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Assessment of Household Hazardous Waste Management: A Comparative Study Between Nablus City and its Refugee Camps.

By

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I dedicate my thesis to my parents

My brothers and sisters

With all respect

Ehab

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إقرار

انا الموقع ادناه مقدم الرسالة التي تحمل: **إدارة المخلفات المنزلية الخطرة: دراسة مقارنة بين مدينة نابلس ومخيماتها**.

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TABLE OF CONTENTS

Chapter Three

Methodology

Chapter Four

Results and Discussions

Chapter Five

Conclusions and Recommendations

Annexes

Lists of Tables

List of Figures

List of Photos

List of Abbreviations

DPPEA	Division of Pollution Prevention and Environmental Assistance
EEA	European Environment Agency
EPA	Environmental Protection Agency
HHP	Household Hazardous Product
HHW	Household Hazardous Waste
HHWM	Household Hazardous Waste Management
HSW	Household Solid Waste
HW	Hazardous Waste
IEPA	Illinois Environment Protection Agency
MEnA	Ministry of Environmental Affairs
MSW	Municipal Solid Waste
PCBC	Palestinian Central Bureau of Statistic
pH	Hydrogen Ion Concentration
SWMD	Solid Waste Management District
TCLP	Toxicity characteristic Leaching Procedure
USEPA	United Stated Environmental Protection Agency
WHO	World Health Organization

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Abstract

This thesis is about the "Assessment of Household Hazardous Waste Management: A comparative Study Between Nablus City and its Refugee Camps" and aims studying household hazardous waste (HHW) to determine the type and the quantity of hazardous materials most commonly used at homes, the level of awareness of household heads concerning the disposal of these substances, the extent of hazardous substance-related accidents and injuries occurring at homes. It also suggests an integrated management plan for HHW taking into consideration different engineering measures for managing the HHW from the point of generation to final disposal.

Literature was collected and analyzed to identify the extent of the problem and its related issues. The questionnaire was distributed among 1300 households and a solid waste generation analysis was carried out during a 15 working days period with sorting 150 samples of 23 tons of municipality solid waste at Nablus solid waste transfer station.

HHW concentrations of 2.89% and 1.88% were detected in the Nablus city and its refugee camps respectively in proportion to the family income.

Findings indicate that home products and personal care products most commonly consumed hazardous substances at homes and 17.9% of the study households have injuries, poisons and burns from accidents resulted from the use of these substances. The study also found that the level of households' awareness of hazardous substances is generally low and is in need of continuous improvement.

The results lead to many recommendations: a proposed management system for HHW management is needed that would help the Palestinian health to enhance and develop health and environmental services. A management system, including new approach for storage, collection, separation, transportation, treatment and disposal of HHW was proposed . This system will deal with at least 1600 tons/year of HHW in Nablus city and its refugee camps.

Chapter One

Introduction

1.1 Introduction

Solid wastes are all the waste arising from human and animal activities that are normally solid and that are discarded as useless or unwanted (Gerorge et.al, 1997).

According to the Resource Conservation and Recovery Act (RCRA) solid wastes mean (University of Central Florida, 2006):

1. mixed household wastes
2. recyclables
3. household hazardous waste
4. commercial waste
5. yard waste
6. litter
7. bulky items
8. Construction & demolitions waste.

According to the EPA regulations, a solid waste means any garbage, or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities (UNEPA, 2006).

It is known that household waste has a wide range of waste and some of it could be of hazardous characteristic. Pesticides, paint products, household cleaners, hobby chemical and automotive products frequently contain hazardous waste from regulation (Michael et.al, 1994). Therefore, household hazardous waste (HHW) can be defined as that portion of a household product which is no longer usable, leftover or not wanted and has to be discarded or disposed (UNEPA, 1993). It could be solids, sludge's, liquids, containerized gases, radioactive and infectious wastes. Due to their chemical activity or toxicity, explosively or other characteristics, cause danger or likely will cause danger to health or the environment, whether alone or when coming into contact with other waste (Michael et.al, 1994).

Based on above definitions some of the products used in the home, garage, workshop, yard and garden can be considered hazardous. These products can contain components which have corrosive/caustic, explosive/reactive, flammable, irritant, toxic or radioactive properties. These products include: paint and decorating supplies; solvents and cleaning products; herbicides and pesticides, lawn care products; and automotive products (Haas and Vamos, 1995).

Many household products contain chemicals that are strictly regulated when disposed as industrial waste and pose similar environmental and health problems. Although the quantities of chemicals disposed of by individual households may be small, the number of households in large cities is many, and the amount of waste adds up (Kuhre, 1995; Minnesota Pollution Control Agency, 2006).

Household hazardous waste (HHW) is subgroup of solid waste commonly found in MSW. Many products used in home, garden, garage and hobby shop contain hazardous ingredients and need to be used and stored safely. Once decided to discard these products they become household hazardous wastes (HHW) requiring proper disposal (George and Frank, 2002; Vesilind et.al , 2002).

According to the Federal Hazardous Substances Act of 1960 (Minnesota Pollution Control Agency, 2006), household products are hazardous if they are:

1. Ignitable - capable of burning or causing a fire.
2. Corrosive - capable of eating away materials and destroying living tissue when contact occurs.
3. Explosive and/or reactive - can cause an explosion or release poisonous fumes when exposed to air, water, or other chemicals.
4. Toxic - poisonous, either immediately (acutely toxic) or over a long period (chronically toxic).
5. Radioactive - can damage and destroy cells and chromosomal material (known to cause cancer, mutations, and fetal harm).

Benefits of proper HHW Management (UNEPA, 2007):

- Reduction and recycling of HHW conserves resources and energy that would be expended in the production of more products.
- Reuse of hazardous household products can save money and reduce the need for generating hazardous substances.
- Proper disposal prevents pollution that could endanger human health and the environment.

1.2 Study Area Framework and Characteristics

In this part we are going to handle the specific characteristics of Nablus area in term of population, metrology of data and solid waste generation.

1.2.1 Localities and Population

The city of Nablus is one of the oldest cities in the world and has been a place of habitation for 4000 years. Located 65 km north of Jerusalem, Nablus is considered as the main business and residential center of the northern West Bank. Its prime location also enhances its position in any future development plans, as it is located at the crossroads of the Jerusalem Jenin road running north to south, and the Tulkarm – Jordan Valley road running east to west (Abu Zahra, 2006).

Nablus city is located in the northern part of the West Bank, with about 134,116 inhabitants as estimated in 2006. (Palestinian Central Bureau of Statistics, 2006) Nablus is situated between the mountains of Gerizim and Ebal and there are four refugee camps in Nablus (Balata, old Askar, new Askar and Ein beit Alma) with about 35,387 inhabitants as estimated in 2006 (PCBS, 2006).

1.2.2 Metrological Data

For Nablus the monthly mean of air temperature and the evaporation quantity varies between months according to the following table:

Table 1.1 Monthly mean temperature and evaporation quantities for Nablus (Abu Zahra, 2006)

Month	Temperature ^{o}C	Evaporation (mm)	Relative humidity
January	10.1	49.6	67
February	11.4	67.2	71
March	13.4	99.2	57
April	16.8	149.1	50
May	20.0	202.7	54
June	21.9	225.9	60
July	23.4	237.9	59
August	23.5	218.2	65
September	22.7	177.6	61
October	20.7	131.1	57
November	16.5	74.4	60
December	11.0	48.6	61
Average / Total	17.6	1,681	60.2

The annual average rainfall for Nablus is 663.5 mm. In the year 2005 the annual rainfall was 790.5 mm, and the average relative humidity was 60.2 (Abu Zahra, 2006).

1.2.3 Solid Waste in Nablus

In the Nablus city and its refuge Camps, every home contains hazardous substances that have the potential for posing risk to life, health, property, or the environment, if improperly consumed, stored, or disposed. A review of the available literature indicates that no recent information exist on the extent of hazardous substances accidents at homes in Palestine, or on the level of awareness of households concerning these substances.

Nablus is facing acute environmental and public health deterioration processes where hazardous waste (HW) production is considered to present one of the main causes (Hussein, 2006).

Nablus City

The solid waste collected by Nablus municipality, all the refuse produced in Nablus are discharged in a dump (as a transfer station) located near the industrial area at a distance of approximately 6 kilometers from the city center of Nablus (Abu Zahra, 2006).

Nablus Refugee Camps

The solid waste collected by the UNRWA is merged with the city waste. The municipality is negotiating with the UNRWA about the responsibility of disposal of these wastes after being collected from the refugee camps (Abu Zahra, 2006).

Table 1.2 Solid waste quantities generated in the years 2002-2005 from Nablus municipality (Abu Zahra, 2006)

Year	**Quantity (tons/year)**	**Population**	**Mean generation rate(kg/cap/day)**
2002	42,153	154,649	0.75
2003	59,284	159,753	1.02
2004	40,716	164,864	0.68
2005	51,160	169,975	0.82

Table 1.3 Daily MSW generation rate (Halawah, 2007)

Region	Daily MSW Generation rate
Nablus City	1.0 Kg per capita
Nablus refuge Camps	0.8 Kg per capita

1.3 Problem of the study

The problem of this study can be summarized as follow:

A lack of information about the quantities and characteristics of HHW exists. No information is available about the demographic effect (age, education level, the place of housing (city, camp) and monthly income) on HHW collected and disposed will be studied in this thesis. Information about sorting and disposal of household hazardous waste will be presented and discussed.

1.4 Objectives of the Study

The objectives of this research study were to:

- Determine the components and the quantities of hazardous materials most commonly used or disposed at homes in Nablus city

- Determine the knowledge, attitudes, and perception of household heads concerning the handling of HHW.

- Determine the extent of hazardous substance-related accidents and injuries occurring at homes.

- Suggest an integrated management plan for household hazardous waste in Nablus City, including refugee camps taking into consideration different engineering measures for managing the HHW such as regulating the different engineering aspects of HHW facilities.

1.5 Significance of the Study

The results of this research are fundamental to the design of appropriate management strategies, to avoid current mixing and co-disposal with non-hazardous waste. This includes suggesting proper activities associated with the management of the HHW from the point of generation to final disposal, and grouped into six functional elements:

1) HHW generation.
2) HHW handling and separation, storage and processing at the source.
3) HHW collections.
4) Separation and processing and transformation of HHW.
5) HHW transfer and transport.
6) HHW disposal.

In addition, a strategy was suggested for HHW management that was taken into consideration reducing the quantities of HHW generated, reusing the materials, recycling and recovery of materials, and HHW landfilling.

1.6 Thesis Outline

This thesis consists of five chapters:
An overall introduction about the hazardous household waste, objective and hypotheses of the study are presented in chapter 1.

A discussion of the characteristics and classifications of HHW, the problem of HHW, initial steps in establishing a HHW collection program and previous studies are outlined in chapter 2.

A methodology Carried out in this study in three components: household comprehensive survey, HHW characterization and deep personal interview with the head of the health section in the municipality of Nablus city, all of them are presented in chapter 3.

Presents the status of HHW management in Nablus city and its refugee camps to diagnose the problem of HHW management, various steps and process in the management of HHW are presented and explained from generation to disposal, all of them are presented in chapter 4.

Conclusions and recommendations of the household hazardous waste are outlined in chapter 5.

Chapter Two

Literature Review

2.1 Characteristics of Hazardous Waste

A waste can be classified as hazardous if it exhibits any of the following characteristics:

2.1.1Corrosivity

A waste exhibits the characteristics of corrosively if a representative sample of the waste has either of the following properties (Harry, 1997; Charless, 1995):

a. any liquid which has a pH less than or equal to 2 or greater than or equal to 12.5 as determined by the standard test procedure; or
b. a waste, which can corrode steel at a rate greater than 6.35 mm per year at a test temperature of 55 °C as determined by the standard test procedure.

2.1.2 Reactivity

A waste exhibits the characteristics of reactivity if a representative sample of the waste has any of the following properties (Hasan, 1996):

a. It is normally unstable and readily undergoes violent change without detonating
b. It reacts violently with water

c. It forms potentially explosive mixture with water
d. It is Cyanide or Sulfide bearing waste which when exposed to pH conditions between 2 and 12.5 can generate toxic gases, vapors or fumes in a quantity sufficient to pose danger to human health or the environment.
e. It is an explosive.

2.1.3 Ignitability

A waste exhibits the characteristics of ignitability if a representative sample of the waste has any of the following properties (Harry, 1997; Charless, 1995):

a. It is a liquid other than an aqueous solution containing less than 24% organic solvents by volume and has flash point less than 60 °C as determined by a Pensky Martins closed cup tester using the standard test method.

Flash point is the lowest temperature at which sufficient vapors from a liquid are present that the air/vapor mixture will ignite when exposed to an ignition source (William et.al, 2001).

b. It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes, and when ignited burns so vigorously and persistently that it creates a hazard.

2.1.4 Toxicity

A solid waste exhibits the characteristics of toxicity if the leachates from the representative sample by Toxicity Characteristics Leaching Procedure (TCLP) test method (as followed by USEPA, vide No: S.W 846 contains any of the contaminants listed in Table 2.1.

Table 2.1 TCLP Test Limits (UNEPA, 1997)

Contaminant	**TCLP Limit (mg/l)**
Arsenic	5.0
Barium	100
Benzene	0.5
Cadmium	1.0
Carbon tetrachloride	0.5
Chlordane	0.03
Chlorobenzene	100.0
Chloroform	6.0
Chromium	5.0
o-Cresol	200.0
m-Cresol	200.0
p-Cresol	200.0
Cresol	200.0
2,4-D	10.0
1,4-Dichlorobenzene	7.5
1,2-Dichloroethane	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	0.13
Endrin	0.02

Table 2.1 Cont

Contaminant	TCLP Limit (mg/l)
Heptachlor (and its epaoxide)	0.008
Hexachlorobenzene	0.13
Hexachlorobutadiene	0.5
Hexachloroethane	3.0
Lead	5.0
Lindane	0.4
MERCURY	0.2
Methoxychlor	10.0
Methyl ethyl ketone	200.0
Nitrobenzene	2.0
Pentachlorophenol	100.0
Pyridine	5.0
Selenium	1.0
Silver	5.0
Tetrachloroethylene	0.7
Toxaphene	0.5
Trichloroethylene	0.5
2,4,5-Trichlorophenol	400.0
2,4,6-Trichlorophenol	2.0
2,4,5-TP (Silvex)	1.0
Vinyl Chloride	0.2

2.1.5 Acute toxicity

A waste exhibits the characteristics of being acutely hazardous if a representative sample contains any of the following (Central Pollution Control Board, 2006):

a. Wastes generated in the manufacturing process of halogenated phenols and other halogenated compounds.
b. Wastes generated in the manufacturing/formulating process of pesticides or pesticide derivatives.
c. Wastes generated during the manufacturing process of halogenated benzene under alkaline conditions.
d. off-specification or discarded products generated from the above processes, and
e. Containers used for handling hazardous / toxic substances / wastes.

2.1.5 Infectious Property

Wastes containing viable micro-organisms or their toxins which are known or suspected to cause disease in animal or humans fall under this category (Central Pollution Control Board, 2006).

2.2 Household Hazardous Waste Categories

HHW are any household wastes which are generated from the disposal of substances identified by the department as hazardous household substances including but not limited to the following listed waste sources and types.

According to the classification proposed by Delgado et.al, (2007) and SWMD, (2004), HHW was classified according to eight categories, as shown in Table 2.2.

Table 2.2 Household hazardous waste categories
(Delgado et.al, 2000; SWMD, 2004)

1	**AUTOMOTIVE PRODUCTS** (ANTIFREEZE, AUTO BATTERY, AUTOMATIC TRANSMISSION FLUID, BRAKE FLUID, CAR WAX WITH SOLVENT, CARBURETOR CLEANER (FUEL INJECTORS), DEGREASERS, DIESEL, FUEL OIL, KEROSENE, METAL POLISH WITH SOLVENT, MOTOR OIL, OIL FILTERS, WINDSHIELD WASHER SOLUTION
2	**Home Products** (Aerosol Products, Air Freshener, Batteries - Button, Rechargeable, Bleach , Cleaner - All Purpose, Cleaner - Ammonia-based, Cleaner - Bleach-based, Disinfectant, Drain Cleaner, Floor Care Products, (wax/stripper), Flourescent Lights, Furniture Polish with Solvents, Furniture Cleaner , Metal Polish with Solvents, Moth Balls, Oven Cleaner (lye based), Pet Supplies/Flea and Tick Control, Scouring Powder or Abrasive Cleaners, Shoe Polish, Smoke Detector, Spot Removers/Carpet, Thermometers and Thermostats, Toilet Bowl Cleaner, Upholstery and Rug Cleaner, Window/Glass Cleaner
3	**Personal Care Products** (Hair Spray, Hair Permanent Lotion, Hydrogen, Peroxide, Isopropyl Alcohol (rubbing alcohol), Nail Polish, Nail Polish Remover.
4	**Home Improvements (**Adhesives and Glues (solvent-based), Furniture Stripper, Latex Paint and Primer, Oil-based Paint and Primer, Paint Brush Cleaner, Paint Remover and Stripper, Paint

	Thinner, Stain and Varnish, Wood Preservative.
5	**Healthcare Waste**(Medical waste products)

Table 2.2 Cont.

6	**INDOOR PESTICIDES** (ANT/COCKROACH SPRAY AND BAIT, RODENT POISONS AND BAIT)
7	**Lawn and Garden** (Fertilizer with Weed Killer , Fungicide, Herbicide, Insecticide , Empty Pesticide Containers)
8	**Miscellaneous** (Ammunition, Art Supplies, Photographic Chemicals (diluted/undiluted), Pool Chemicals, Propane Gas Cylinders)

2.3 Problems of Household Hazardous Products

Household hazardous products (HHP) pose risks to personal and environmental health through home use and storage, transport, and disposal. Adverse health effects are most likely to be caused by pesticides, oil-based paints, solvents, adhesives, automotive products, pool chemical, dugs, and corrosive cleaners. Adverse environmental effects are most likely to results from pesticides and fertilizers, automotive products, and solvent-containing products (George and Frank, 2002).

