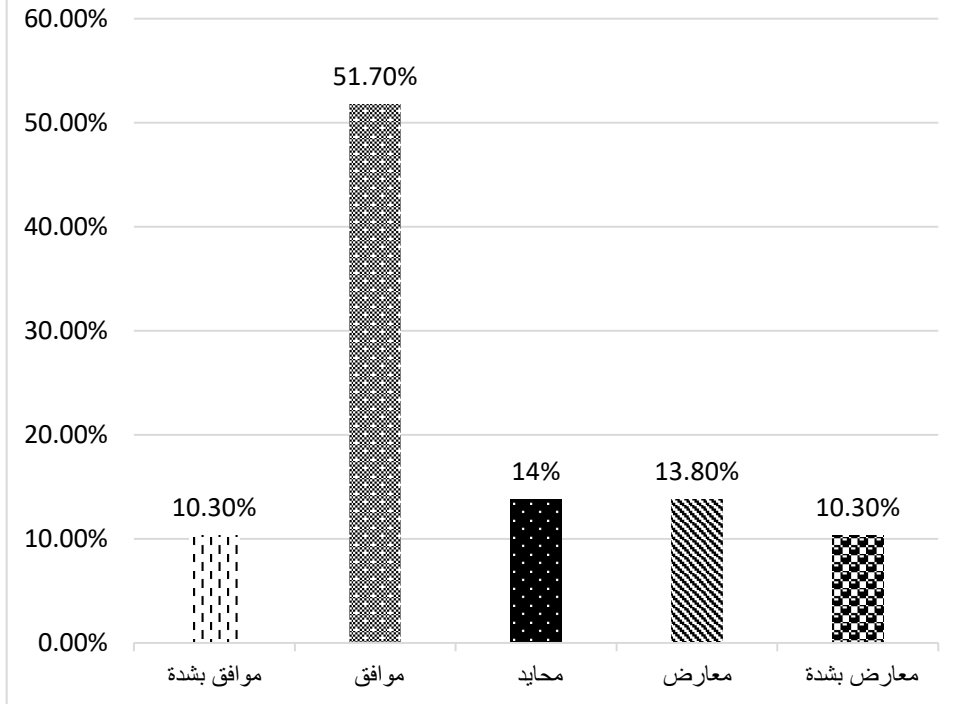


نسبة المخلفات بعد استخراج المواد القيمة من النفايات
الالكترونية والكهربائية

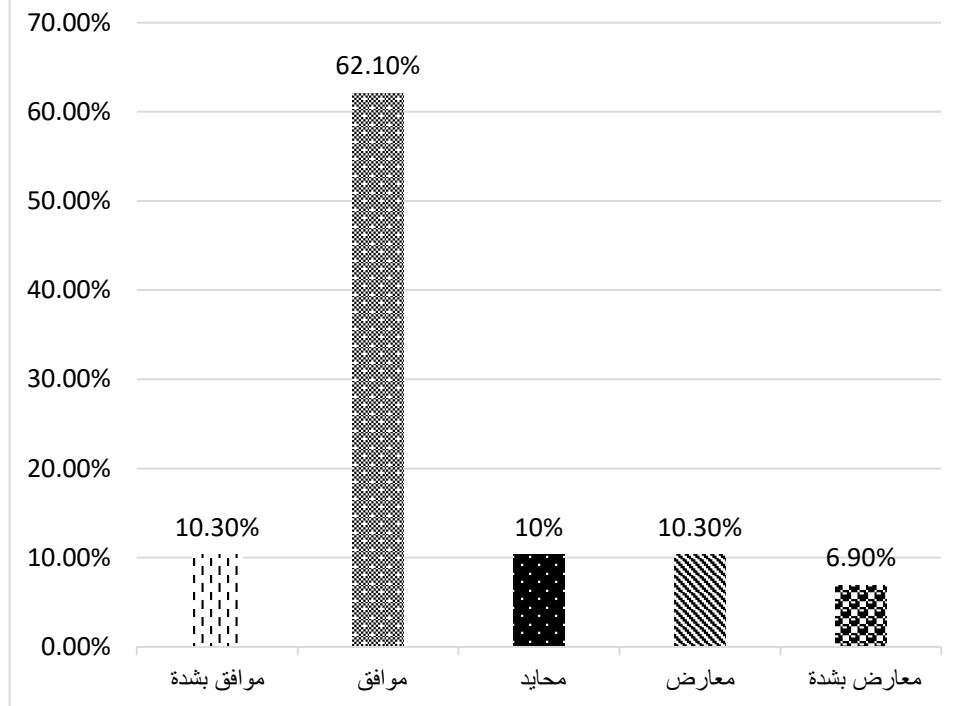


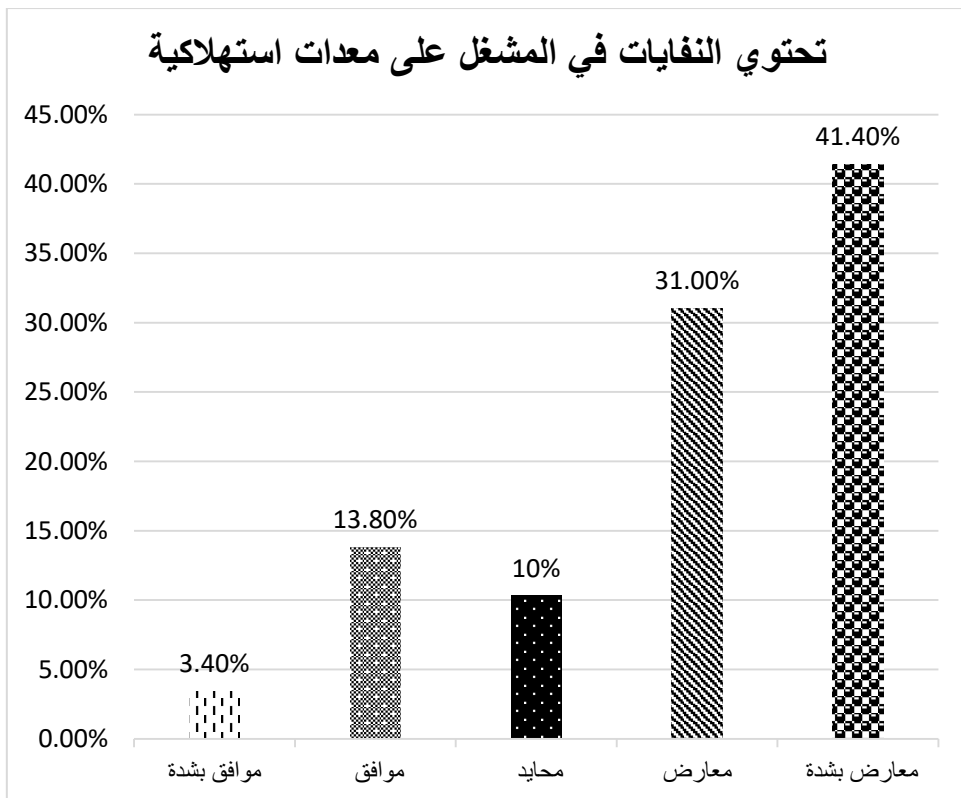
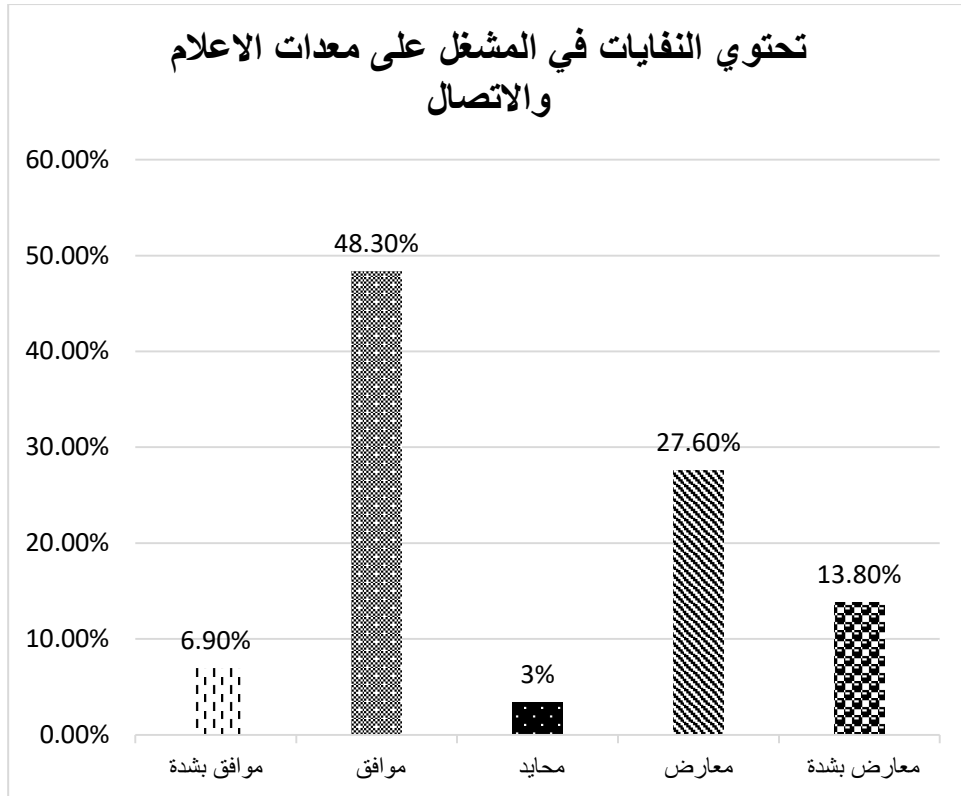


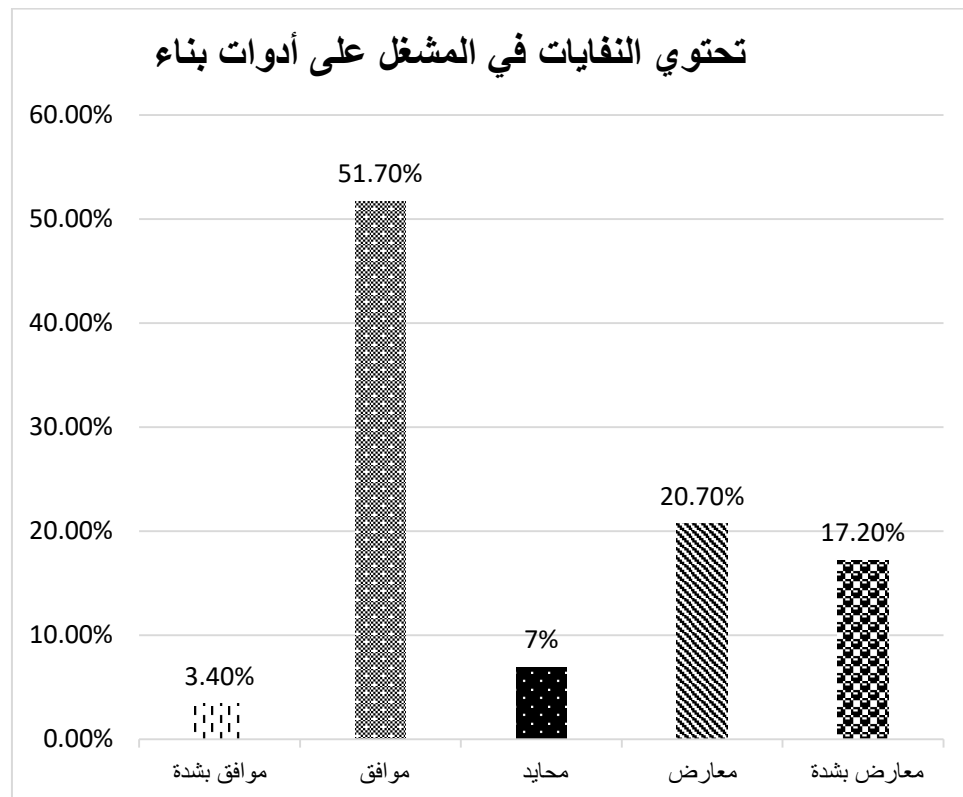
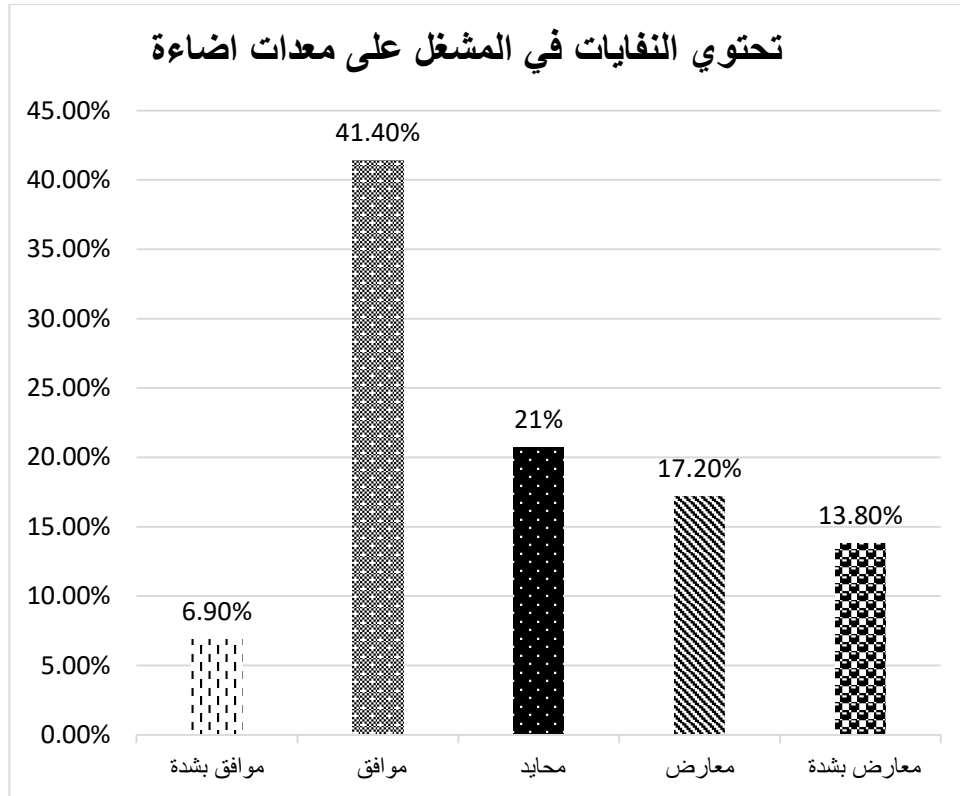
تحتوي النفايات في المشغل على أدوات منزلية صغيرة

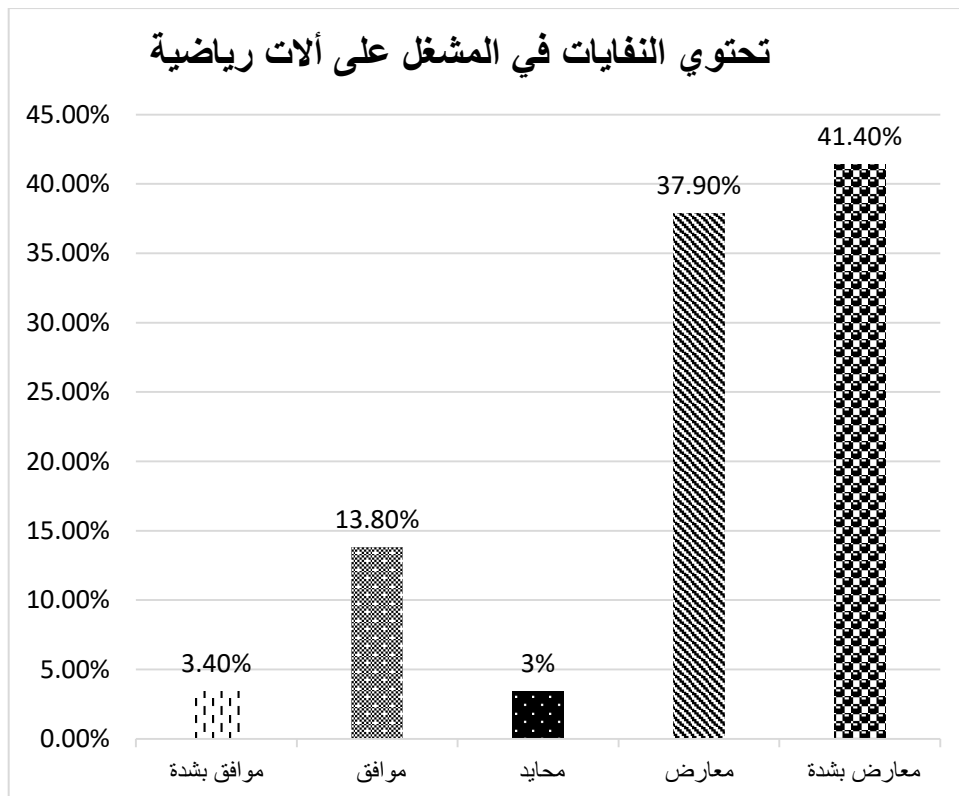
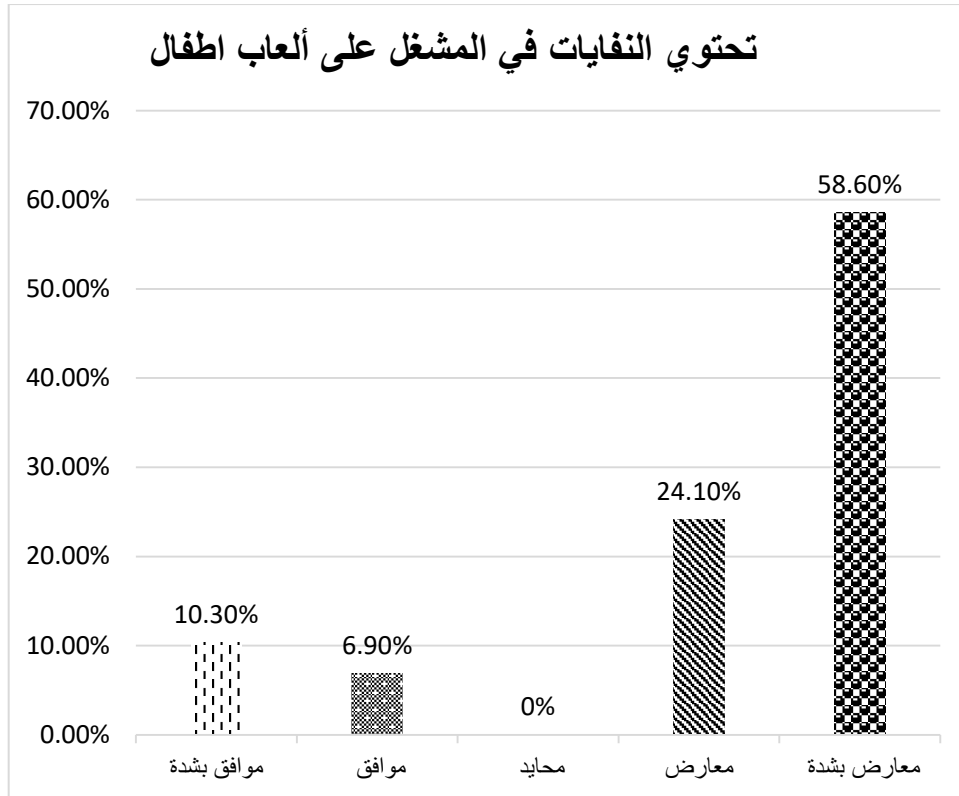