2.3.1 Health Risks

Chemical in household products can enter the body and cause adverse health effects through ingestion, inhalation, or adsorption. Example of acute effects(felt soon after exposure) from HHP including poising from a toxic substance such as antifreeze; burns from an acidic product such as

battery acid; or injuries from an exploding aerosol can left too close to a stove. Some products emit toxic fumes that may produce acute reactions such as headaches, fatigue, burning eyes, runny noses, and skin rashes Chronic health effects may result from repeated, long-term exposure to highly toxic products such as automotive solvents, oil –based paints, or pesticides. Chemicals may be stored in the body's fatty tissues and accumulate over time, causing liver or kidney damage, central nervous system damage, cancer and birth defects, paralysis, sterility, and suppression of immune functions (George and Frank, 2002).

Those that do have the potential to leach based on these characteristics, in most cases, do not represent a threat to human health based on toxicological considerations. However, compounds such as propoxur, which are very mobile and relatively persistent in soil and in addition have been associated with significant potential health effects, may be targeted by the screening process as described here and could be selected for further investigation as candidates for special waste management status (such as HHW). Gray et.al (1997) analysis and recommendations have not been extended to the many types of lawn and garden pesticides that are commonly used by homeowners and are frequently brought to HHW programs. However, their potential for groundwater contamination could also be judged using the same technical considerations as applied in this review to indoor household pesticides. In light of the very high costs of diverting wastes from the MSW stream and into HHW programs, it is recommended that, as a matter of public policy, all categories of household waste that might be considered as HHW be carefully and objectively evaluated for their potential to harm public health or the environment after disposal at MSW landfills (Gray et.al, 1997).

2.3.2 Environmental Risks

Environmental risks depend on a particular products characteristics: its solubility and mobility (chance of moving into surface or groundwater), persistence and degradability (how long it stays hazardous), toxicity to nonhuman target species, potential for penetrating landfill liners, and potential for being broken down by sewage treatment processes.

Chemical that persists in the environmental and bioaccumulation in food chain is of particular concern for environmental quality. Heavy metals such as mercury, lead, and cadmium build up in soils, water, and animal. The U.S Environmental Protection Agency (EPA) has called for elimination of persistent, bioaccumulative , toxic chemical from use and in the environmental (George and Frank, 2002).

There are many reasons it makes sense to collect hazardous household wastes separately and keep them out of landfills. Some household hazardous wastes shouldn't be landfill because they can be recycled or used as an energy saving fuel. Less hazardous waste in the landfill means less hazardous leachate requiring expensive treatment. The risk of ground and water pollution should leachate leak from landfills is also reduced. Garbage collectors and landfill workers can be injured by exploding aerosol cans, splashing chemicals or poisonous fumes created by mixed chemicals. Chemical reactions can also cause fires in garbage collection trucks (Boulder County Colorado Government Online, 2006).

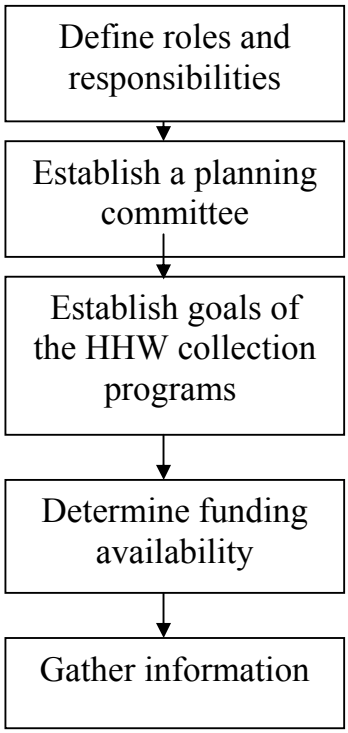
2.3.3 Reactivity Risks

This section tells how the product will react under particular environmental conditions. The following provides definitions of the terms used to describe reactivity (William et.al, 2001).

- Stability indicates whether the product will decompose over time and the environmental conditions, such as heat or direct sunlight that may cause a dangerous reaction.
- Incompatibility indicates which chemicals should not come in contact with the product. Store and use separately any materials that are identified as incompatible.
- Hazardous decomposition products indicate which hazardous substances might be released during fires or from decomposition.
- Hazardous polymerization is a process by which the molecules of a chemical can combine to form larger molecules (polymerize). If this chemical reaction happens too quickly, it may produce a great amount of heat (especially when large quantities of materials are involved), which may result in a fire or explosion.

This type of reaction, under controlled conditions, is commonly used to produce plastics and usually requires heat or a catalyst. If a polymerization hazard exists, specific storage instructions and the shelf life of the chemical should be listed (University of Missouri, 2001).

2.4 Initial Steps in Establishing a HHW Collection Program



2.4.1 Define Roles and Responsibilities.

Although one person can be the main organizer, the success of the program depends on the involvement of a variety of individuals and organizations. Those individuals that have an on-going role in the program should be aware of their responsibilities (California Integrated Waste Management Board, 2005).

2.4.2 Establish a Planning Committee

A core group of people with the expertise needed to plan the HHW collection program should be established. Committee members should represent the local solid or hazardous waste planning program, local health program, city or county planning commissions, citizen groups, and emergency management. Planning for the first collection program should begin early, at least 6-18 months in advance of collection program date (California Integrated Waste Management Board, 2005).

2.4.3 Establish Goals

Identify the goals of the HHW collection program. While the overall goal is to keep HHW out of landfills, sewers, etc... These specific goals may be to provide the most convenient service, to include multi-family housing, or to maximize reuse and recycling. Establishing specific goals will help the planning committee and local officials determine the type of program to establish. It is also recommended that evaluation methods and the criteria to be used to measure the effectiveness of the program be developed (California Integrated Waste Management Board, 2005)

2.4.4 Determine Funding Availability

Potential funding sources can be general funds, tipping fees, parcel fees, and grants. (California Integrated Waste Management Board, 2005).
Funding for HHM programs is generally not available through normal environmental funding channels and funds are secured on an installation-by-installation basis. However, there are many ways to keep HHM program costs down, some of which are discussed below.

The cost of running a HHW management program will depend on the types and amounts of waste the facility accepts, and the manner in which materials that cannot be reused are disposed of. Recycling and reusing/exchanging as many of the turned-in products as possible is generally the least costly option. Some items that may be recycled include used batteries, oil, antifreeze, and used solvents; while good candidates for exchange include products such as unused solvents, paints, pesticides, motor oil, household cleaning products, and antifreeze.

HHW not recycled or exchanged must be disposed of in accordance with applicable regulations. For example, in USA, federal regulations require different treatment and disposal methods for different types of waste. For example, some pesticides may require incineration, while other pesticides may be allowed in a hazardous waste landfill. Other hazardous wastes may be destroyed or detoxified through chemical or biological processes. The appropriate methods and resulting cost will be dictated by the types of waste, any applicable land disposal restrictions, and the proximity of the community/installation to treatment facilities (Harry, 1997).

Americans generate 1.6 million tons of household hazardous waste per year. The average home can accumulate as much as 100 pounds of household hazardous waste in the basement or garage and in storage closets. When improperly disposed of, household hazardous waste can create a potential risk to people and the environment (UNEPA, 2006).

Disposal costs are, by far, the greatest expense associated with a HHW management program. According to the EPA, the proper disposal of one 55-gallon drum of the most hazardous materials such as pesticides, dioxins, or polychlorinated biphenyls (PCBs) can cost $850.

Transporting used oil and solvent-based paints to a facility to be used as supplemental fuel in an approved burner typically costs $175 to $250 per drum, while the cost of sending most other wastes to a hazardous waste incinerator or hazardous waste landfill ranges from $350 to $500 per drum (Carper, 2005).

2.4.5 Gather Information

It is essential that the sponsor and the planning committee learn about local laws and regulations that apply to their program. It is also important to anticipate the types and quantities of wastes that may be collected through the programs. In addition, gather information about other jurisdictions' HHW collection programs (California Integrated Waste Management Board, 2005).

2.5 Types of HHW Collections

Many people understand that household hazardous waste should not be thrown away. The best disposal option for unwanted, If the products are no longer usable, but can be recycled, they should be taken to a recycling outlet. If these options are not possible, the products should be saved for a household hazardous waste collection program. There have been over 4,500 collection programs in the United States since the first one was held in 1980 (UNEPA, 2005). When a community holds a household hazardous waste collection, people are encouraged to bring unwanted and unusable household chemicals to a designated location. There, trained workers remove the products from the vehicles, sort them into types of waste, pack them in drums, and then dispose of the wastes, usually to a special hazardous waste incinerator or landfill

2.5.1 One –Day Collections

One-day collections allow householders to bring their household hazardous waste to a designated location on a specified date. Wastes that are brought in are recycled if possible, and the rest are immediately packaged and sent to a hazardous waste treatment or disposal facility (Joan, 1997).

Advantages of One –Day Collections programs:

- Increases consumer awareness of environmental issues and the impact of consumer choices.
- Leads to higher recycling/reuse rates, thereby conserving natural resources.
- Can lead to new recycling/ reuse opportunities.
- Prevents inappropriate disposal of hazardous and problematic wastes.
- Can charge a fee from participants.

Disadvantages of One –Day Collections programs:

- Typically requires public funds.
- Typically has higher per pound cost than manufactures' take back programs or a permanent collection facility.
- Time consuming to organize.
- Not always convenient for public to participate, leading to low participation rates.

- Often has limited scope of acceptable waste products.
- Public must transport hazardous wastes to collection, increasing health and environmental risks.
- Does not encourage manufacturers to implement source reduction or design products for recycling and sustainability.
- Does not share the waste responsibility with the manufacturer.
- Can be weather dependent.
- Tend to be sporadic, dependent on funds.
- Difficult to distinguish household during collections.
- Participants may show up with unknown or inappropriate wastes.
- May rely on volunteers to do some part of the collection activities.

2.5.2 Permanent Collections

Permanent collection facilities are designed to store household hazardous wastes for short periods of time. At a permanent collection facility, householders bring their hazardous waste by appointment or during open hours (Joan, 1997).

Advantages of permanent collection facilities

- Infrastructure may already be in place.
- Convenient for consumers.
- Can be open year round and is not typically weather dependent.
- Increases participation rates, especially in rural communities.
- Increases consumer awareness of environmental issues and the impact of consumer choices.
- Leads to higher recycling/reuse rates, thereby conserving natural resources.

- Prevents inappropriate disposal of hazardous and problematic wastes.
- Large quantities can be collected.
- Leads to new recycling or reuse opportunities.
- Does not rely upon volunteers.
- Variety of funding options.
- Same system of collection that resident may already use for MSW and recycling non hazardous wastes.

Disadvantages of permanent collection facilities

- May be hard to site if new.
- Does not encourage manufacturers to design products for recycling and sustainability.
- Requires public funds.
- Responsible public entity assumes generator liability.
- May be inconvenient for elderly, handicapped and very rural populations.
- Public must transport hazardous wastes to collection, increasing health and environmental risks.
- Does not always share the waste responsibility with the manufacturer.

2.5.3 Door –To Door Collections

Some communities provide door-to-door collections where trained staff pick up materials in a retrofitted truck and sort, package, and store at a main facility until enough waste is collected to warrant disposing of it. Door-to-door is particularly helpful to elderly and/or disabled people. In

most areas this collection is done by appointment. This is a very expensive service and typically is provided in conjunction with other collection events (Joan, 1997).

Advantages of door-to-door collection

- No infrastructure needed. Government only provides funds and oversight.
- Accessible to all, including elderly and handicapped.
- Convenient for consumers.
- Increases participation rates, especially in rural communities.
- Increases consumer awareness of environmental issues and the impact of consumer choices.
- Leads to higher recycling/reuse rates, thereby conserving natural resources.
- Prevents inappropriate disposal of hazardous and problematic wastes.
- Larger quantities can be collected.
- The number of repeat users can be reduced or eliminated.
- Hazardous waste is not transported by a resident.
- Program can be available year-round.
- Gives public entity the ability to set a budget and adhere to it.
- Because routes are predetermined and pickups coordinated, door-to-door collection has been found to be less expensive per pound than periodic collections or operating some permanent facilities.
- Does not rely upon volunteers.
- Can charge a fee from resident.
- All liability is on contractor who is the generator and provides insurance and indemnity.

Disadvantages of door-to-door collection

- Does not encourage manufacturers to design products for recycling and sustainability.
- Requires public funds.
- Does not share the waste responsibility with the manufacturer.
- Can make it too convenient for residents. There's little incentive for source reduction or buying environmentally preferable products

2.5.4 Curbside Collections

Some communities provide a curbside collection program where yellow boxes are set out at the curb for pickup of household hazardous wastes (Joan, 1997).

Advantages of curbside collection

- Same as those for door-to door collections. (See above).
- No need for resident to make an appointment for pickup.
- Same system of collection that resident may already use for MSW and for recycling non hazardous wastes.

Disadvantages of curbside collection

- Does not encourage manufacturers to design products for recycling and sustainability.
- Requires public funds.

- Hazardous wastes are left unattended and available to children, animals and increased environmental risk.
- Can be weather dependent.
- Can make it too convenient for residents. There's little incentive for source reduction or buying environmentally preferable products.
- Does not share the waste responsibility with the manufacturer.

2.5.5 Mobile Collections

Mobile sites stay in one location for a specific period and then move the whole operation to the next site in within the service area. At the end of the collection period at the site, the waste is placed on a truck and transported back to the main facility; or if the truck is not full, it moves on to the next site (Joan, 1997).

Mobile sites typically follow a route within the service area, staying in place for a specified period and then moving the whole operation to the next site. Similar to one-day events, mobile units have set up at fairgrounds, parks, shopping malls, fire stations, schools, store parking lots, and other convenient locations. Wastes are transported to a main facility for processing and disposal.

2.6 Household Hazardous Waste Stored and Segregated

HHW handling and separation involves the activities associated with management of wastes until they are placed in storage containers collection. Handling also encompasses the movement of loaded

containers to the point of collection. Separation of HHW from household waste is important step in the handling and storage of HHW.

Rules for storing Hazardous Products (Hammet et.al, 2002):

- Follow the directions for storage on the label.
- Protect the original label.
- Store hazardous household chemicals in the original container.
- Keep containers dry to prevent corrosion.
- Store similar products together to reduce any danger from reactions if containers should leak or contents should spill.
- Store products in a well-ventilated area.
- Store products away from children and pets. Generally high, locked shelves work best.
- Store products away from any flammable materials or sources

Reusable products are segregated from the waste stream and placed in the reuse room for customers to take, free of charge. Used oil, latex paint, car batteries and anti-freeze are segregated and packaged separately for recycling. Household hazardous waste that is not reusable or recyclable is sorted by compatible chemical properties and safely packaged into drums. These drums are then transferred to the storage bays in preparation for transport to recycle, treatment, or disposal facilities (Central Contra Costa Sanitary District, 2003**).**

2.7 Disposal Methods

Reuse means to use the product again. Household solvents, such as paint thinner and paint brush cleaner, can be used over and over. Let the used solvent sit undisturbed in a sealed container until the paint particles settle to the bottom. Carefully pour off the clean solvent and use it again. Since these solvents are flammable, this activity should be done outdoors or with plenty of fresh air and adequate ventilation, and away from sources of heat, spark, or flame. The sludge that remains after pouring off the clean solvent should be kept in the sealed container and saved for a household hazardous waste collection, or may be able to go to the landfill if it is completely dry (University of Missouri, 2005).

Triple-rinse container is the prescribed treatment method for empty pesticide containers. To triple-rinse, fill the container 1/4 full with water (or the solvent recommended on the product label), close it tightly, and shake or invert so the rinse reaches all inside surfaces. Repeat this procedure two more times. Rinse water should be used to make up the pesticide mixture or applied to the area you are treating following the same precautions used with the full-strength pesticide. Plastic containers should be punctured to prevent reuse. Discard the rinsed container with the trash, or see if the local recycling center will accept triple-rinsed glass or plastic containers (University of Missouri, 2005).

Recycle is the preferred option for any household hazardous product that can be recycled (University of Missouri, 2005). Paint cans, lead-acid batteries, many household batteries, mercury and some solvents are recycled into other useful products (IEPA, 2003).

Save for collection indicates those products that should be saved for a household hazardous waste collection (University of Missouri, 2005).

Flush down drain indicates that a product can be poured down the drain with plenty of water (University of Missouri, 2005).

Put in trash indicates that a product is suitable for landfill disposal. Generally speaking, empty containers can be thrown away. Liquids should never be disposed of in the trash. Some products are acceptable for landfill disposal if they are hardened or dried up (University of Missouri, 2005).

Fuel blending latex and oil-based paints, motor oils, gasoline, kerosene, paint removers, thinners and other flammable or combustible liquids are blended with virgin fuels to be used as an alternative fuel source for permitted industrial boilers and cement kilns.

Chemical treatment many household cleaners, swimming pool chemicals, cyanide and acids have their toxins neutralized or removed by various chemical processes and are rendered harmless (IEPA, 2003).

Incineration insecticides, herbicides, waxes, adhesives, sealers, and flammable materials not suited for fuel blending or recycling are destroyed by incineration at high temperatures (IEPA, 2003).

Hazardous waste landfill: asbestos tile and less than one percent of wastes collected are placed in hazardous waste landfills. Hazardous waste landfills are highly regulated, have polyliners and are continuously monitored for leakage (IEPA, 2003).

Chapter Three

Methodology

This chapter includes a description of the study criteria, population of the study, the research tool and the techniques. Also it includes the statistical analysis and sample analysis.

The fieldwork in this study constituted of three components:

3. 1 Household Comprehensive Survey

The first component is related to the knowledge, perceptions and attitudes of people towards household hazardous waste. This part is investigated through a comprehensive survey that covers the different aspects of people's knowledge, perceptions and attitude about household hazardous waste handling, including the socioeconomic parameters. The tool for that was structured questionnaire that was designed for that purpose.

The questionnaire included different aspects such as educational level of housewife, type of housewife work, monthly income for the family and different aspects related to household hazardous waste handling (types, separation, storage, home accidents, disposal, etc.). A representative

sample from the whole population of Nablus city (City, Refugee camps), was chosen randomly from the households of the study population.

3.1.1 Population of the Study

The population of the study consists of all households in Nablus City and its refuge camps. Tables 3.1 and 3.2 show total population and the families in Nablus city and its refugee camps.