تحتوي النفايات في المشغل على أدوات منزلية كبيرة

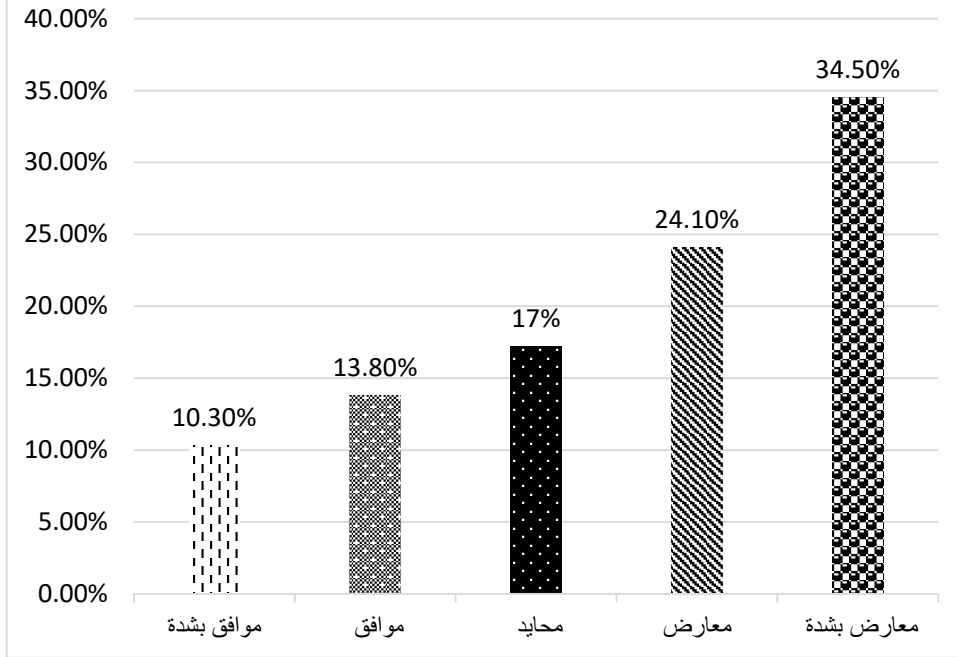




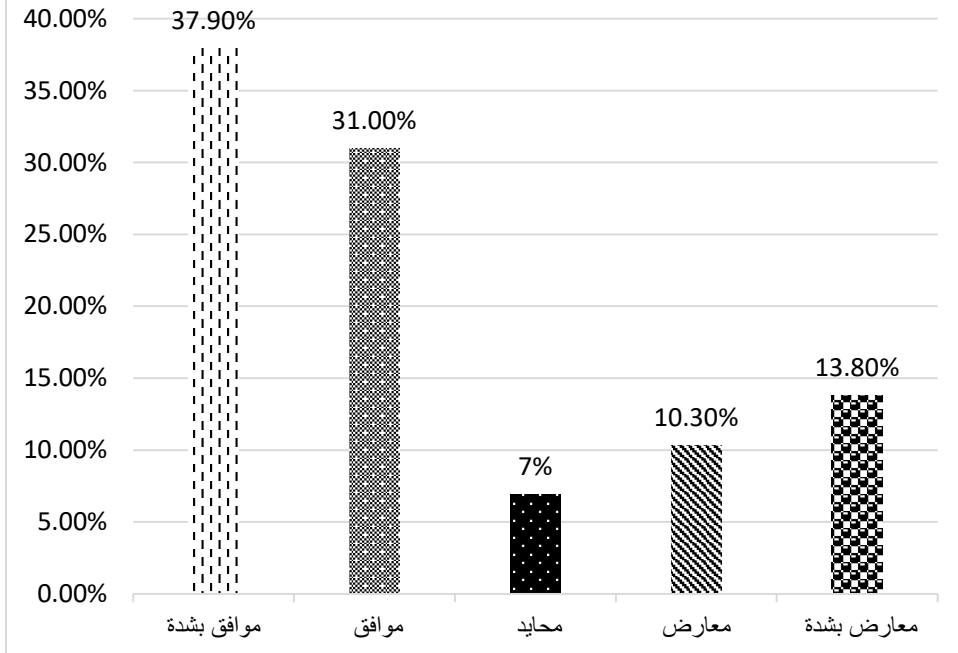




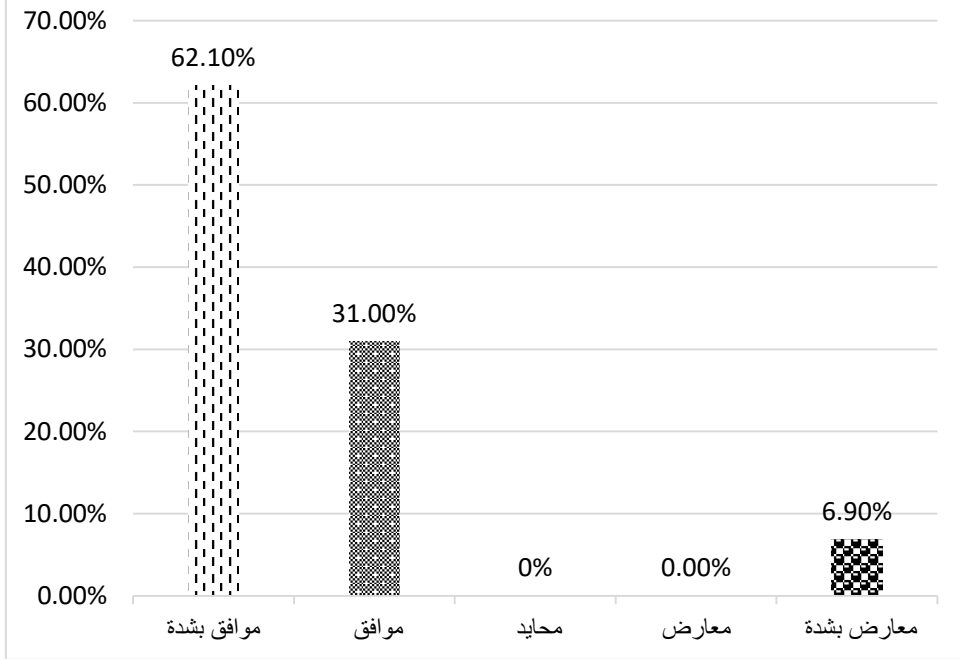
تحتوي النفايات في المشغل على أجهزة اوتوماتيكية خدماتية



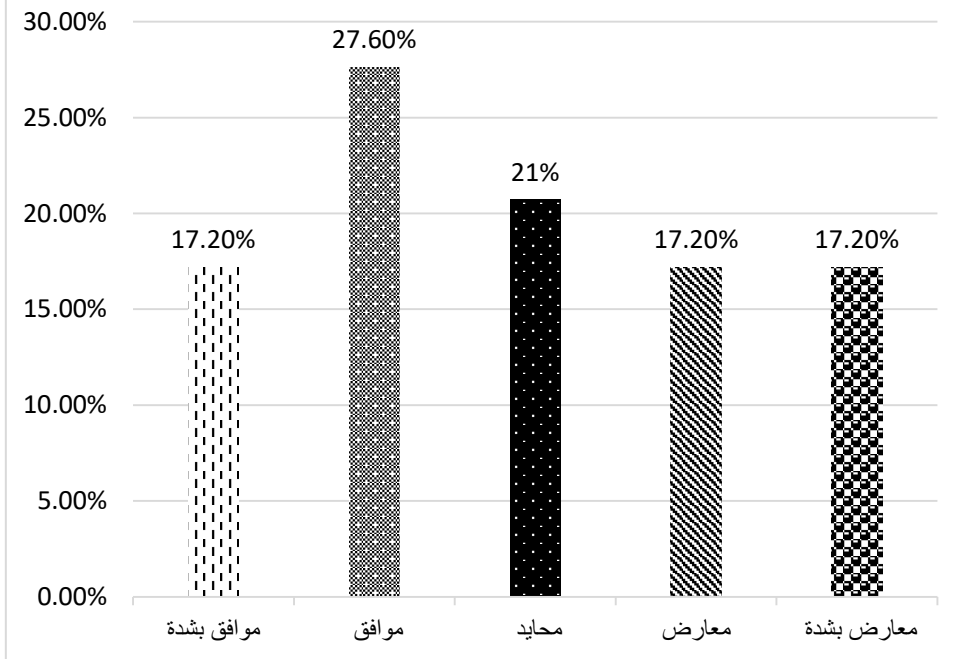
جميع النفايات الالكترونية والكهربائية القادمة الى المشغل يتم تدويرها