Table 3.1

Total population and families in Nablus city (PCBS, 2006)

	population	Total number of families
Nablus city	134116	24101

Table 3.2

Total population and families in Nablus camps (PCBS, 2006)

Camp name	population	Total number of families
Balata camp	17645	2942
Askar camp	12706	2044
Ein Beit Alma camp	5036	840
Total	35387	5826

3.1.2 The Sample of the Study

The Questionnaire was distributed among 1300 households in different socioeconomic regions in Nablus city and its Refugee Camps, 753

questionnaires were answered correctly by housewives and 547 questionnaires were incomplete or not returned, the percentage of those who answered the questionnaires correctly was 58%.

3.1.3 The Questionnaire Design

The questionnaire consists of three basic parts: first part was about knowledge about the meaning of HHW and HHW produced, second part was about demographic (dependent) variables and diagnostic questions, and the third part deal with household hazardous waste management

3.1.3.1 Part One

This part consisted of (2) questions, the first question was about knowledge of meaning of HHW. Second question was about the type of HHW produced in the homes.

3.1.3.2 Part Two

This part consists of (21) demographic (dependent) variables and diagnostic questions:

- Demographic (dependent) variables: this sections consists of the following variables (region house , age of housewife ,educational level of housewife , type of work housewife, the number of individuals residing in the home, type of the house , monthly income for the family, presence of children of age range between 8 months to 10 years.

- Diagnostic questions

In this section, direct diagnostic questions were asked to the housewife.

1. Does the house contain hazardous materials related to the work of the father?
2. Where are these hazardous materials kept?
3. Is the storage place with the others apartments?
4. Who is responsible for transferring solid waste from home to the container?
5. How often should waste disposal be done from the home to container?
6. At what period of the day is solid waste taken away from home to container?
7. How far is the nearest solid waste container from home?
8. Is the size of the solid waste container sufficient to waste?
9. Is there any industrial waste in or around the solid waste container?
10. If the answer to question (9) is yes, is this waste hazardous?
11. Is there any kind of inappropriate behavior of children near the solid waste container?
12. Do any of the family members suffer from any these hazardous materials (accidents)?
13. If the answer to question (12) is Yes,
    a. What type of suffering (accident)?
    b. How was the hazardous materials kept after the accident?
    c. Is there any negative psychological effect on infected person from HHW?

3.1.3.3 Part Three

The part concern about the way people handle several HHW that may be found in home, this is mainly about the dispose of method of HHW.

3.1.4 Statistical Analysis

Analysis of data was performed by the use of Statistical Package for Social Sciences (SPSS) computer program version 11.0. Appropriate tests of significance (Chi-squre) was performed to determine the relationships between socio-economic variables and the respondents HHW knowledge, perceptions and attitudes.

3.2 HHW Characterization

The second component of this research was related to household characterization. A solid waste generation analysis was carried out during 15 working days period at Nablus solid waste transfer station that serves Nablus city and the three refugee camps.

The random representative samples of the disposed household waste in the transfer station have been analyzed. On each day 10 samples of $0.5m^3$ household wastes were emptied in a shallow tray band where the solid waste components were categorized manually by placing them in a pre – weighted and appropriately labeled trays (Once each part has been categorized it was weighted to record its percentage from the total

household solid waste. This step was repeated for 15 days and then followed by data analysis. The procedure to manually sort individual components is adapted from the Mexican Official Norm NOM-AA-22-1985 (Buenrostro et.al, 2001; Delgado et.al, 2006. According to the classification proposed by Delgado et.al, (2007) and SWMD, (2004), HHW was classified according to eight categories, as shown in table 3.3.

Table 3.3 Household hazardous waste categories

1	**AUTOMOTIVE PRODUCTS** (ANTIFREEZE, AUTO BATTERY, AUTOMATIC TRANSMISSION FLUID, BRAKE FLUID, CAR WAX WITH SOLVENT, CARBURETOR CLEANER (FUEL INJECTORS), DEGREASERS, DIESEL, FUEL OIL, KEROSENE, ,METAL POLISH WITH SOLVENT, MOTOR OIL, OIL FILTERS, WINDSHIELD WASHER SOLUTION
2	**Home Products** (Aerosol Products, Air Freshener, Batteries - Button, Rechargeable, Bleach , Cleaner - All Purpose, Cleaner - Ammonia-based, Cleaner - Bleach-based, Disinfectant, Drain Cleaner, Floor Care Products, (wax/stripper), Flourescent Lights, Furniture Polish with Solvents, Furniture Cleaner , Metal Polish with Solvents, Moth Balls, Oven Cleaner (lye based), Pet Supplies/Flea and Tick Control, Scouring Powder or Abrasive Cleaners, Shoe Polish, Smoke Detector, Spot Removers/Carpet, Thermometers and Thermostats, Toilet Bowl Cleaner, Upholstery and Rug Cleaner, Window/Glass Cleaner
3	**Personal Care Products** (Hair Spray, Hair Permanent Lotion, Hydrogen, Peroxide, Isopropyl Alcohol (rubbing alcohol), Nail Polish, Nail Polish Remover.

4	**Home Improvements (**Adhesives and Glues (solvent-based), Furniture Stripper, Latex Paint and Primer, Oil-based Paint and Primer, Paint Brush Cleaner, Paint Remover and Stripper, Paint Thinner, Stain and Varnish, Wood Preservative.

Table 3.3 Cont.

5	**HEALTHCARE WASTE** (MEDICAL PRODUCTS)
6	**Indoor Pesticides** (Ant/Cockroach Spray and Bait, Rodent Poisons and Bait)
7	**Lawn and Garden** (Fertilizer with Weed Killer , Fungicide, Herbicide, Insecticide , Empty Pesticide Containers)
8	**Miscellaneous** (Ammunition, Art Supplies, Photographic Chemicals (diluted/undiluted), Pool Chemicals.

3.3 Personal Interview with the Head of the Health Section in the Municipality of Nablus

The third component was a personal interview in the form of a deep discussion with the head of the health section in the municipality of Nablus who was in charge of the city's solid waste management system, was conducted. During this interview, issues such as the role of Nablus municipality in HHW control, problems facing the city in this regard, and the cooperation of residents in HHW control, was discussed.

3.4 Procedure of the Study

The study was done according to the following steps:

1. A list of population and area name in Nablus city and its refuge camps was taken from Palestinian Central Bureau of Statistics.
2. The questionnaires were distributed among the sample study
3. The answered questionnaires were retrieved by the researcher
4. The questionnaires were analyzed statistically by SPSS program.
5. The Characteristics of HHW test was carried out on the selected study sample at Nablus solid waste transfer station.
6. The results from the characteristics of HHW test were analyzed.
7. Distribution of HHW containers in Nablus city and its refuge camps was performed by the use of Information Geographic System (GIS) computer program version ArcGIS 9.0.

Chapter Four

Results and Discussions

4.1 Knowledge about the Meaning of HHW

The majority of respondents (90%) stated that HHW was chemical substance and cleaners products and medical products as well as personal care products (cosmetics); the answers indicated 80% of respondents agreed that HHW was a real problem to both Environment and Public health.

A product that is discarded from a home or a similar source that is ignitable, corrosive, reactive, or toxic (e.g. used motor oil, cleaning products, auto batteries, gasoline, pesticides, etc.) (Wolf et.al, 1997). HHW contain potentially dangerous chemicals that must be disposed of with special care (Kaufman et.al, 2005).

Figure 4.1 shows the most HHW produced in Nablus City and its refugee camps according to respondent's opinions.

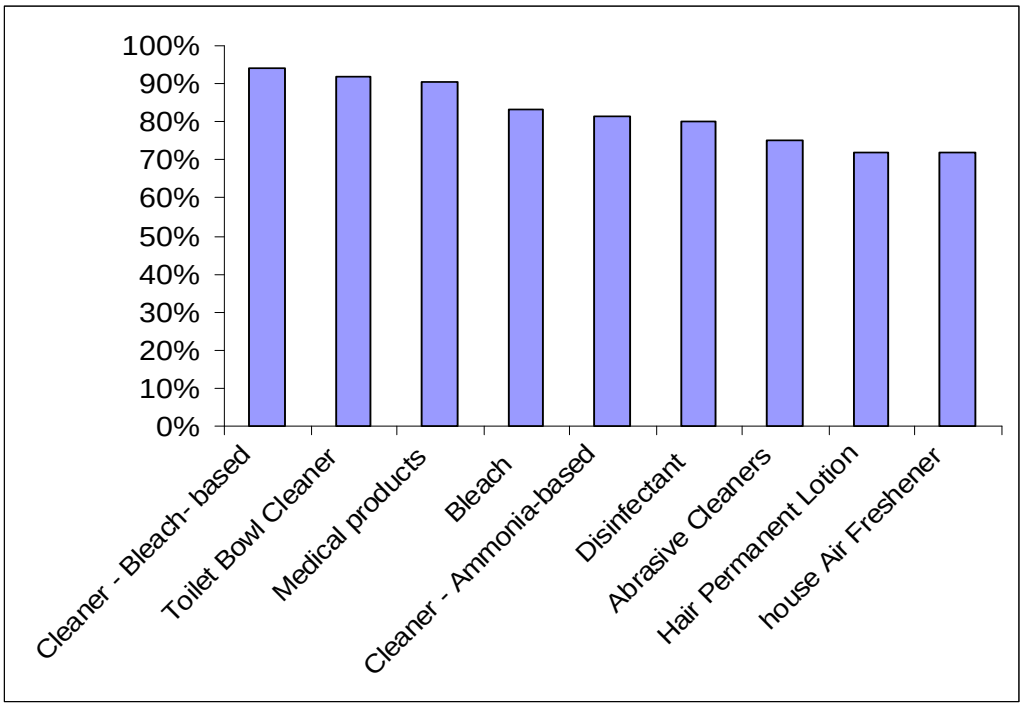


Figure 4.1 Most HHW produced in the homes

Figure 4.1 shows that relatively large quantities of cleaners products and medical products as well as personal care products could be found in Nablus city and its refugee camps.

Findings indicate that cleaner–bleach based, toilet bowl cleaner medical products, bleach and cleaner-ammonia based, where the top five most commonly consumed hazardous substances at homes in Nablus city and its refugee camps, compared with cleaner-ammonia based, cleaner–bleach based, glass/window cleaners, roach killers, oven cleaners, and , toilet bowl cleaner in Kuwait (Parviz et.al, 2002), this indicates that no difference between Palestine and the Kuwait.

Cleaning products are used to provide cleaner and safer home. However, these products contain active ingredients that can cause different types of

toxicity upon mishandling, improper storage, or extensive daily use (Sawalha, 2007).

4.2 Demographic results

This section consists of the following variables (region house, age of housewife, educational level of housewife, type of housewife work, the number of individuals residing in the home, the nature of housing, and monthly income for the family. Detailed demographic characteristics of the respondents are show in Table 4.1.

Table 4.1

Demographic description of the respondents

Demographic characteristics	%
Region house	
City	55.6%
Camp	44.4%
Age of housewife	
Less than 25	12.1%
26-35	33.4%
36-45	37.6%
More than 45	16.8%
Educational level of housewife	
Illiteracy	5.5%
School Certificate	58.5%
University Certificate	32.6%
Graduate Study Certificate	3.4%
Housewife job	
Housewife only	70.3%
Working in the government sector	11.3%
Working in the private sector	18.4%

Table 4.1 Cont.

Demographic characteristics	%
The number of individuals residing in the home	
(2-4)	27.2%
(5-7)	47.4%
More than 7	25.4%
Type of the house	
A flat in apartment	38.8%
House independent	61.2%
Monthly income for the family(JD)	
Less than 300	51.8%
300-500	34.2%
500-1000	11.5%
More than 1000	2.4%
Presence of children of age range between 8 months to 10 years	62.4%
Presence storage place with others apartments	18.4%

Responses were received from both Nablus city and its refuge camps in proportions of 55.6% City and 44.4% camps.

The age distribution of housewife was 37.6% in the 36 to 45 year old group, 33.4% in the 26 to the 35 year old group, 16.8% in the older than 25 group, 12.1% in the older less 25 groups.

In this study, most of housewife's have finished their school certificate and were only working as housewife with moderate income and lived in independent house.

4.3 Solid Waste Management

The results of figure 4.2 show the responsibility the transfer of solid waste from home to the container. 40.1% of householder transferred solid waste, compared with 20.8% of the children and 13.5% of the housewife.

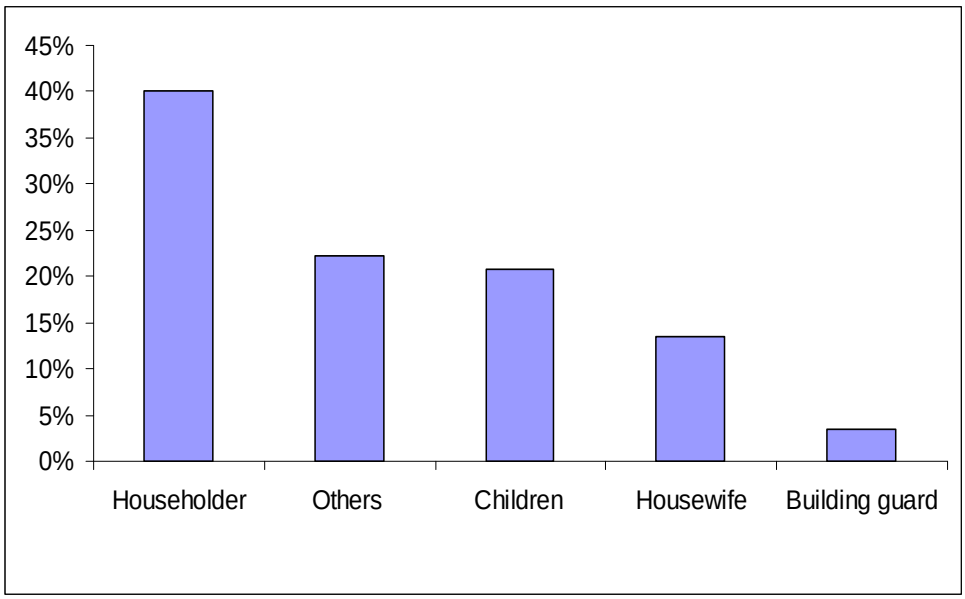


Figure 4.2 the person is responsible for transferring solid waste from home to container

Figure 4.3 shows that 77.7% of the households in Nablus city and its refugee camps dispose solid waste every day, compared with 14.7% of the homes dispose solid waste every two days.

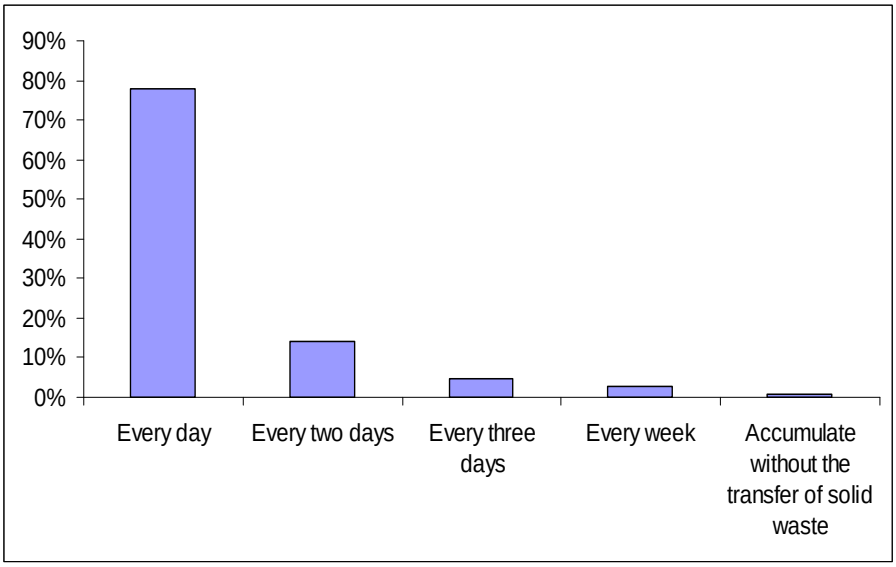


Figure 4.3 the disposal of solid waste from home to container

Figure 4.4 shows that 68.7% of the households transfer of the solid waste from the house to the container at morning, compared with 21.2% at evening and 10.1% at noon.

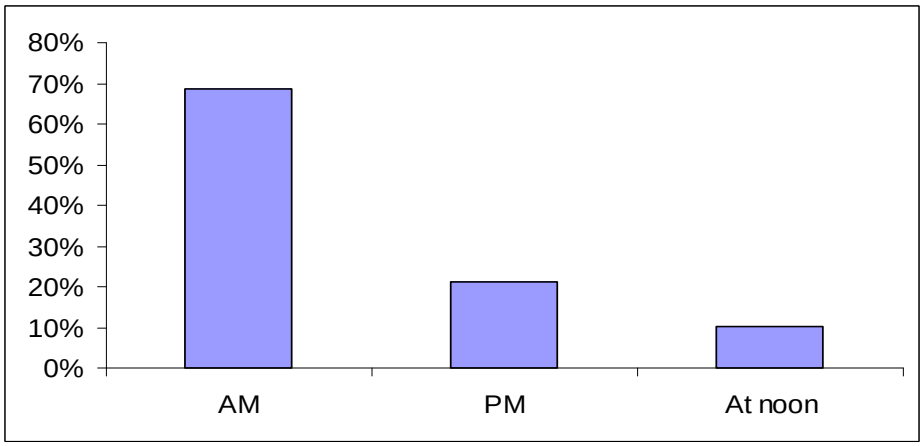


Figure 4.4 the time of transferring solid waste from the house to the container

According to WHO the recommended distance between the containers is 150m (Abu Zahra, 2006). From figure 4.5 distance between the

containers is different from region to another region, 66.8% of respondents consider the solid container in their streets are at distance of less than 100 meters from their household and the others consider it to be more than 100 meters.

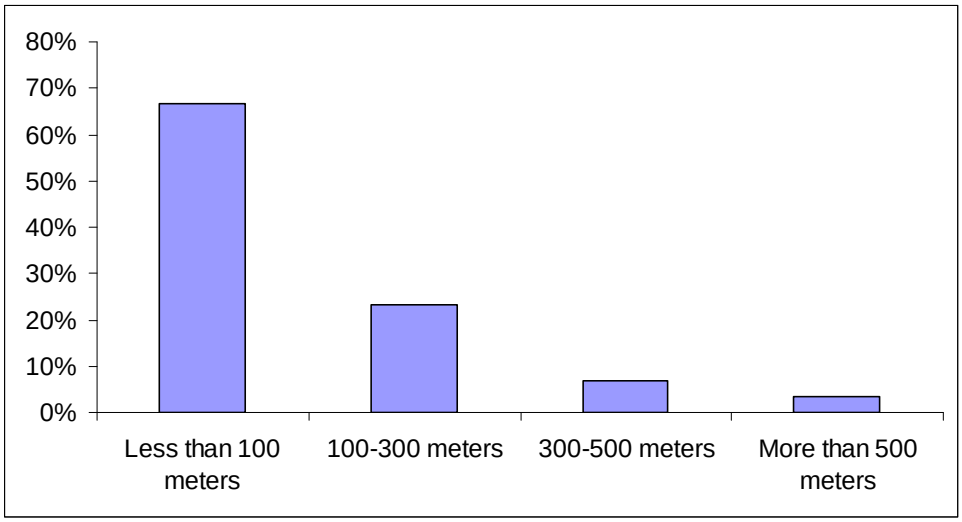


Figure 4.5 the distance of the nearest solid container for house

The residents mentioned that the solid waste containers in their streets are sufficient in the Nablus city and its refuge camps with a percent of 46.4% but 53.6% of them mentioned that the number was not sufficient.

4.4 Risk Assessment of HHW

To determine awareness and risk of HHW and the potential health and environmental problem, residents were asked questions in table 4.2.

Table 4.2

Diagnostic results for risk assessment

	Percentage of risk
The house containing hazardous materials related to the work of householder	19.0%
Presence industrial waste in or around the solid waste container	51.2%
Industrial waste in or around solid waste container is hazardous waste	44.5%
Presence of inappropriate behavior of children near solid waste container	48.6%
Presence accidents from HHW	17.9%
HHW accidents resulted in a negative psychological effect on the person	46.6%

19% of the houses contains hazardous materials related to the work of the householder, 51.2% of respondents have industrial waste in or around the solid waste container and 44.4% of them considered it as a hazardous material.

In Nablus city and its refugee camps Nearly 48.6% of the households have inappropriate behavior of children near solid waste container and 17.9% of the households had accidents(physical injury , poisoning and burning) from HHW, compared with 15% of the households in Kuwait (Parviz et.al, 2002). This indicates that no difference between Palestine and the Kuwait according to HHW accident that involving the use of hazardous substances.

46.6% of the households in Nablus city and its refugee camps mentioned that a negative psychological effect on the person resulted in HHW accidents.

Figure 4.6 shows that 54.7% of households in Nablus city and its refuge camps stored of hazardous materials mainly in special place which can not be reached by children.

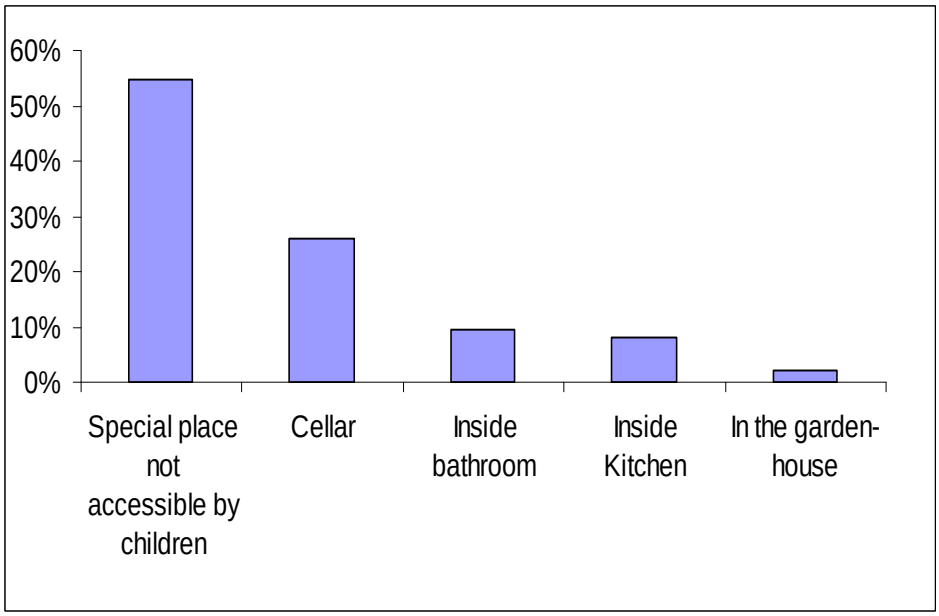


Figure 4.6 Storage place of HHW

The dangers of HHW may not be immediately obvious, but certain types of household hazardous waste have the potential to cause physical injury , poison and burns. Figure 4.7 shows type of accidents in Nablus city and its refugee camps, 40.6% injuries, 39.1% Poison and 20.3% burning were considered the major risks associated with HHW.

Figure 4.7 the major risks associated with HHW

Figure 4.8 shows that 63.2% of the households kept hazardous material in safe place after the accident.

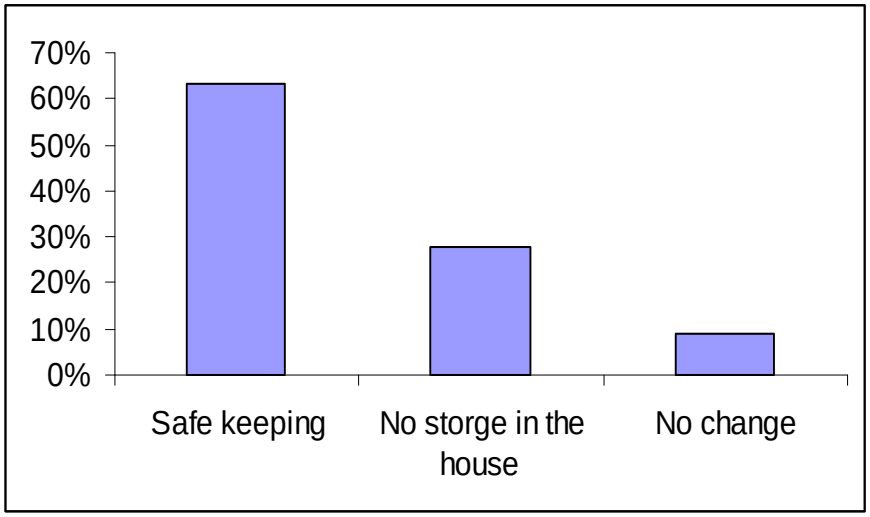


Figure 4.8 Re-keeping and storage of hazardous waste materials

4.5 Hypotheses Testing

Table 4.3 shows the results from the cross-tabulation analysis demonstrated difference in region house (City, Camps) according to statements in first column, there are significant relationship, in the significance level 0.05, between statements in first column and region house (City, Camps).

Table 4.3

Test hypothesis according to region house

	City	Camp	D.F	Chi-sq	P_{Value}
Place of storage of hazardous materials					
Inside Kitchen	8.6%	7.2%			
Inside bathroom	18.6%		4	15.424	0.004
In the garden-house	2.9%	1.4%			
Cellar	24.3%	27.5%			
Special place not accessible by children	45.7%	63.8%			
Who is responsible for transferring solid waste from home to the container					
House holder	46.4%	32.1%			
House wife	13.5%	13.5%	4	74.675	0.0001
Children	25.6%	14.7%			
Building guard	3.6%	3.1%			
Others	10.9%	36.7%			
How often do you dispose solid waste from home to container?					
Every day	72.2%	84.7%			
Every two days	18.6%	8.6%	4	18.181	0.001
Every three days	5.3%	4.0%			
Every week	2.9%	2.1%			
Accumulate without transferring	1.0%	.6%			

Table 4.3 Cont.

	City	Camp	D.F	Chi-sq	P_{Value}
At what time of the day is waste taken away from home to container?			2	9.227	0.010
AM	64.2%	74.5%			
At noon	12.1%	7.5%			
PM	23.7%	18.1%			
How far is nearest solid waste container from home?			3	53.151	0.0001
Less than 100 meters	77.6%	53.0%			
100-300 meters	17.3%	30.5%			
300-500 meters	3.7%	10.9%			
More than 500 meters	1.5%	5.6%			
Is the size of solid waste container sufficient to waste?			1	6.959	0.008
Yes	49.3%	59.1%			
No	50.7%	40.9%			
Is there any industrial waste in or around the solid waste container?			1	10.990	0.001
Yes	37.2%	53.6%			
No	62.8%	46.4%			
Is there any kind of inappropriate behavior of children near solid waste container?			1	54.811	0.0001
Yes	36.6%	64.0%			
No	63.4%	36%			
Do any of the family members suffer from any hazardous material?			1	9.089	0.003
Yes	14.1%	22.6%			
No	85.9%	77.4%			

Note:

The Pearson value (P_{Value}) equals 0.05 or less than 0.05 which indicates that there is a significant relationship between cross tabulation statements, Degree of freedom (D.F)

- Approximately 45.7% of the households in Nablus city store hazardous materials mainly in special place which can not be reached by children, compared with 63. % in Nablus refugee camps.

- 25.6% of children in Nablus city are responsible for transfer of solid waste from home to the solid waste container, compared with 14.7% in Nablus refugee camps.

- 72.2% of households in the city have disposal of solid waste every day and 64.2% done that in the morning, compared with 84.7% in the refugee camps done that in every day, and 74.5% done that in the morning.

- 77.6% of the households in Nablus city found solid waste container a less than 100 meters away, compared with 53% in the refugee camps.

- 49.3% of households in Nablus city consider the size of solid waste container sufficient to solid waste, compared with 59.1% in the refugee camps.

- 37.2% of households in Nablus city find industrial waste in or around the solid waste container, compared with 53.6% in refugee camps.

- 36.6% of households in Nablus city say that there is inappropriate behavior of children towards the solid waste container, compared with 64% in the refugee camps.

- There is another difference between Nablus city and its refugee camps concerning HHW accidents, this indicates that the households in Nablus city have fewer accidents from HHW than Nablus refugee camps. As the percentage in the refugee camps are 22.6 % and in the Nablus city is 14.1%.

Based on above results from the cross-tabulation analysis demonstrated in region house (City, Camps) according to diagnostic questions. Findings were significantly higher or lower between Nablus city and its refugee camps. Difference might be due to adverse socioeconomic parameters between Nablus city and its refugee Camps.

Table 4.4 shows the results from the cross-tabulation analysis demonstrated difference in presence accidents from HHW (physical injury, poisoning and burning) according to statements in first column, there is significant relationship, in the significance level 0.05, between statements in first column and presence accidents from HHW.

Table 4.4

Test hypothesis according to the presence of accidents from HHW in the households

	% Presence accidents from HHW	**D.F**	**Ch-sq**	**P_{Value}**
Educational level of housewife		3	18.65	0.001
Illiteracy	11.4%			
School Certificate	65.2%			
University Certificate	21.2%			
- Graduate Study Certificate	2.3%			
Housewife jobs		2	10.229	0.05
housewife only	81.4%			
Working in the government sector	8.5%			
Working in the private sector	10.1%			
Monthly income for the family (JD)		3	8.235	0.041
less than 300	62.6%			
300-50	25.2%			
500-1000	10.6%			
more than 1000	1.6%			
Who are responsible for transferring solid waste from home to the container		4	11.670	0.02
House holder	29.9%			
House wife	11.8%			
Children	26.0%			
Building guard	2.4%			
Others	29.9%			
The houses contain hazardous materials related to the work of the householder	28.7%	1	9.13	0.003
Presence children of age range from 8 months to 10 years	73.0%	1	7.194	0.008

Table 4.4 Cont.

	% Presence accidents from HHW	D.F	Ch-sq	P_{Value}
Presence industrial waste in or around the solid waste container	62.5%	1	7.322	0.007
Industrial waste that around solid waste container is hazardous waste	67.8%	1	24.73	0.001
Presence of inappropriate behavior of children near solid waste container	65.4%	1	16.666	0.001

Note:

The Pearson value (P_{Value}) equals 0.05 or less than 0.05 which indicates that there is a significant relationship between cross tabulation statements, Degree of freedom (D.F)

- 65.2% of school certificate holders have accidents from HHW. This indicates that educated families have fewer accidents from HHW than uneducated families.
- 28.3% of houses that contain hazardous materials related to the work of the householder have accidents from HHW.
- 73% of the households have children age range from 8 months to 10 years have accidents from HHW.
- 62.6% of households who get lower monthly income have accidents from HHW.
- 26.0% of children are responsible for transferring solid waste from home to the solid waste container have accidents from HHW.
- 62.5% of presence industrial waste in or around the solid waste container causes accidents from HHW.
- 67.8% of industrial hazardous waste causes accidents from HHW.

- 65.4% of the inappropriate behavior of children near solid waste container has accidents from HHW.

Based on above results from the cross-tabulation analysis demonstrated in presence accidents from HHW according to diagnostic questions. Findings were significantly higher in presence accidents from HHW Nablus city and its refugee camps, difference might be due to:

1. school certificate holders
2. the households contain hazardous materials related to the work of the householder
3. the households had children age range from 8 months to 10 years
4. the households had lower monthly income
5. the children were responsible for transferring solid waste from home to the solid waste container
6. presence industrial waste in or around the solid waste container
7. presence industrial hazardous waste
8. presence inappropriate behavior of children near solid waste container

4.6 Household Hazardous Products Found

1. Automotive Products

Results in figure 4.9 show that the kerosene and windshield washer solution products ranked as the first among the automotive products

found in the home, with a percent of 61.8% kerosene and 23.3% windshield washer solution.

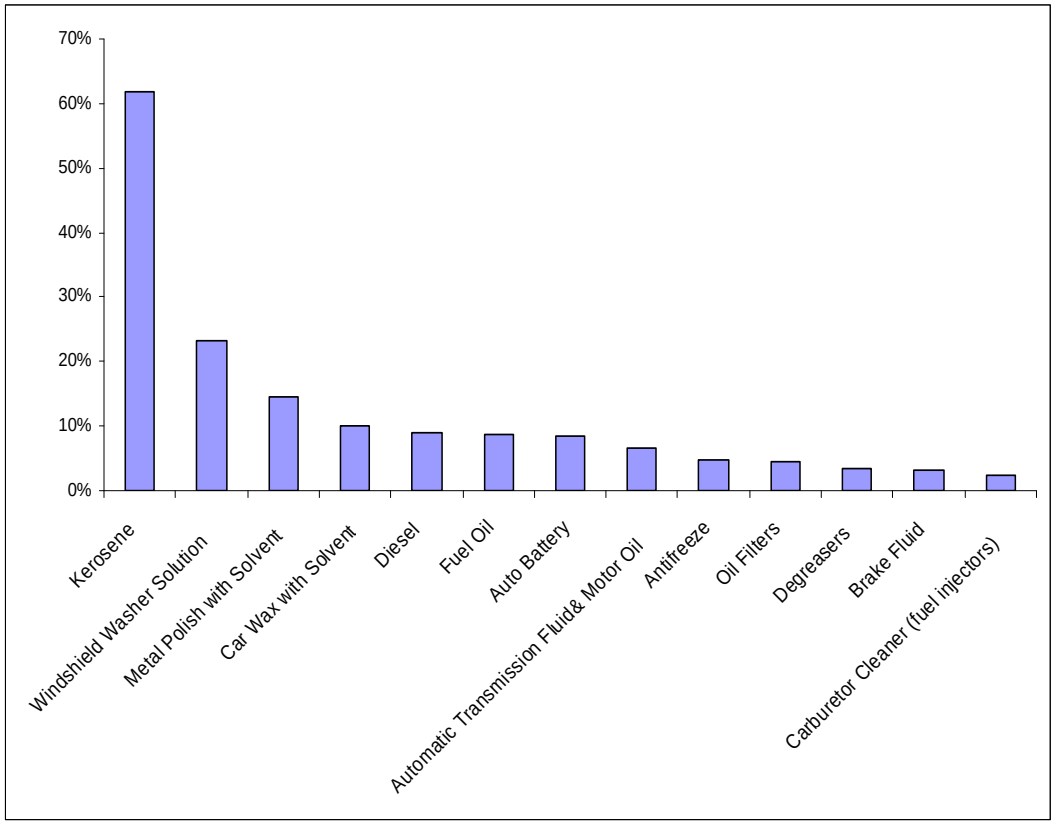


Figure 4.9 automotive products found in the home

2. Home Products

Results in figure 4.10 show that the cleaner –bleach Based, toilet Bowl cleaner, shoe polish, bleach and cleaner-ammonia-based ranked as the first home products found in the homes, with a percent of 93.9% cleaner –bleach based, 92% toilet bowl cleaner, 87.6% shoes polish ,83.4% bleach and 81.4 % cleaner-ammonia-based.