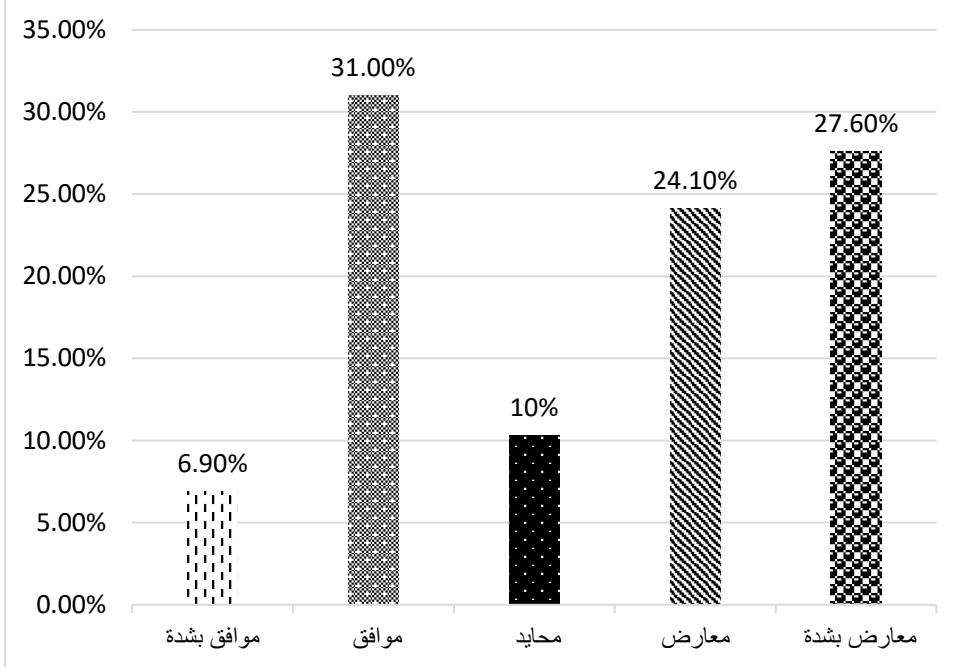
يتم التعامل مع النفايات الالكترونية والكهربائية عن طريق الفرز



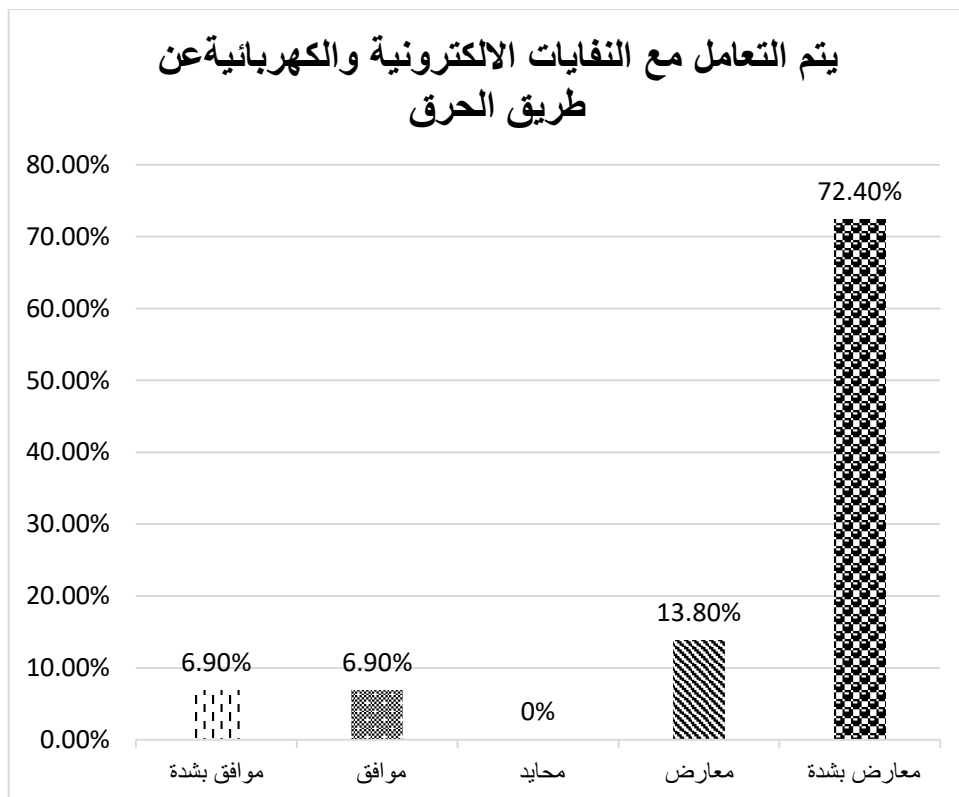
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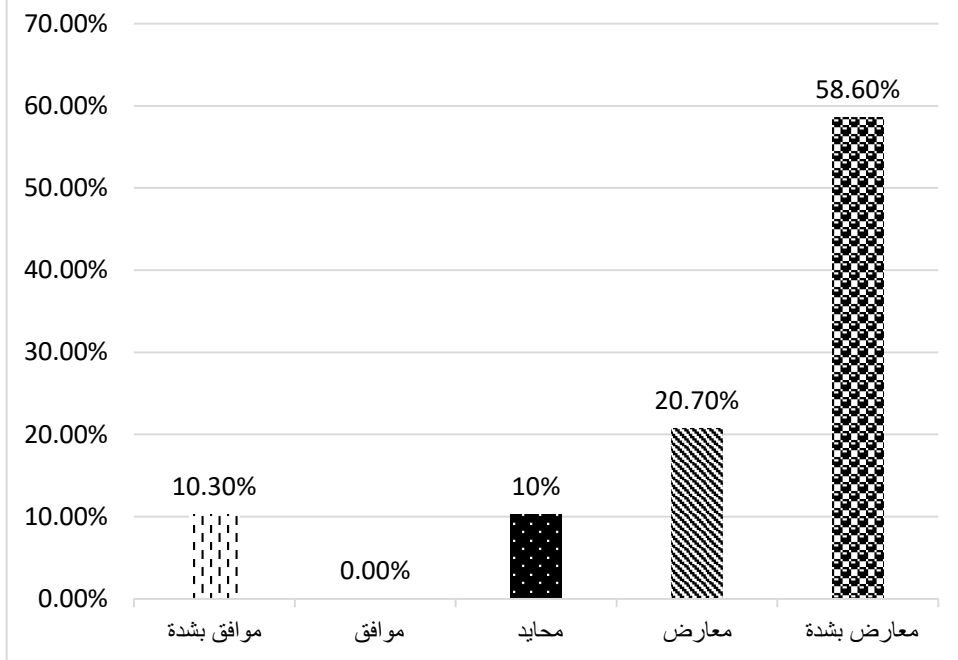
يتم التعامل مع النفايات الالكترونية والكهربائية عن طريق المعالجة



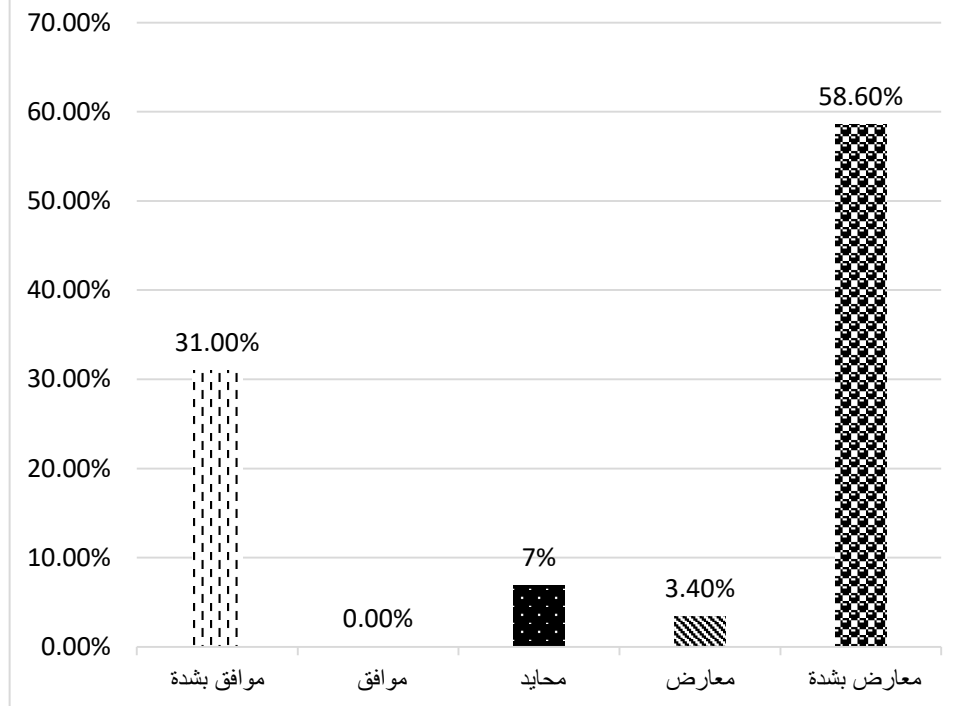
يتم التعامل مع النفايات الالكترونية والكهربائية عن طريق الحرق