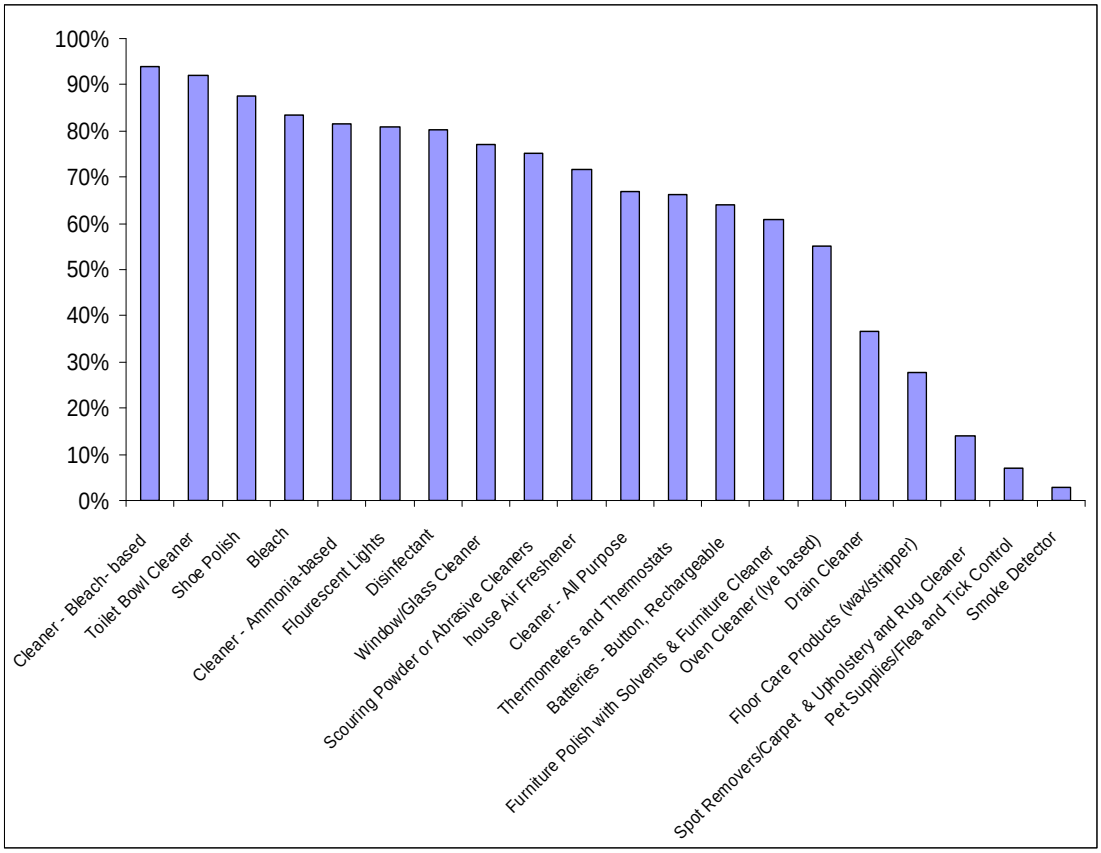


Figure 4.10 Home products found in the homes

In report on HHW generation in Japan that the quantity of cleaners materials corresponded 35% of the total HHW (Masaru and Kenji, 2006).

3. Personal Care Products

Results in figure 4.11 show that the isopropyl alcohol (rubbing alcohol), hair permanent lotion, nail polish and nail polish remover ranked as the first personal care products found in the homes, with a percent of 93.6% isopropyl alcohol (rubbing alcohol), 71.9% hair permanent lotion, 57.8% nail polish and 57.5% nail polish remover.

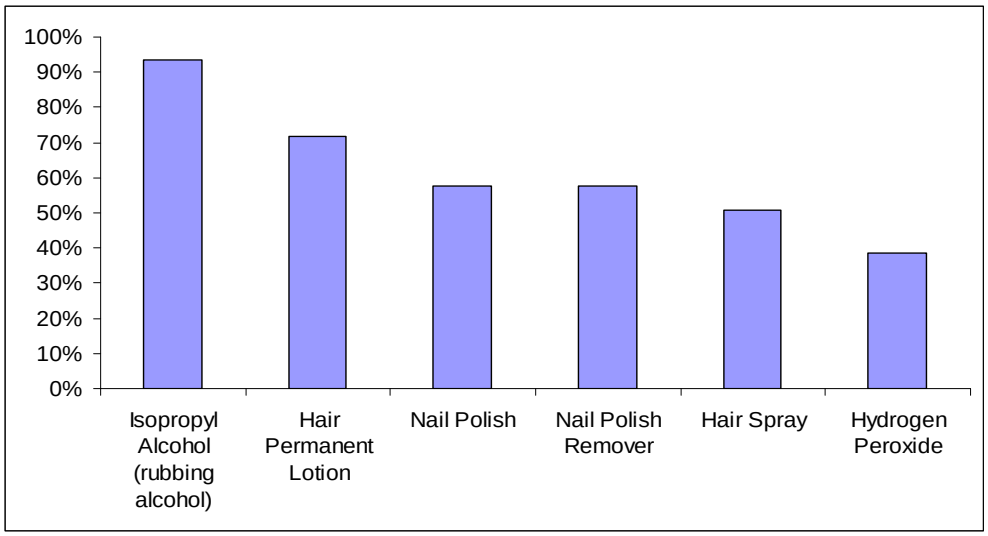


Figure 4.11 Personal care products found in the home

4. Healthcare Products

From figure 4.12 the results show that 90.3% of the houses contain medical products.

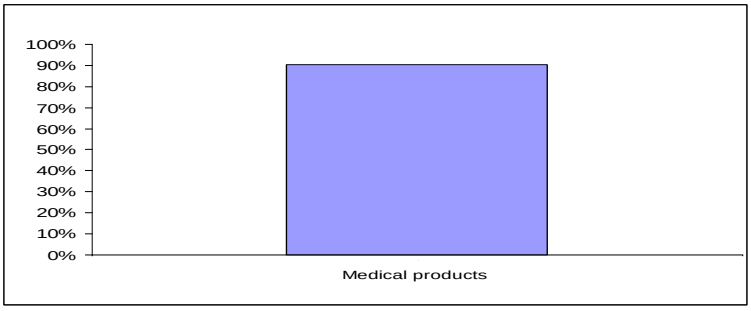


Figure 4.12 Healthcare products found in the home

EPA concluded that the disease causing potential of medical waste is greatest at the point of generation and naturally tapers off after this point. Thus, risk to the general public of disease caused by exposure to medical waste is likely to be much lower than risk for the occupationally exposed individual (UNEPA, 2007).

5. Home Improvements Products

Results in figure 4.13 show that the adhesives and glues (solvent-based), paint brushes cleaner and paint thinner ranked as the first home Improvements products found in the homes, with a percent of 68.8% adhesives and glues (solvent-based), 30.9% paint brush cleaner and 28.4% paint thinner.

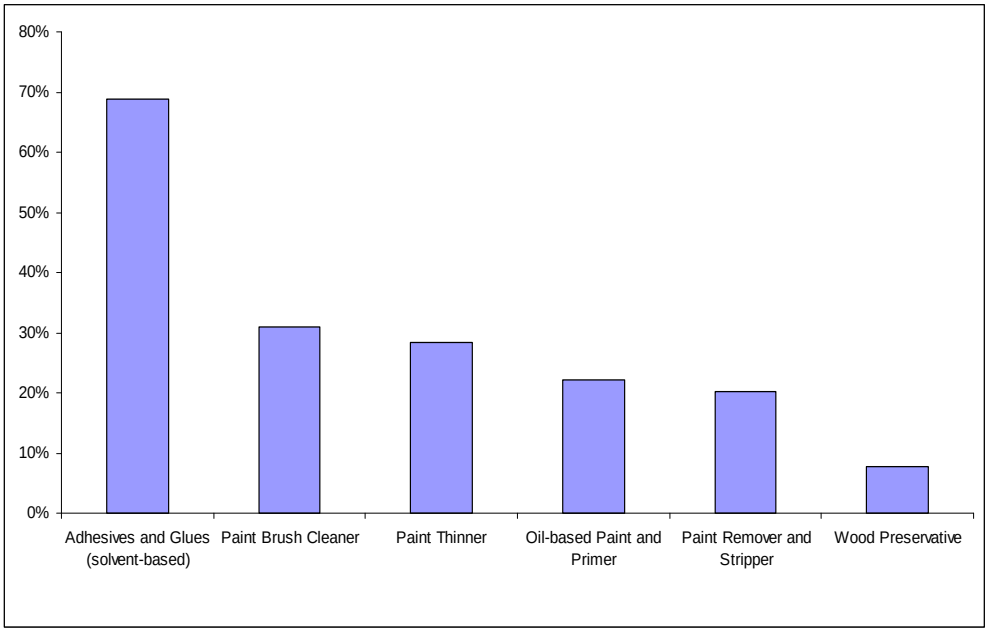


Figure 4.13 Home improvements products found in the home

6. Indoor Pesticides Products

Results in figure 4.14 show that the ant/cockroach spray and bait ranked as the first Indoor pesticides found in the homes, with a percent of 62.9% ant/cockroach spray and bait.

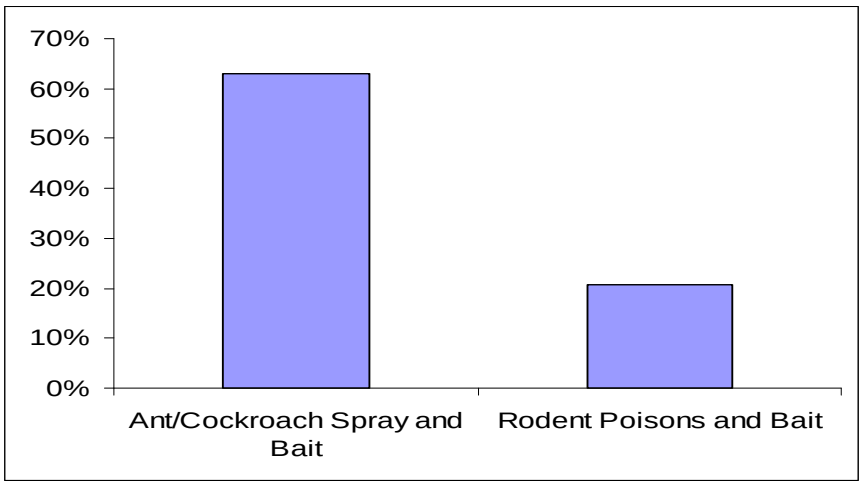


Figure 4.14 Indoor pesticides products found in the home

7. Lawn and Garden Products

Results in figure 4.15 show that the insecticide and fertilizer with Weed killer ranked as the first lawn and garden found in the homes, with a percent of 43.9% insecticide and 13.4% fertilizer with weed killer.

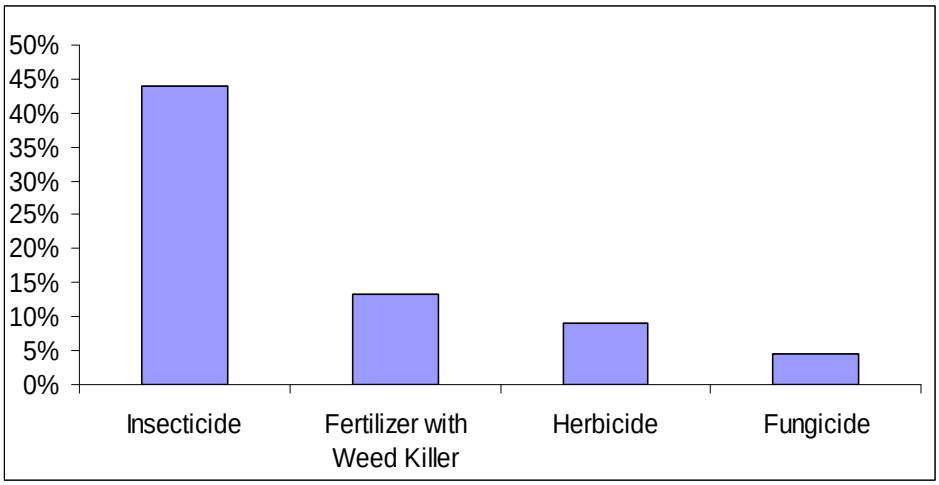


Figure 4.15 Lawn and garden found in the home

8. Miscellaneous Household Hazardous Products

Results in figure 4.16 show that the art supplies ranked as the first miscellaneous products found in the homes, with a percent of 43.9% art s-supplies.

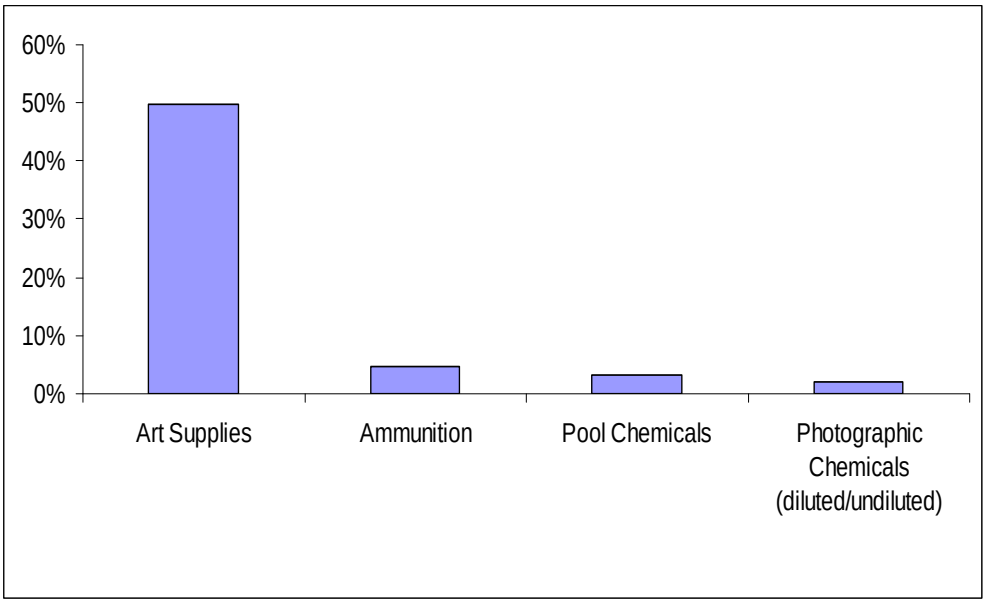


Figure 4.16 miscellaneous household hazardous products found in the home

4.7 Household Hazardous Waste Management

HHW Management can be divided into four categories (MEnA, 2005).

- Waste and materials which cannot be poured down the drain, but can be sent to a sanitary landfill if they are sealed in a closed container and identified.
- Materials that should be saved for a community –wide collection program, or collection by a licensed hazardous wastes contactor

- Material which can be recycled or reused.
- Wastes which can be poured down the drain and diluted with plenty of water.

Results in figure 4.17 show that the personal care products and healthcare products ranked as the first HHW is thrown with the household solid wastes, with a percent of 43.9% personal care products and 58% healthcare products.

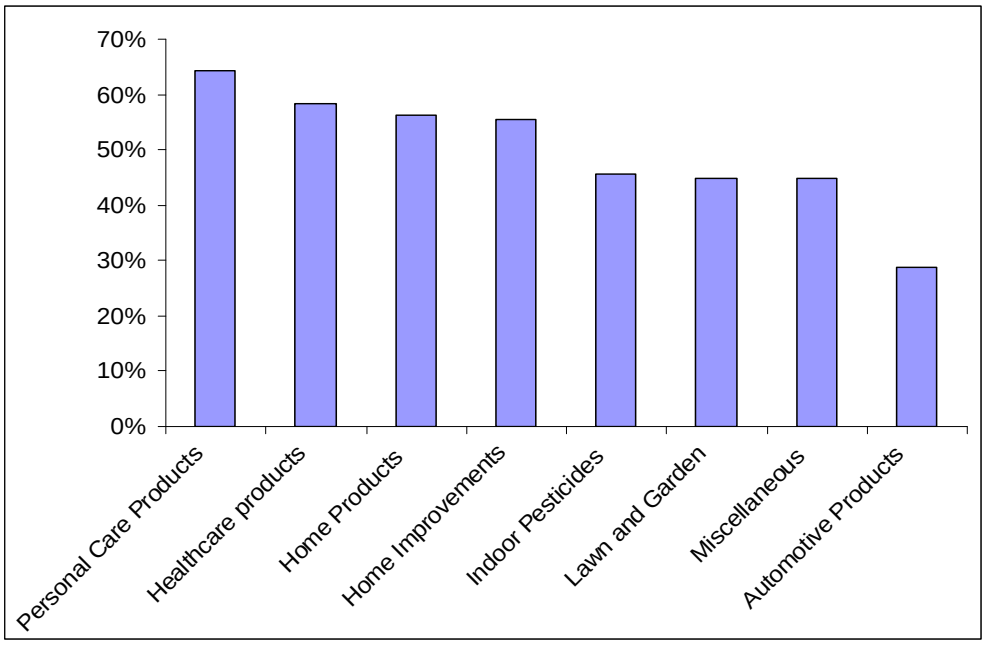


Figure 4.17 Percentage of HHW products which were thrown with the household solid wastes

Results in figure 4.18 show that the automotive products and indoor pesticides products ranked as the first HHW were separately saved at source (home), with a percent of 52% automotive products and 42% indoor pesticides

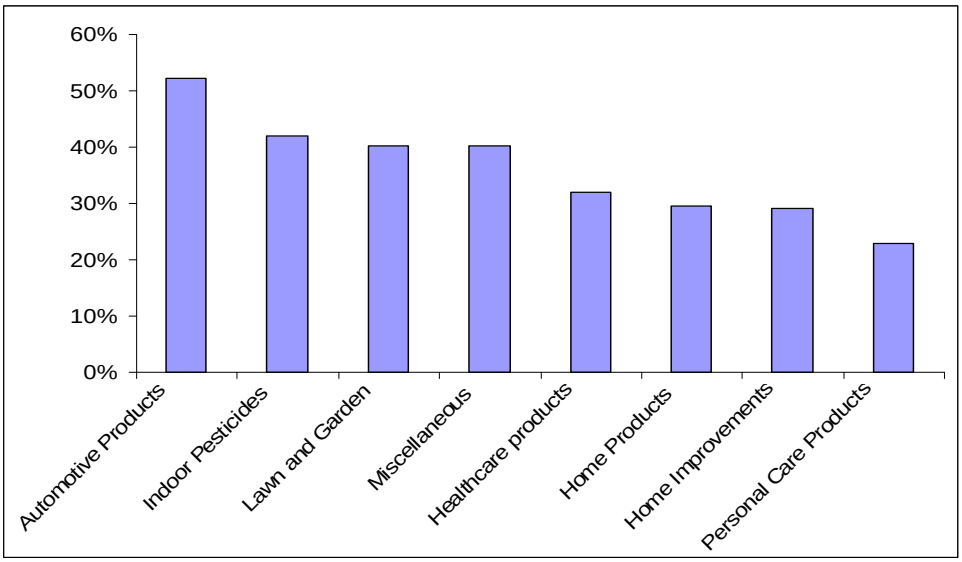


Figure 4.18 Percentage of HHW products which were separately saved

Results in figure 4.19 show that the automotive products and home improvements products ranked as the first HHW are reused, with a percent of 15% automotive products and 12% home improvements products.