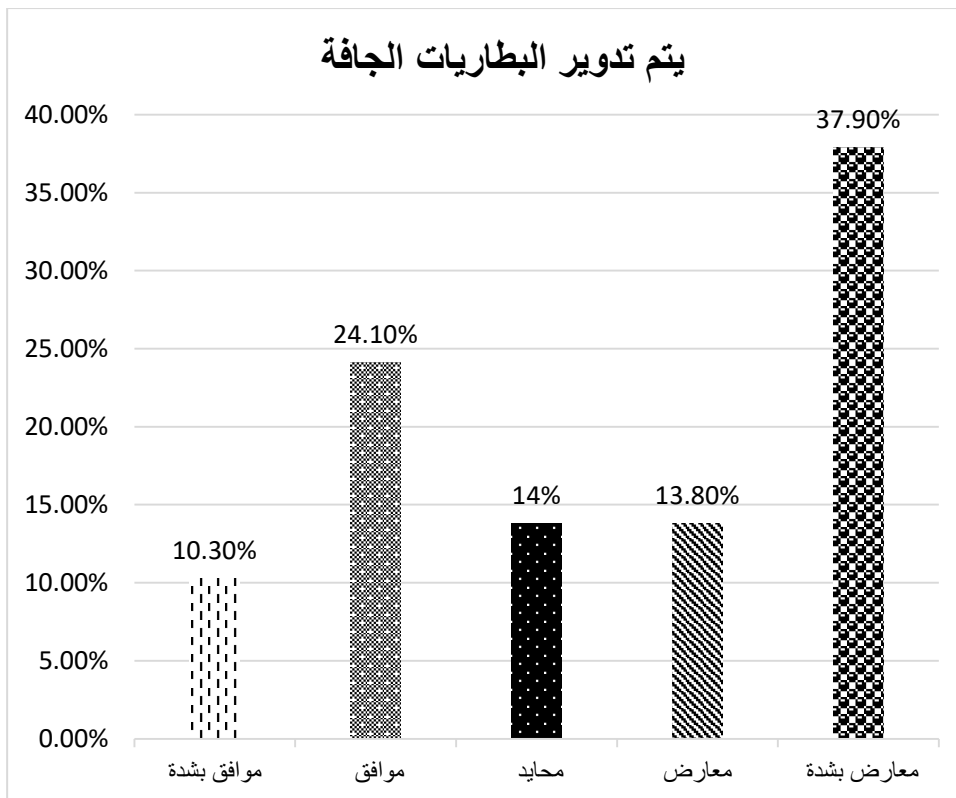
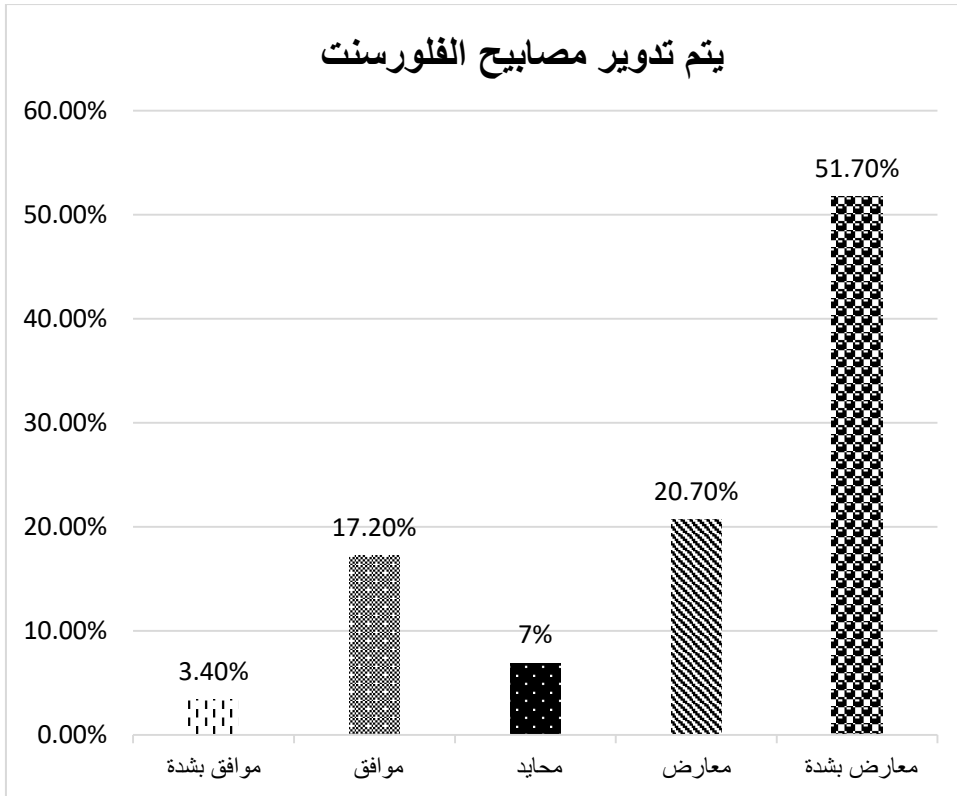


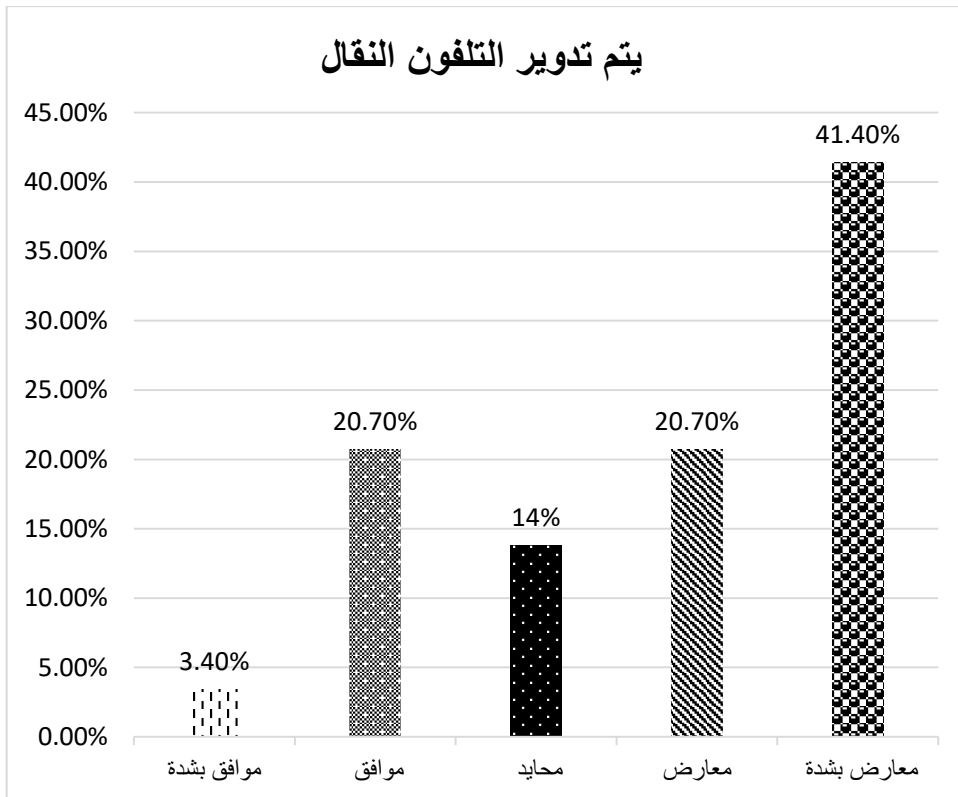
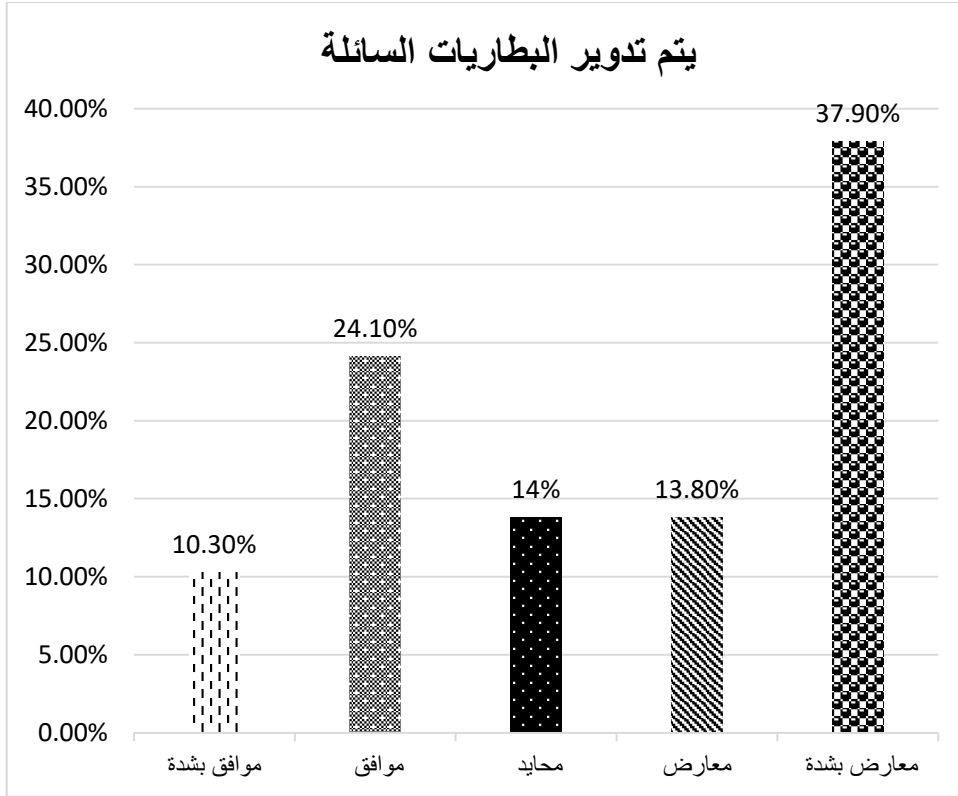
يتم التعامل مع النفايات الالكترونية والكهربائية عن طريق الدفن

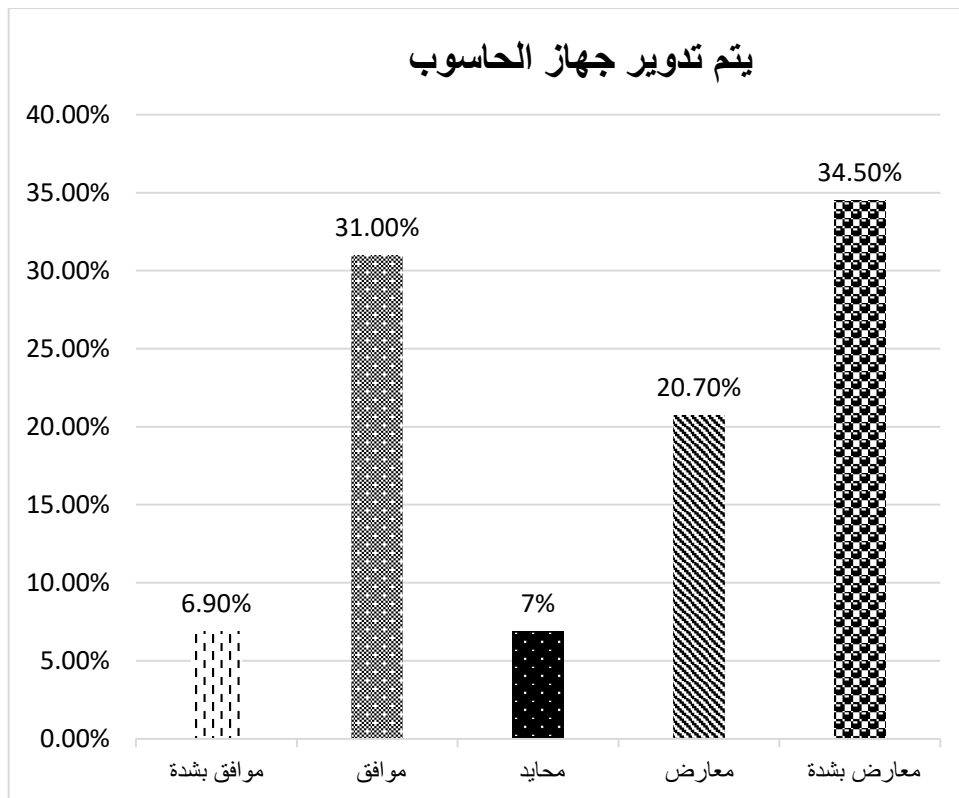
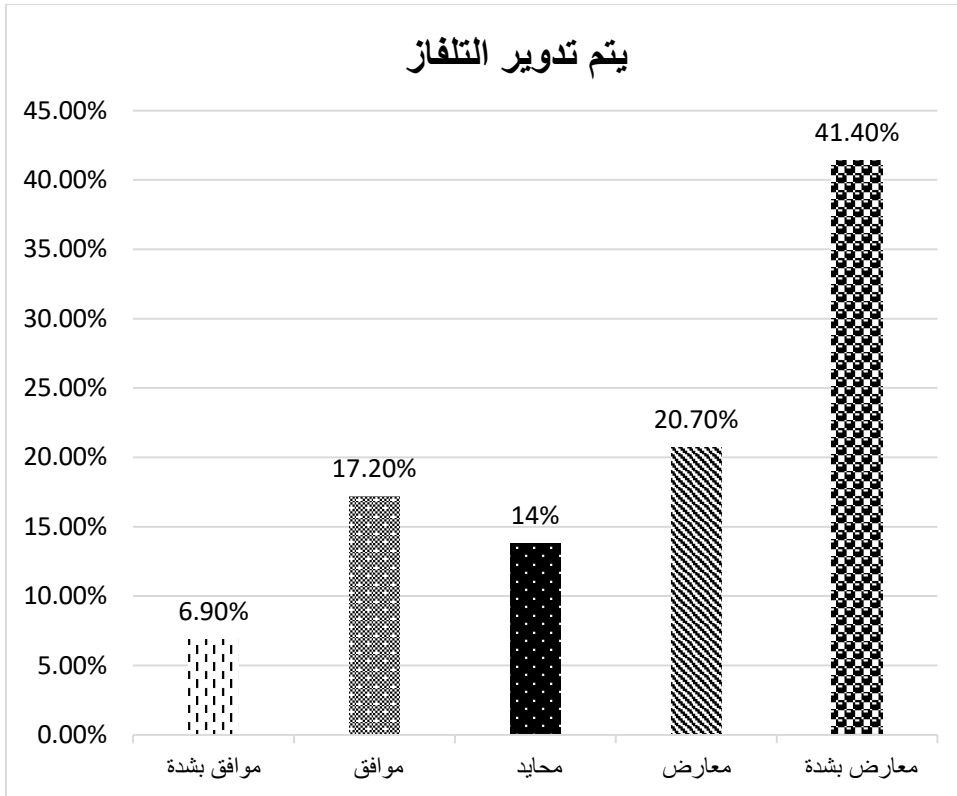