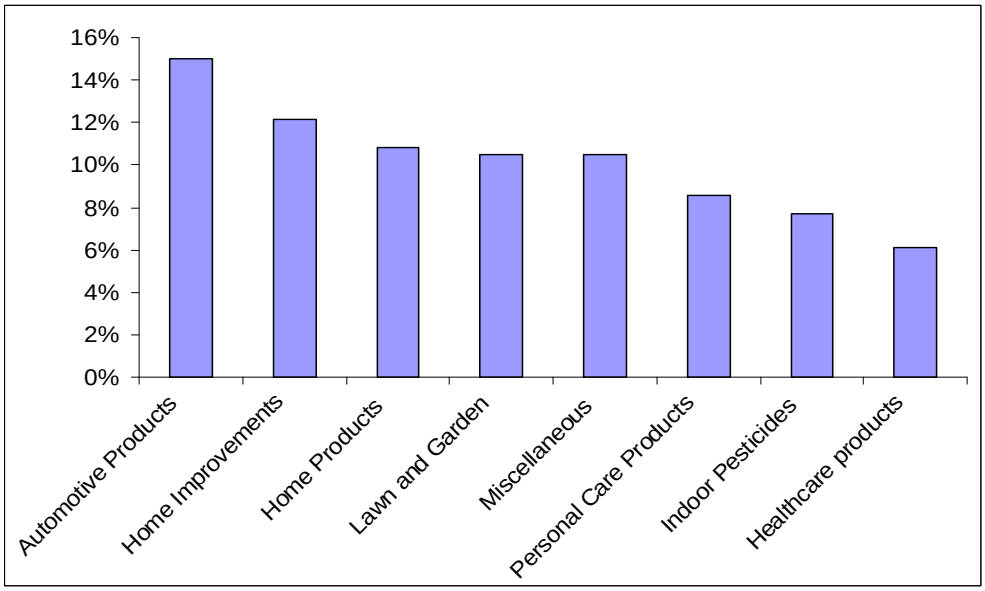


Figure 4.19 Percentage of HHW products which were reused

4.7.1 Comparison Between Nablus City and its Refugee Camps to HHW Management

Depend on annex (B) & (C): comparison between Nablus city and its refugee camps according to HHW management.

It was found also that these were a variation among disposal methods of HHW in Nablus city and its refugee camps. In terms of household hazardous waste Management (HHWM). Figure 4.20 shows that 56% of households in Nablus city dispose the HHW by throwing it with the household solid waste , compared with 41% of the households in Nablus refugee camps.

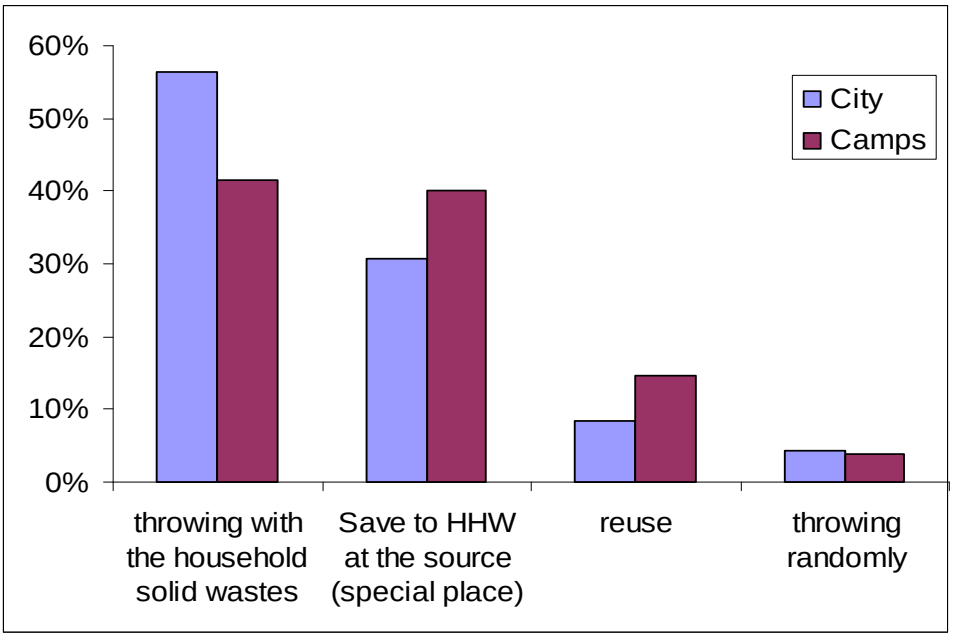


Figure 4.20 Comparative between Nablus city and its refuge camps according to HHW disposal method.

On the other hand, figure 4.20 shows that 31% of households in Nablus city were separately saved at source (home) then throwing it with the household solid waste, compared with 40% of the households in Nablus refugee camps.

Figure 4.20 shows also that reusing of HHW in Nablus refugee camps households are more than that in Nablus City, with a percent of 15% in Nablus refugee camps and 9% in Nablus City.

4.8 Characteristics of HHW

HHW has attracted attention recently because of the steadily increasing levels of municipal solid waste (MSW) of which HHW forms a proportion. A lack of detailed information exists on specific waste types composing HHW and the volumes of HHW produced (Slack et.al, 2005).

Solid waste generation analysis in Nablus city and its refugee camps covered of all houses. Table 4.5 shows the total components of the 150 analyzed samples.

A solid waste generation analysis was carried out during a 15 working days period with sorting 150 samples of 22,372 Kg of municipality solid waste at Nablus solid waste transfer station

Table 4.5

Weight components of HHW from the analyzed solid waste samples

Waste component	Nablus city (weight Kg)	Nablus Camps (weight Kg)	Total (weight Kg)
Total MSW	13601.0	8771.0	22372.0
Automotive Products	23.5	7.0	30.5
Home Products	231.1	125.9	357.0
Personal Care Products	37.4	16.4	53.7
healthcare waste	14.3	5.5	19.8
Home Improvements	25.7	2.7	28.3
Indoor Pesticides	12.7	2.1	14.7
Lawn and Garden	47.1	7.5	54.6
Miscellaneous	2.4	0.4	2.8
Total HHW	394.0	167.3	561.4

This table is used to calculate the bulk density of HHW and weight percentages of HHW categories in Nablus city and its refugee camps

A sample calculation to compute solid waste density is as follows:

Total volume of the sample in Nablus city =

= (6 samples per day)*(0.5m^3 volume of each sample)*(15 working days)

= 45 m^3

Total volume of the sample in Nablus refugee camps =

= (4 samples per day)*(0.5m^3 volume of each sample)*(15 working days)

= 30 m^3

Solid waste density = weight (Kg)/Volume (m^3)

Solid waste density (City) =13601 (Kg) /45(m^3)

=302.3kg/m^3

Solid waste density (Camps) =8771 (Kg) /30(m^3)

=292. 4kg/m^3

As an average the density of the solid waste in Nablus city and its refugee camps is 297.3 Kg/m^3. This density shows a small variation between the two regions.

Table 4.6 shows that HHW concentrations of 2.89% and 1.88% were detected in the Nablus city and its refugee camps, respectively. These percentages are in share to the total municipal solid waste stream.

Table 4.6

Weight percentages of HHW in Nablus city and its refugee camps

Community type	% contribution of HHW to the total solid waste stream
Nablus city	2.89%
Nablus camps	1.88%
Nablus city and its refugee camps	2.51%

Table 4.7 shows monthly income for the family in Nablus city and its refugee camps. In this study it was found that HHW was proportional to the family income.

Table 4.7

Monthly income for the family in Nablus

Monthly income for the family(JD)	city	Camp
less than 300	41.5%	65.1%
300-500	38.2%	29.2%
500-1000	16.6%	5.1%
More than 1000	3.8%	0.6%

Table 4.8 shows the weight proportions of HHW found in Nablus city and its refugee camps. On the whole, the two major contributing categories where home products and personal care products.

Table 4.8

Percentages of HHW categories in Nablus city and its refugee camps

HHW (category)	% HHW categories in Nablus city	% HHW categories in Nablus refugee camps	% HHW categories in Nablus city and refugee camps
Home Products	59.3%	77.9%	63.6%
Personal Care Products	9.5%	9.2%	9.7%
Lawn and Garden	11.4%	3.5%	9.6%
healthcare waste	6.0%	2.9%	5.4%
Automotive Products	6.3%	1.6%	5.0%
Home Improvements	3.6%	3.4%	3.5%
Indoor Pesticides	3.3%	1.1%	2.6%
Miscellaneous	0.6%	0.3%	0.5%
Total	100%	100%	100%

In Nablus city, HHW comprised 2.9% of municipal solid waste, the largest categories in this fraction were home products 59.3%, and personal care products 9.5% and lawn and garden 11.4%. In Nablus refugee camps, HHW comprised 1.9% of municipal solid waste, the largest categories in this fraction were home products 77.9%, personal care products 9.2% , lawn and garden 3.5%.

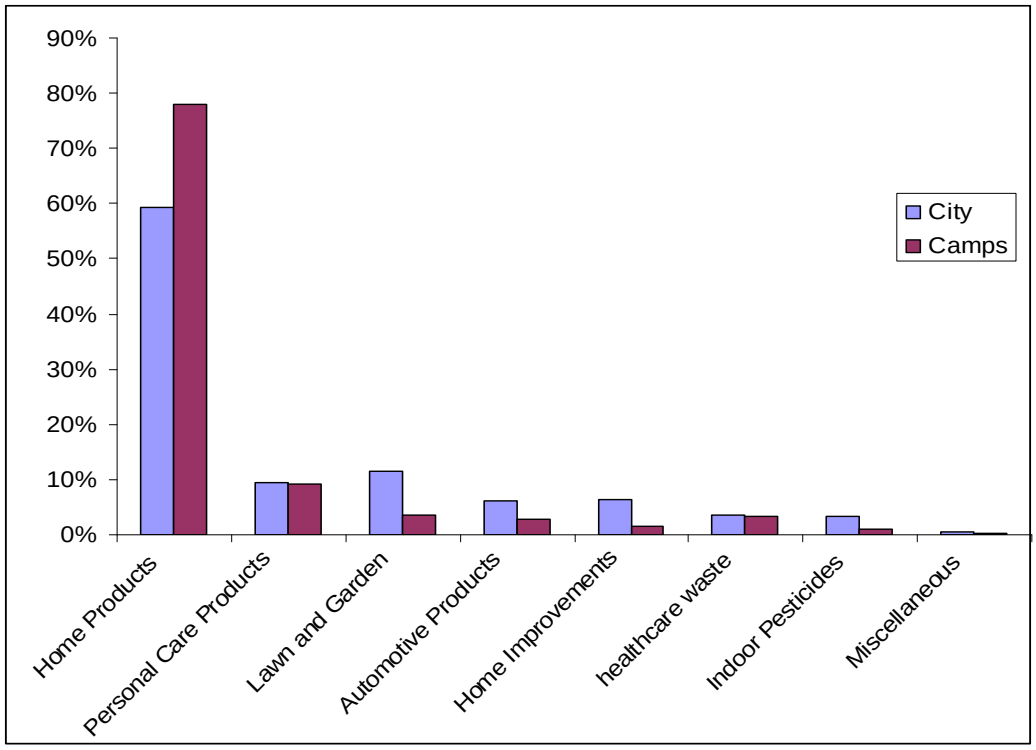


Figure 4.21 Comparative figure of HHW related to the fraction of HHW between Naablus city and its refugee camps

Mexicali city in the north part of Mexico, household hazardous waste comprised 3.7% of municipal solid waste (Delgado et.al, 2007), compared with 2.51% in Nablus city and its refugee camps. Figure 4.22 shows the largest categories in this fraction were home products 35.2% in Mexicali city, compared with 14.7% in Nablus city and its refugee camps, home improvements, lawn and garden products 29.2% in

Mexicali city, compared with 63.6% in Nablus city and its refugee camps. Differences might be due to diverse methodologies, separation, collection processes and culture.

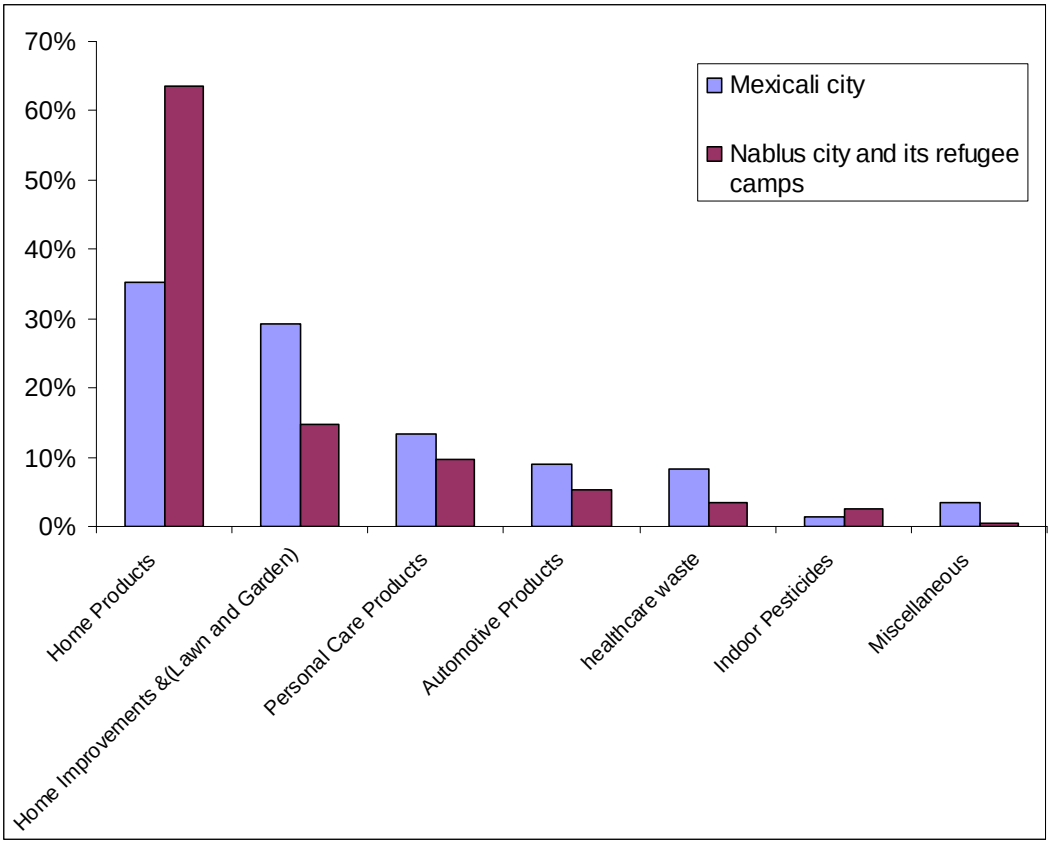


Figure 4.22 Comparative figure of HHW related to the fraction of HHW between Mexicali city and Naablus city and its refugee camps

Table 4.9 shows a list of several reports on the contribution of HHW to the total waste stream. Findings were significantly higher or lower than this study from others countries. Differences might be due to diverse methodologies, separation, collection processes and culture. Even more, our results correspond only to waste originated from households (residential source).

Table 4.9 Household hazardous waste concentration reports (Delgado et.al, 2007) and this report

STUDY	% CONTRIBUTION OF HHW TO THE TOTAL WASTE STREAM
Nablus city	2.89%
Nablus refugee camps	1.88%
Mecicali, Mexico	3.70%
Cuitzeo Basin, Mexico	1.01%
Tijuana, Mexico	1.10%
Argentina	1.00%
New Mexico,USA	0.50%
Massachussets, USA	4.00%
UK	1.00%

4.9 Functional Elements of HHW Management System

HHW poses challenges to human health and to the environment although it is a small portion of the total waste stream. It is important to manage this material in Nablus city and its Refugee Camps, to reduce the impacts of these materials. By offering collection methods for residents to easily and properly dispose of HHW.

The interrelation between the functional elements is identified by considering each functional element separately, it is possible to:

- Identify the fundamental aspects and relationships involved in each element in Nablus city and its refugee camps.
- Develop, where possible. Quantifiable relationships for the purpose of making engineering comparisons, analyses and evaluation in Nablus city and its refugee camps.

4.9.1 HHW Generation

Many household products contain chemicals that when discarded contribute to the contamination of natural resources including water supplies. Table 4.10 shows HHW yearly generation produced typically by a family in Nablus city and its refugee camps.

Table 4.10

HHW generation in Nablus city and its refugee camps

	HHW quantities (ton /year)	HHW quantities (Kg/cap/year)
Automotive Products	90.9	0.53
Home Products	992.9	5.84
Personal Care Products	152.8	0.90
healthcare waste	57.6	0.34
Home Improvements	92.6	0.54
Indoor Pesticides	48.3	0.28
Lawn and Garden	169.0	0.99
Miscellaneous	9.3	0.05
Total weight of HHW	1613.4	9.49

Samples of waste in Nablus city and its refuge camps indicated there was 1613.4 ton of HHW in the residential waste stream in Nablus city and its refugee camps. This represented less than three percent of the annual 59447 ton of residential waste generated in Nablus city and its refuge camps. These quantities distributed into 1418 ton in the Nablus City and 195 ton in Nablus refugee camps.

Most of this quantity was produced from home products which amount 992 ton. Compared with 152 ton from personal care products.

While this may seem like a minor amount, even a small amount of household hazardous waste can cause considerable damage. For example, just one liter of used oil can contaminate 1,000,000 liters of water.

4.9.2 HHW Handling, Separation and Storage at the Sources

Table 4.11 shows results from survey analysis according to HHW management (handling, separation and storage) at the source in Nablus city and its refugee camps; this is mainly about the disposal method of HHW and divided into four categories:

1. HHW which are thrown with the household solid wastes.
2. HHW which are saved to HHW at the source (special place).
3. HHW which are reused.
4. HHW which are thrown randomly.

Table 4.11

Methods for HHW management at the source in Nablus

	Products	throwing with the household solid wastes	Save to HHW at source (special place)	reusing	throwing randomly
Automotive Products					
1	Antifreeze	27%	55%	9%	9%
2	Auto Battery	20%	55%	21%	4%
3	Automatic Transmission Fluid& Motor Oil	14%	62%	17%	7%
4	Brake Fluid	42%	53%	0%	5%
5	Car Wax with Solvent	45%	42%	9%	5%
6	Carburetor Cleaner (fuel injectors)	27%	73%	0%	0%
7	Degreasers	29%	54%	13%	4%
8	Diesel	16%	62%	19%	3%
9	Fuel Oil	16%	56%	25%	3%
10	Kerosene	20%	46%	32%	2%
11	Metal Polish with Solvent	38%	41%	20%	2%
12	Oil Filters	38%	45%	14%	3%
13	Windshield Washer Solution	43%	35%	17%	5%
Home Products					
14	house Air Freshener	58%	28%	10%	4%
15	Batteries – Button, Rechargeable	72%	17%	6%	6%
16	Bleach	55%	31%	10%	3%
17	Cleaner – All Purpose	58%	30%	11%	2%

18	Cleaner – Ammonia-based	56%	32%	9%	4%
19	Cleaner – Bleach- based	53%	33%	11%	3%
20	Disinfectant	55%	33%	10%	3%

Table 4.11 Cont.

	Products	throwing with the household solid wastes	Save to HHW at source (special place)	reusing	throwing randomly
Home Products Cont.					
21	Drain Cleaner	53%	36%	10%	1%
22	Floor Care Products (wax/stripper)	59%	29%	9%	3%
23	Flourescent Lights	55%	28%	13%	4%
24	Furniture Polish with Solvents & Furniture Cleaner	60%	29%	9%	2%
25	Oven Cleaner (lye based)	59%	32%	6%	4%
26	Pet Supplies/Flea and Tick Control	35%	41%	18%	6%
27	Scouring Powder or Abrasive Cleaners	56%	31%	11%	3%
28	Shoe Polish	61%	26%	8%	5%
29	Smoke Detector	65%	24%	12%	0%
30	Spot Removers/Carpet & Upholstery and Rug Cleaner	57%	26%	13%	4%
31	Thermometers and Thermostats	45%	32%	21%	3%
32	Toilet Bowl Cleaner	57%	30%	9%	4%
33	Window/Glass Cleaner	60%	25%	11%	3%
Personal Care Products					
34	Hair Spray	65%	23%	9%	3%

35	Hair Permanent Lotion	61%	23%	11%	5%
36	Hydrogen Peroxide	68%	21%	6%	5%
37	Isopropyl Alcohol (rubbing alcohol)	60%	27%	10%	4%
38	Nail Polish	66%	21%	8%	5%

Table 4.11 Cont.

	Products	throwing with the household solid wastes	Save to HHW at source (special place)	reusing	throwing randomly
Personal Care Products Cont.					
39	Nail Polish Remover	67%	22%	7%	4%
Medical products					
40	Medical products	58%	32%	6%	4%
Home Improvements					
41	Adhesives and Glues (solvent-based)	62%	26%	9%	3%
42	Oil-based Paint and Primer	66%	22%	8%	3%
43	Paint Brush Cleaner	51%	31%	14%	4%
43	Paint Remover and Stripper	59%	26%	11%	4%
44	Paint Thinner	55%	32%	10%	4%
45	Wood Preservative	40%	38%	21%	2%
Indoor Pesticides					
46	Ant/Cockroach spray and bait	54%	33%	8%	5%
47	Rodent Poisons and Bait	37%	51%	8%	4%
Lawn and Garden					
48	Fertilizer with Weed Killer	51%	37%	10%	3%
49	Fungicide	39%	46%	12%	3%
50	Herbicide	37%	43%	13%	7%
51	Insecticide	53%	35%	7%	5%
Miscellaneous					

52	Ammunition	59%	24%	10%	7%
53	Art Supplies	58%	25%	14%	3%
54	Photographic Chemicals	25%	42%	25%	8%
55	Pool Chemicals	50%	35%	10%	5%
Average		**50%**	**36%**	**10%**	**4%**

Table 4.11 is used to calculate the level of awareness in Nablus city and its refugee camps according to HHW disposal methods.

Figure 4.23 shows the Knowledge, attitudes and perception of household heads concerning the disposal methods of household waste. 49% of households in Nablus city and its refugee camps disposed HHW by throwing it with the household solid waste, compared with 35% of the households were separately saved at source (home) but not reached it to save HHW collections facility then throwing it with the household solid waste and 4% throwing randomly, the results also found that the level of households' awareness of hazardous substances is generally low according to HHW disposal methods.

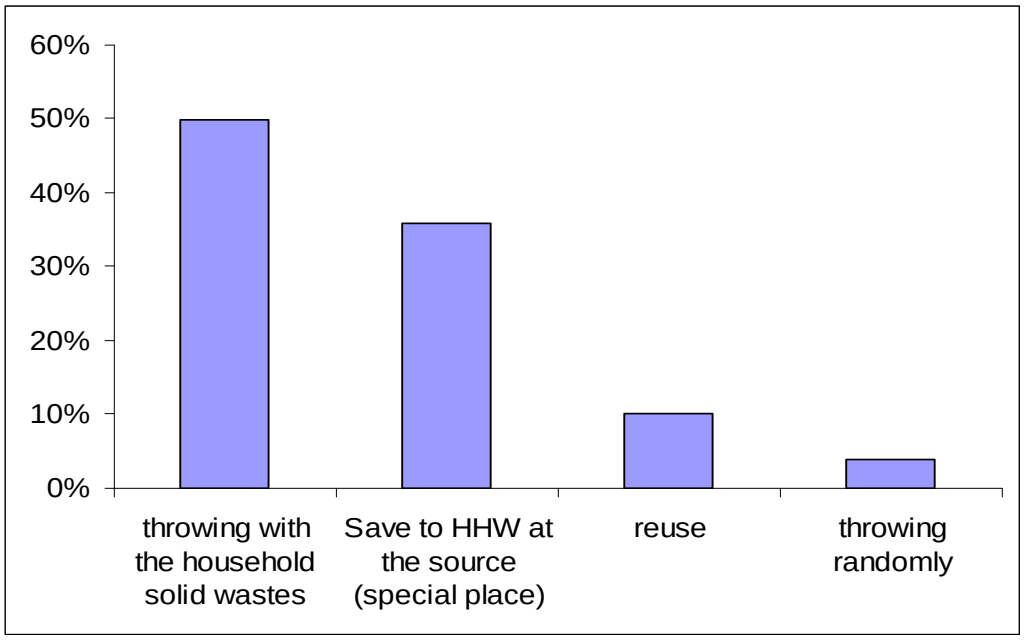


Figure 4.23 Nablus city and its refuge camps according to HHW disposal method

Results in Nablus city and its refugee camps indicated that approximately 53 percent of the households were unaware of the best method that could be used for separation, storage and processing HHW at the sources by improper disposal of these products, compared with 40 percent of the households in Colorado(Scudder, 1991), this indicates that difference between Palestine and Colorado and is need of continuous improvements in Nablus city and its refugee camps according to HHW disposal method.

Table 4.12 shows the best method that could be used for separation, storage and processing HHW at the sources derived from annex (A)

Table 4.12

The best methods for HHW management at the source

	Products	Throwing with the household solid wastes	Save to HHW collection	reusing	sewer system
Automotive Products					
1	Antifreeze				x
2	Auto Battery			x	
3	Automatic Transmission Fluid& Motor Oil		x	x	
4	Brake Fluid		x	x	
5	Car Wax with Solvent	X	x		
6	Carburetor cleaner(fuel injectors)		x		
7	Degreasers		x		
8	Diesel		x		
9	Fuel Oil		x		

10	Kerosene		x		
11	Metal Polish with Solvent	X	x		
12	Oil Filters		x	x	
13	Windshield Washer Solution		x		x

Table 4.12 Cont.

	Products	Throwing with the household solid wastes	Save to HHW collection	Reusing	Sewer system
	Home Products				
14	House Air Freshener	X	x		
15	Batteries - Button, Rechargeable		x	x	
16	Bleach			x	x
17	Cleaner - All Purpose			x	x
18	Cleaner - Ammonia-based				x
19	Cleaner - Bleach- based				x
20	Disinfectant			x	x
21	Drain Cleaner		x	x	x
22	Floor Care Products (wax/stripper)		x		
23	Flourescent Lights		x	x	
24	Furniture Polish with Solvents & Furniture Cleaner		x		
25	Oven Cleaner (lye based)		x		
26	Pet Supplies/Flea and Tick Control		x		
27	Scouring Powder or Abrasive Cleaners				x
28	Shoe Polish	X		x	
29	Smoke Detector			x	
30	Spot Removers/Carpet &		x		

	Upholstery and Rug Cleaner				
31	Thermometers and Thermostats		x		
32	Toilet Bowl Cleaner		x		x
33	Window/Glass Cleaner				x
Personal Care Products					
34	Hair Spray	X			

Table 4.12 Cont.

	Products	Throwing with the household solid wastes	Save to HHW collection	Reusing	Sewer system
Personal Care Products Cont.					
35	Hair Permanent Lotion				x
36	Hydrogen Peroxide		x		x
37	Isopropyl Alcohol (rubbing alcohol)				x
38	Nail Polish		x		x
39	Nail Polish Remover		x		
Medical products					
40	Medical products		x		
Home Improvements					
41	Adhesives and Glues (solvent-based)	X	x		
42	Oil-based Paint and Primer		x	x	
43	Paint Brush Cleaner		x	x	
43	Paint Remover and Stripper		x		
44	Paint Thinner		x	x	
45	Wood Preservative		x		
Indoor Pesticides					
46	Ant/Cockroach Spray and Bait		x		
47	Rodent Poisons and Bait		x		
Lawn and Garden					

48	Fertilizer with Weed Killer		x		
49	Fungicide		x		
50	Herbicide		x		
51	Insecticide		x		
Miscellaneous					
52	Ammunition		x		
53	Art Supplies		x		

Table 4.12 Cont.

	Products	Throwing with the household solid wastes	Save to HHW collection	Reusing	Sewer system
Miscellaneous Cont.					
54	Photographic Chemicals		x		x
55	Pool Chemicals		x		x

4.9.3 HHW Collections

There are several types of household hazardous waste collections. The type of collection a community chooses often depends upon the availability of funds and whether its citizens live in a rural or urban setting.

The best methods of household hazardous waste collection in Nablus city and its refuge camps are curbside collection and permanent collection, the joining between the two types depend on socioeconomic and characteristics of the HHW in Nablus city and its refugee camps as well as 70% of HHW is home products.

4.9.3.2 Volume of HHW Collections

Sample of calculation to compute volume of HHW generated and number of containers required:

Volume of HHW generated yearly is calculated as follows:
V= (365*P*W)/D…….(University of Central Florida, 2001).

Where:

V: volume of HHW generated yearly
P: population of community (2010)
D: density of HHW in kilogram per cubic meters
W: weight of HHW generation per capita per day

W = (daily MSW generation rate)* (% contribution of HHW to MSW)

Daily MSW generation rate (city)=1.0 Kg / capita (Halawah, 2007)

Daily MSW generation rate (Camps)=1.0 Kg / capita (Halawah, 2007)

W (city) = 1.0 Kg per capita*2.9%/day
=0.029 Kg per capita/day

W (camps) = 0.8 Kg per capita*1.9%/day
=0.0152 Kg per capita/day

V (city) = (365*166203*0.029)/302.3

=5819 m^3

V (camps) = (365*41204*0.0152)/292.4

=782 m^3

Assume:

1. HHW container collected one time per week
2. Containers of 1 m^3 size. They are the most common type of containers and are located in almost all parts of the city. In the past they were imported or come as aids to Palestinian from different donors. Nowadays they are manufactured locally (Abu Zahra, 2006).
3. Utilized factor 50% full to safety purposes (University of Central Florida, 2001).

Sample of calculation to compute Number of solid waste containers needed in Nablus city and its refuge camps

Volume of HHW per week (city) = 5919/52

=114 m^3

Numbers of HHW containers = (114/50%)

=228 Containers

Volume of HHW per week (refuge camp) = 782/52

=16 m^3

Numbers of HHW containers = (16/50%)

=32 Containers

Of persons for each container (city) =166203/228

=729 person

# of persons for each container (refugee camp) = 41204/32

=1288 person

4.9.3.3 Distribution of HHW Collection Containers

In order to develop the map layout for Nablus city and its refugee camps with all the required features (HHW containers) are used the following shapefiles:

- Roads_Nablus.shp: this shapefile provides the road network for Nablus city and its refugee camps.
- Area_Nablus.shp: this shapefile provides the distribution of the different zones of the Nablus city and its refugee camps.
- Population_Nablus: this shapefile provides the distribution of thr population in Nablus city and its refugee camps.

Nablus city and its refugee camps are divided into 24 area as shown in photo 4.1. Each area is divided into sub areas until the HHW containers are distributed this depended on annex (E) total population in each sub area as shown in photos 4.2 to 4.9.

Nablus City and its Refugee Camps

Photo 4.1 Nablus areas

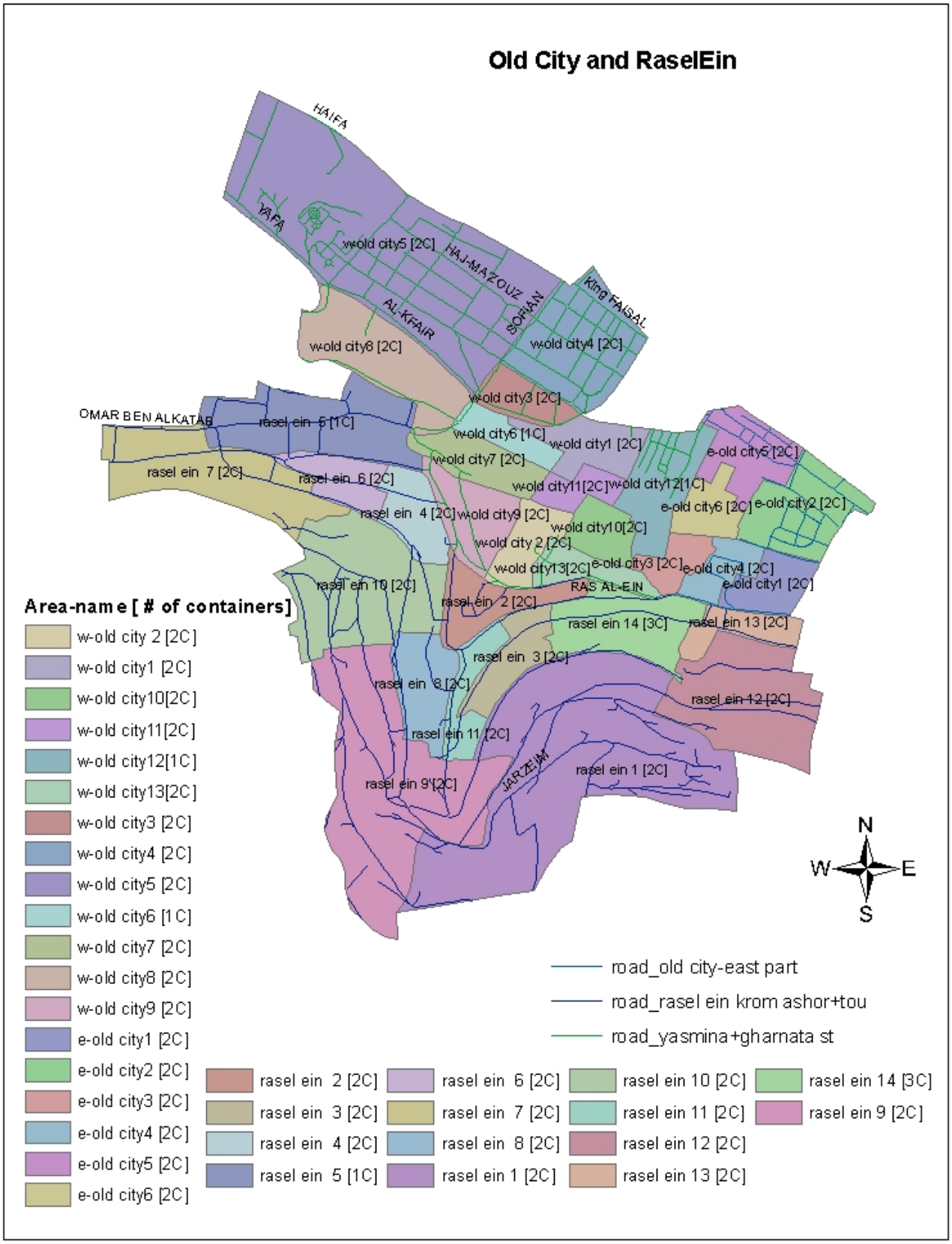


Photo 4.2 Recommend distribution of HHW containers in Old city and Ras Elein

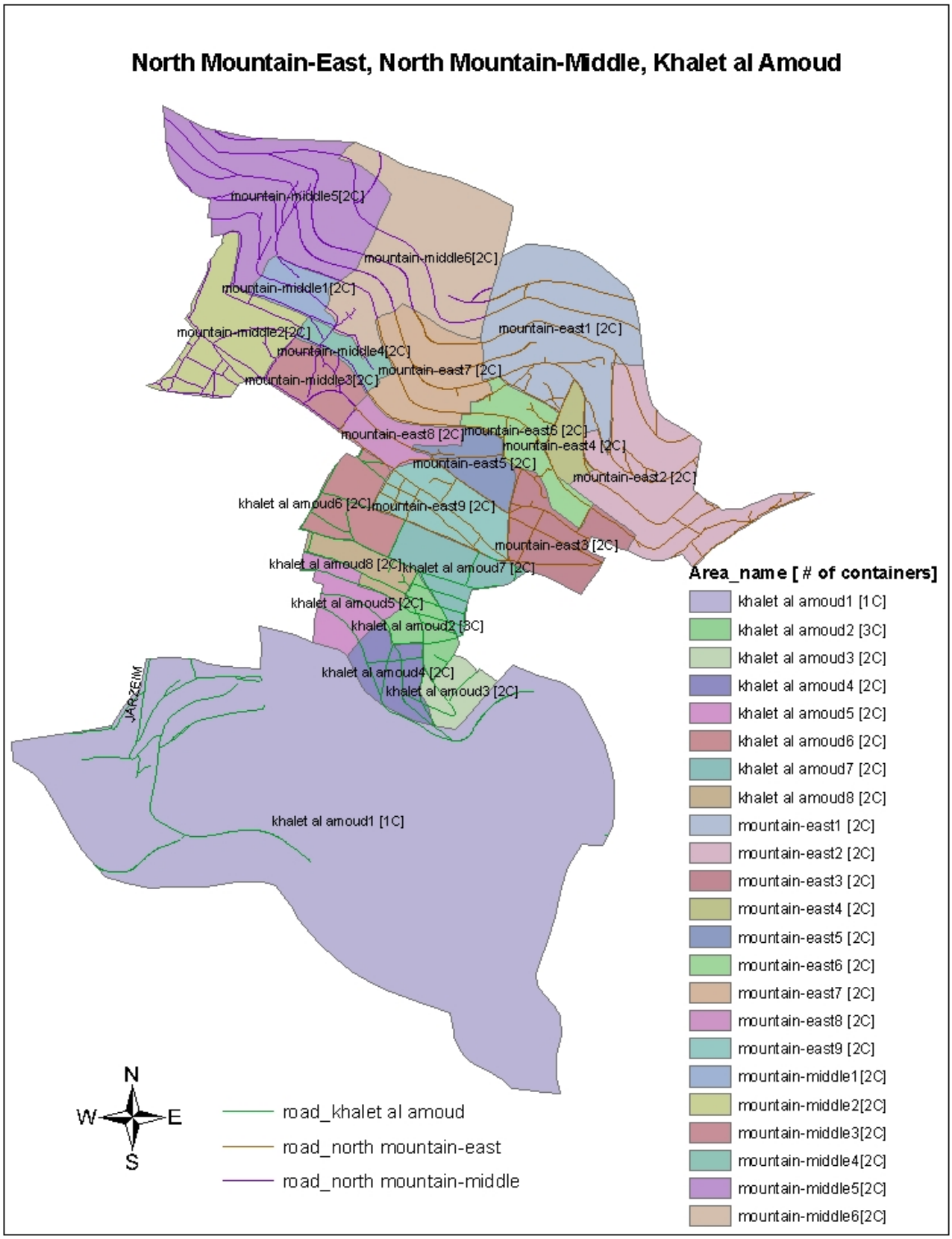


Photo 4.3 Recommend distribution of HHW containers in Khalet Al Amoud, NorthMountain East and North Mountain Middle