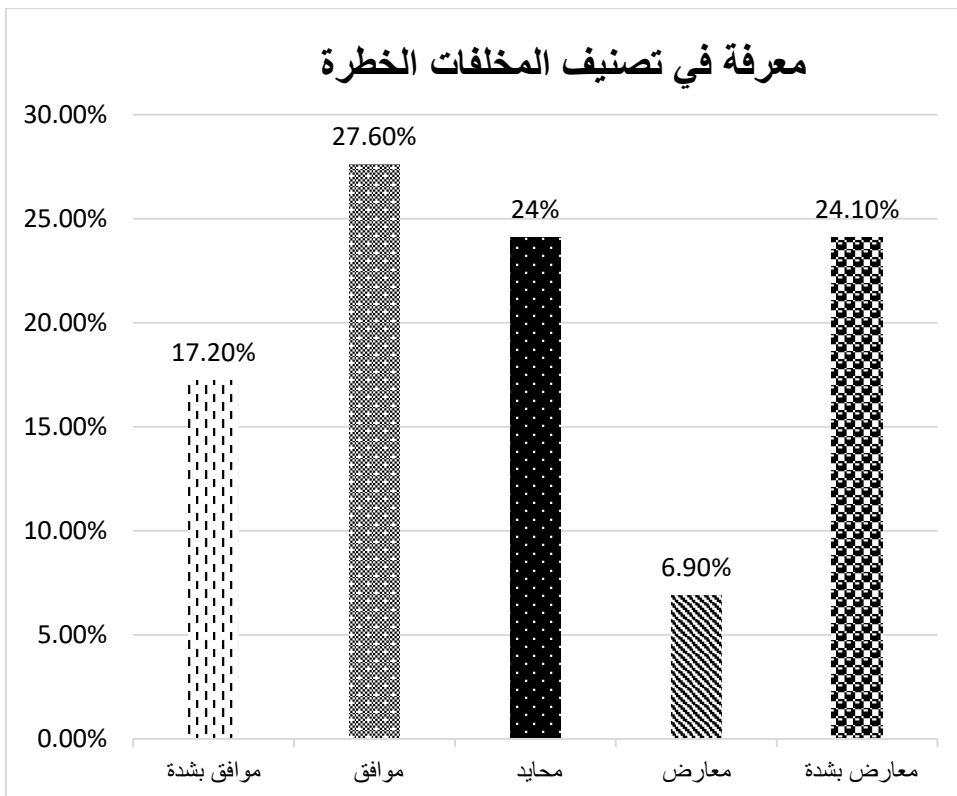
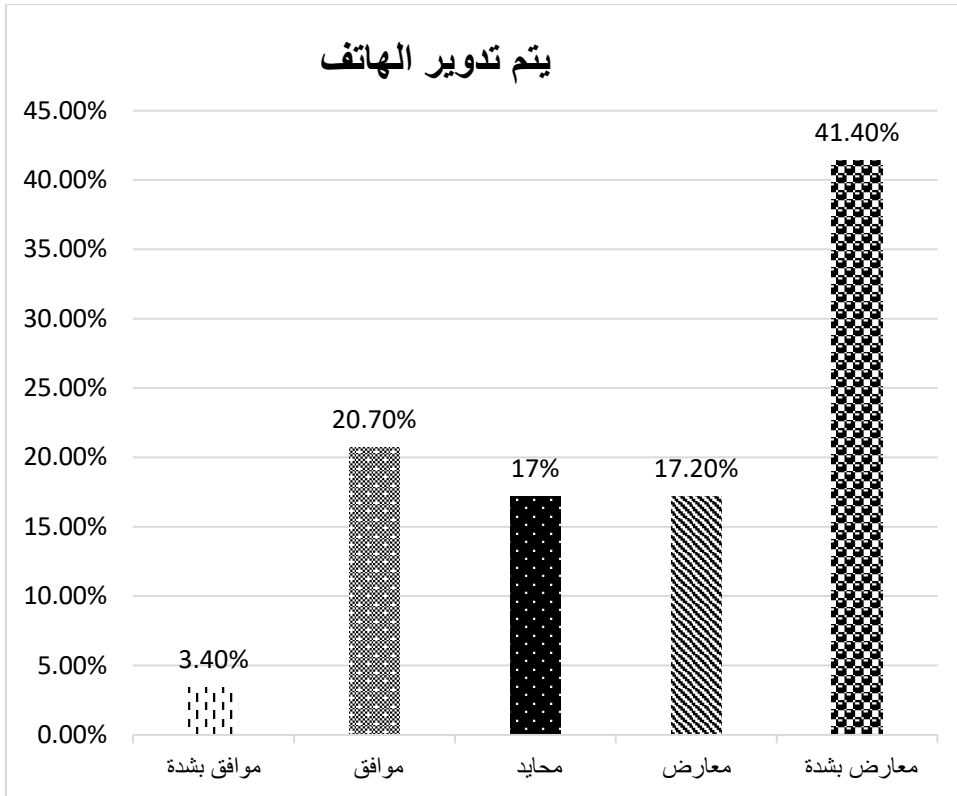
يتم التخلص من النفايات في حاويات البلدية



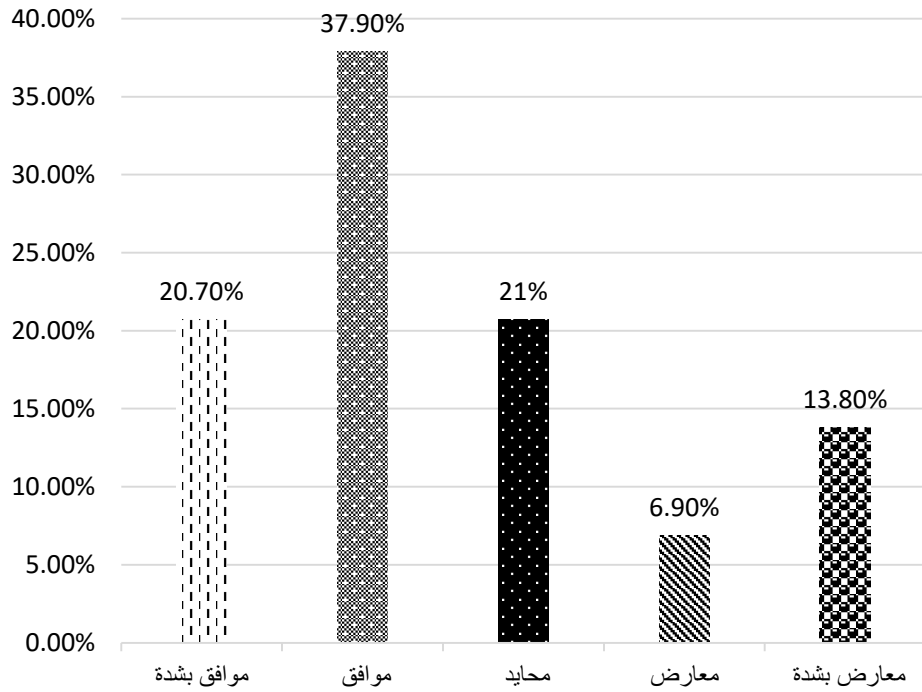




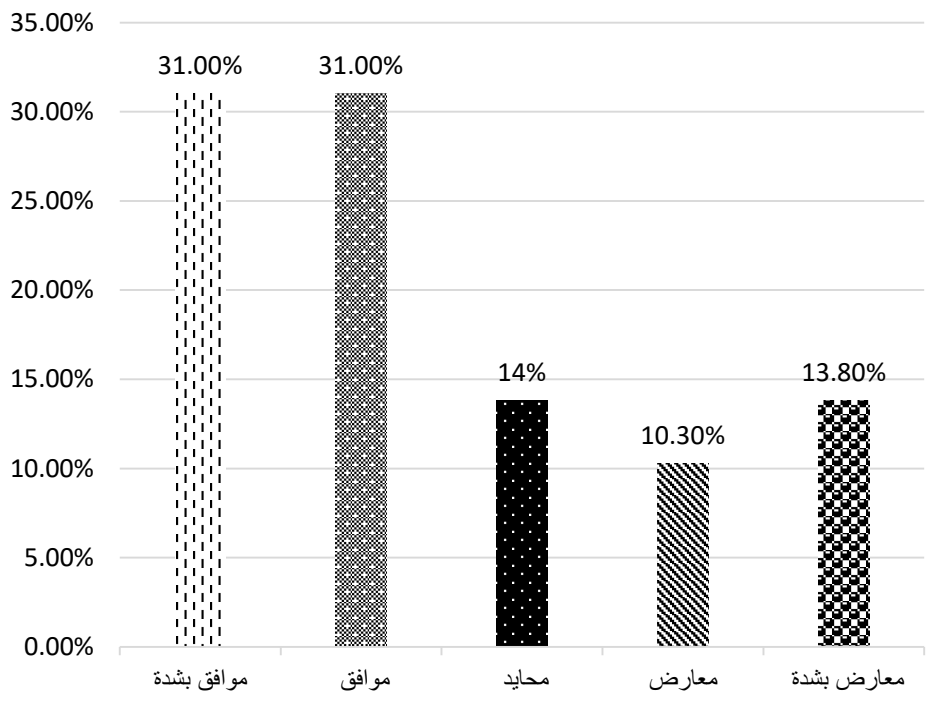




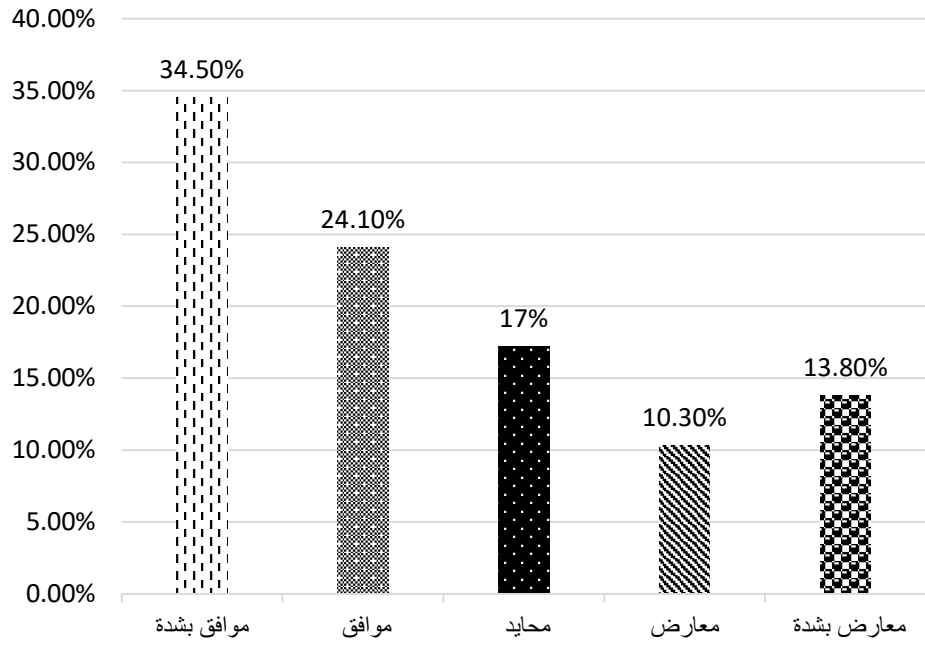
أرشادات خاصة للتعامل مع النفايات الخطرة بشكل سليم



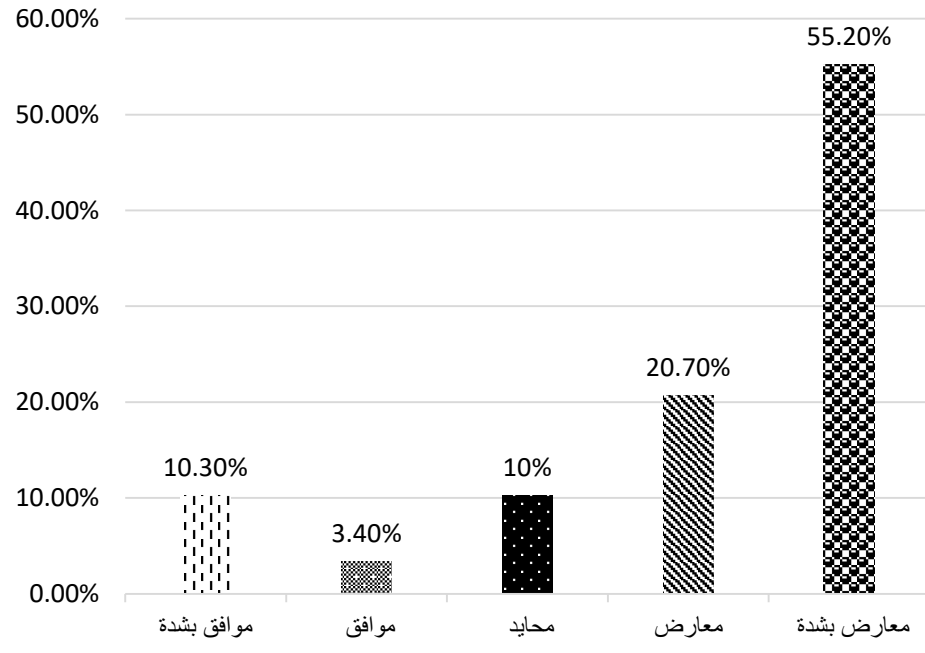
النفايات الالكترونية والكهربائية خطيرة على البيئة



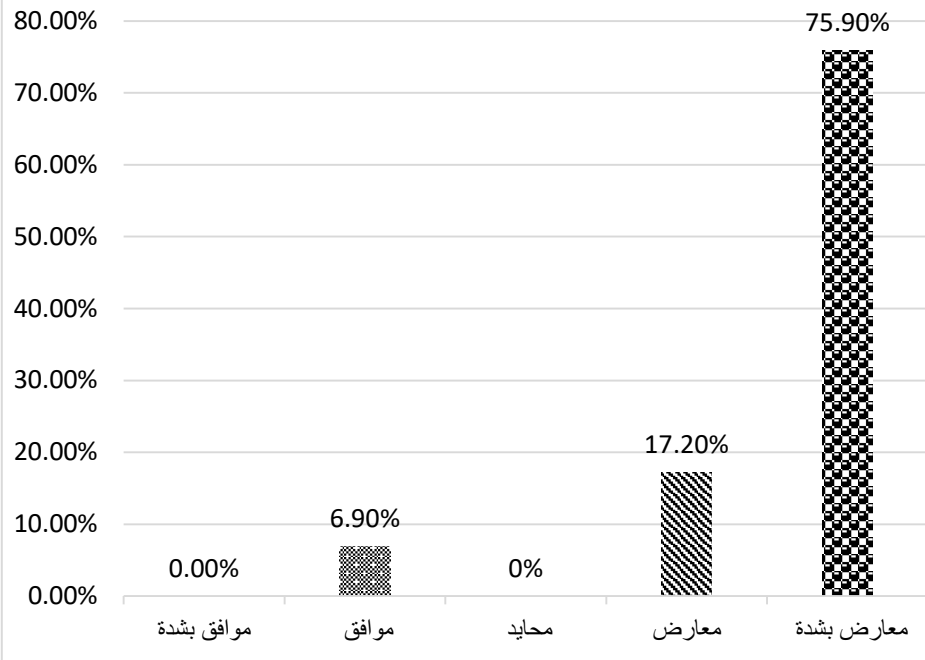
النفائات الالكترونية والكهربائية خطيرة على صحة الانسان



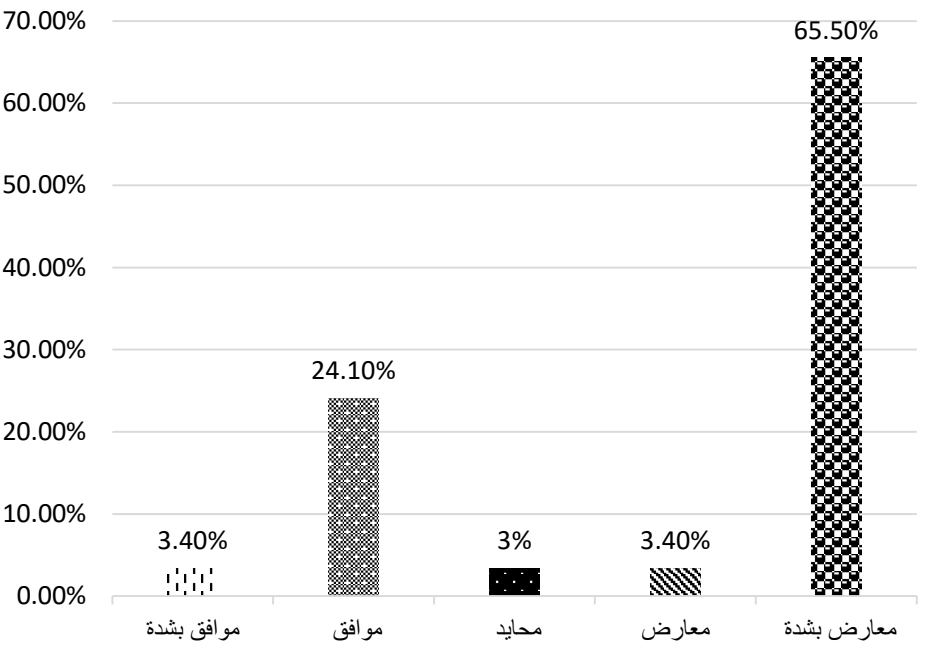
تعرض أحدكم لاحد المواد الكيمائية نتيجة العمل في المشغل



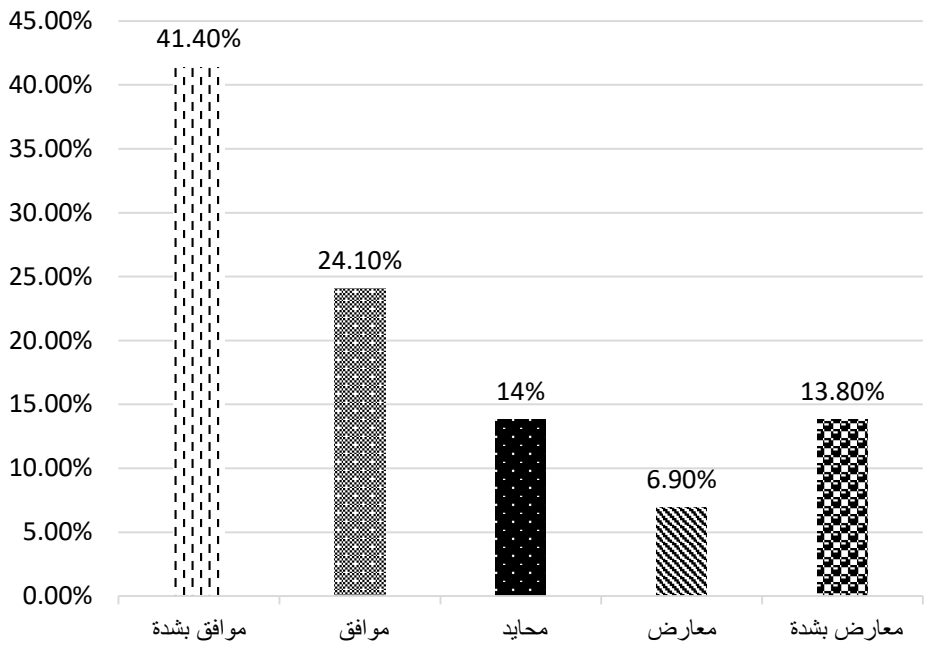
تقوم المؤسسات الرسمية بتقديم الخدمات لكم



هناك اي رقابة من قبل المؤسسات الرسمية



تذهب المعادن بعد فرزها الى الاراضي المحتلة عام
١٩٤٨ مباشرة



تذهب المعادن بعد فرزها الى اسرائيل مباشرة