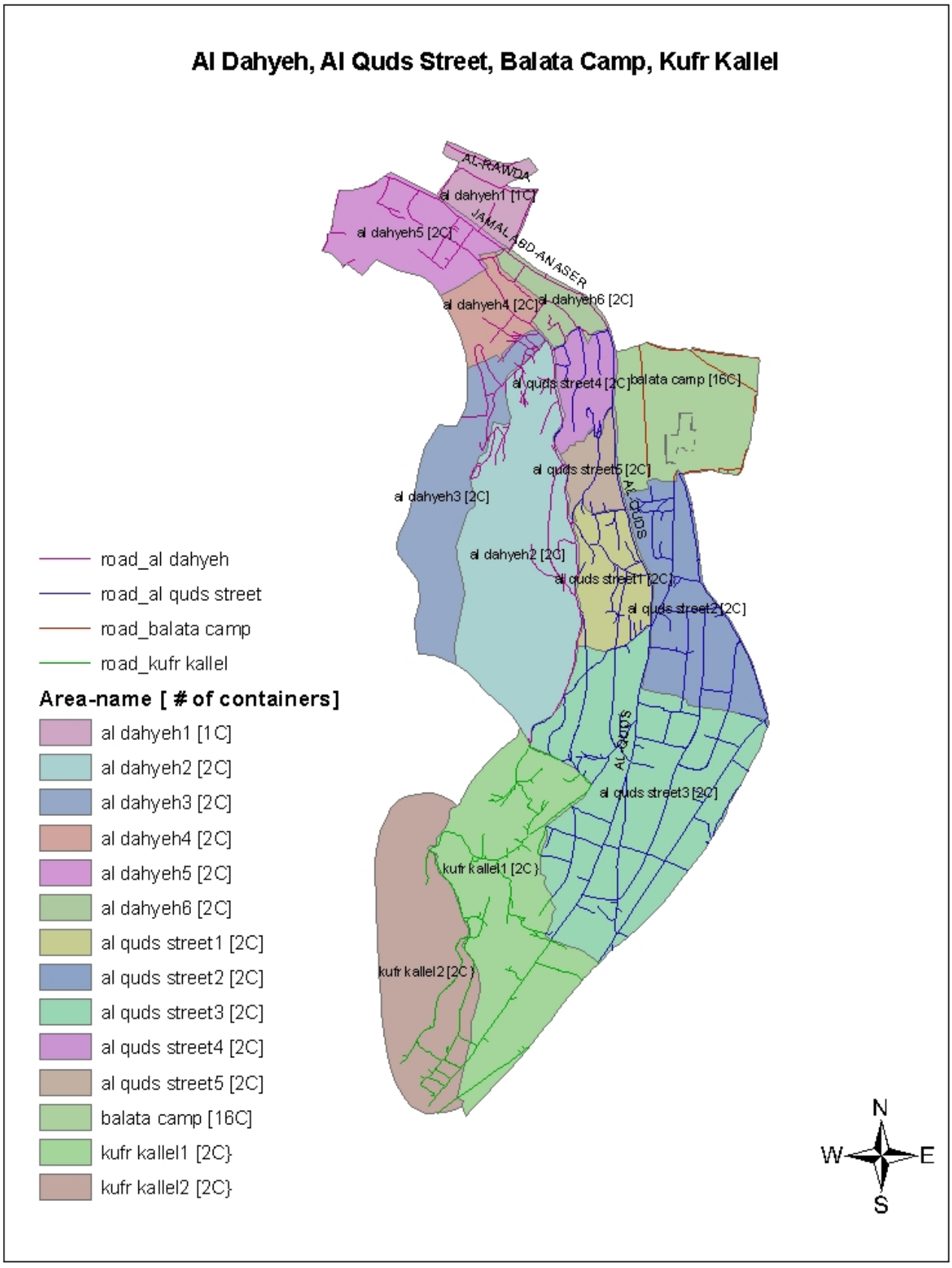


Photo 4.4 Recommend distribution of HHW containers in Al Dahyeh, Al Quds Street, Balata Camp and Kufr Kallel

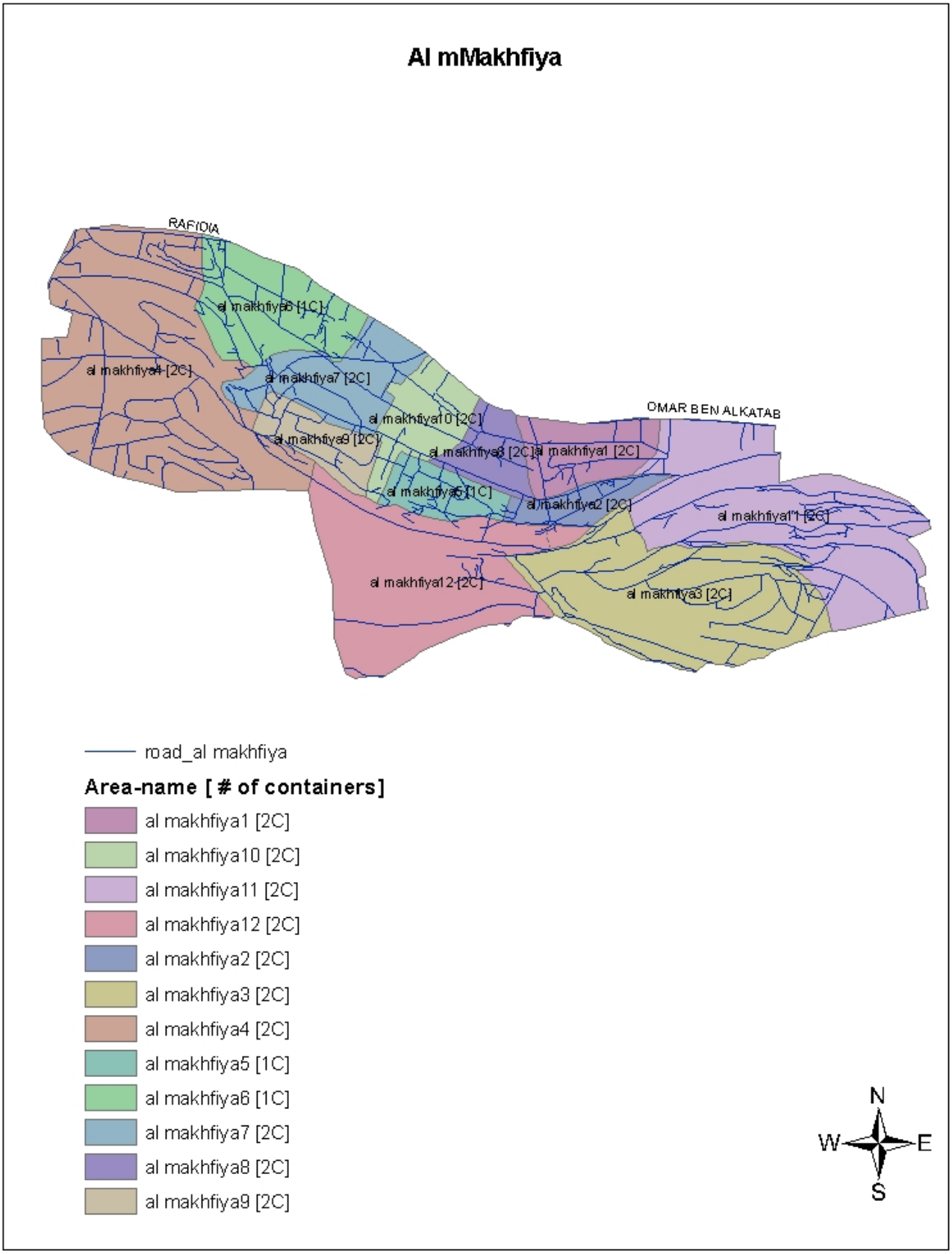


Photo 4.5 Recommend distribution of HHW containers in Al Makhfiya

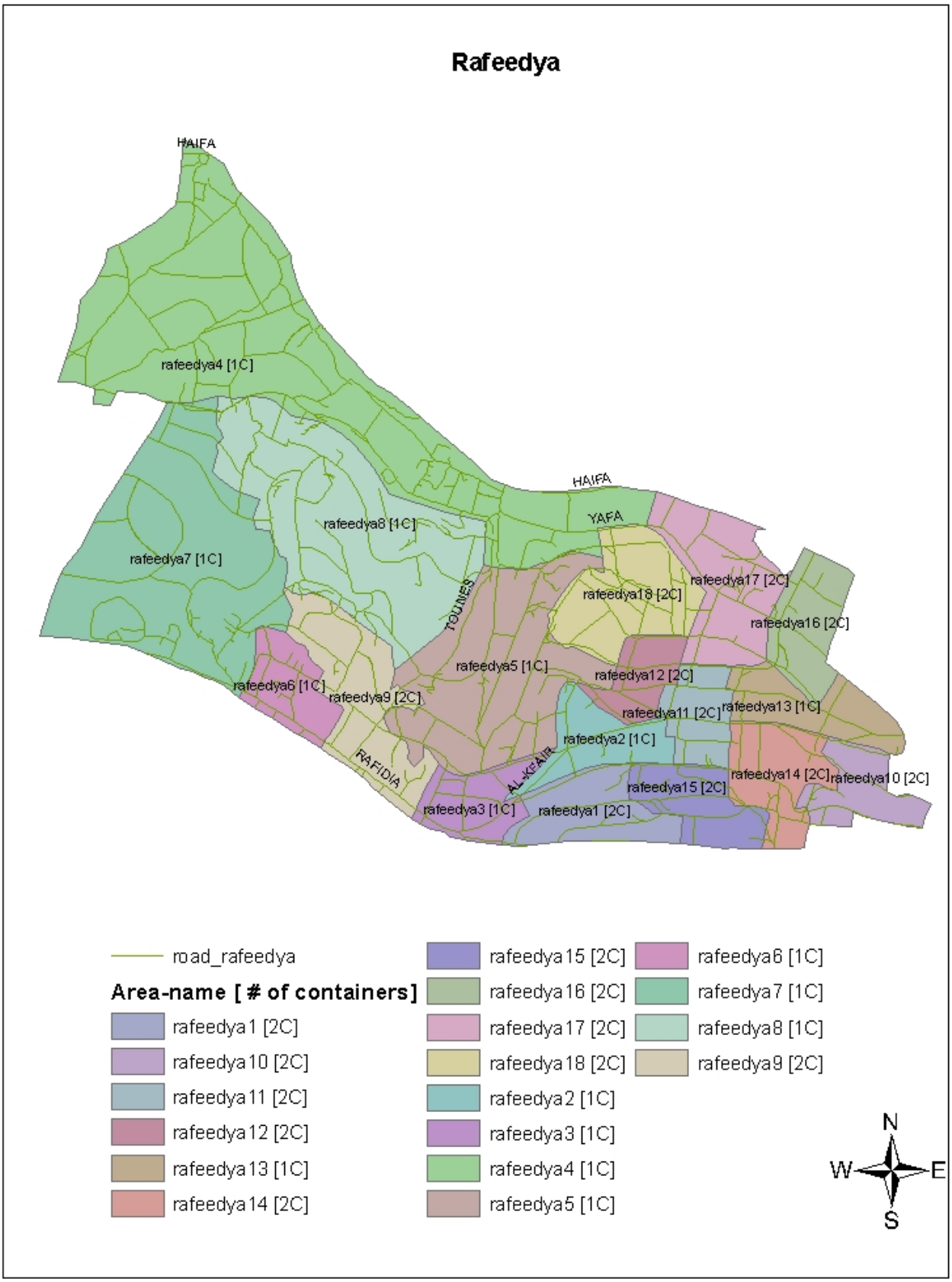


Photo 4.6 Recommend distribution of HHW containers in Rafeedya

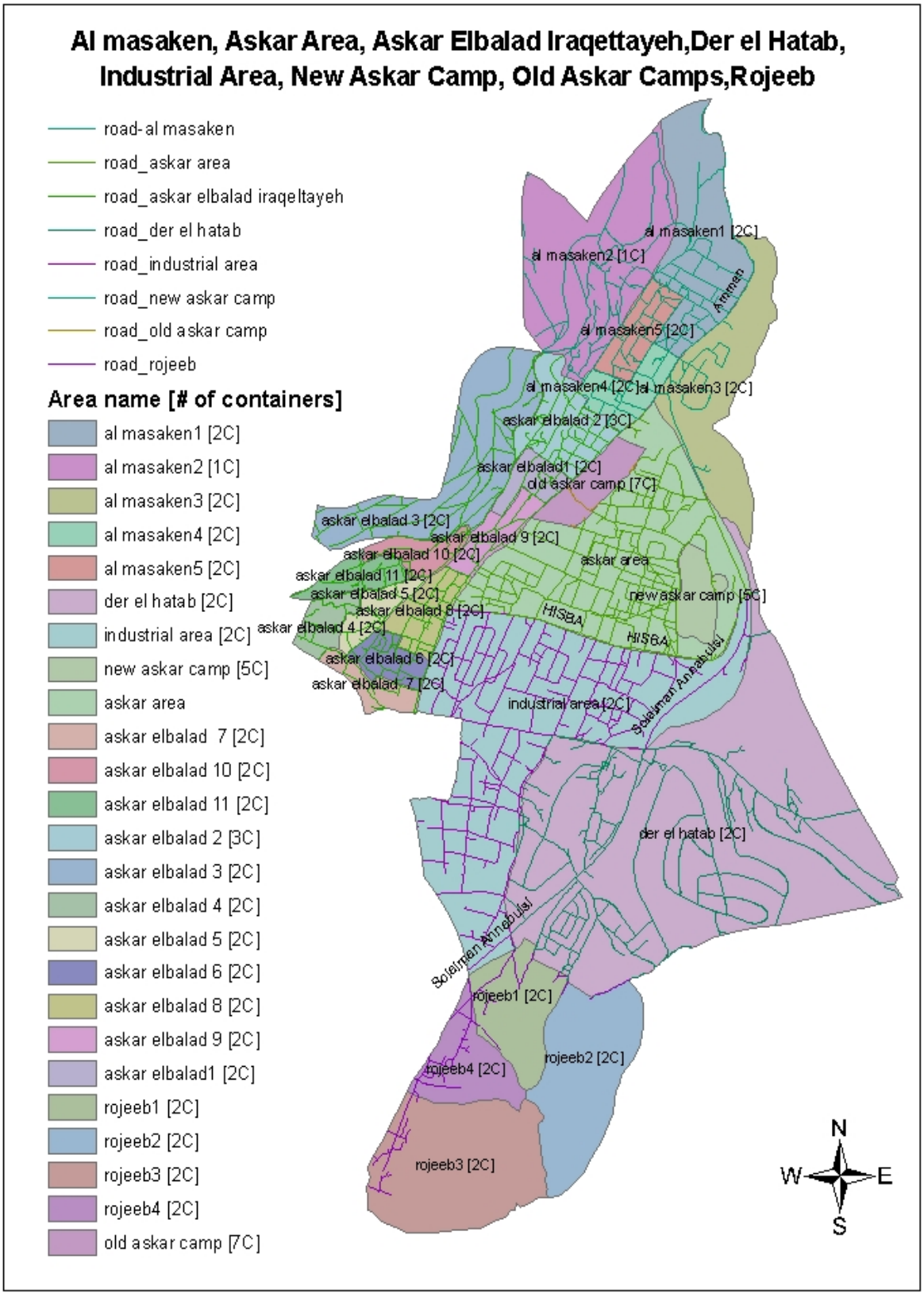


Photo 4.7 Recommend distribution of HHW containers in Al Masaken, Askar Area, AskarElbaled and Iraq El Tayeh, Der El Hatab, Industrial Area, New Asker Camp, Old Asker Camp and Rojeeb

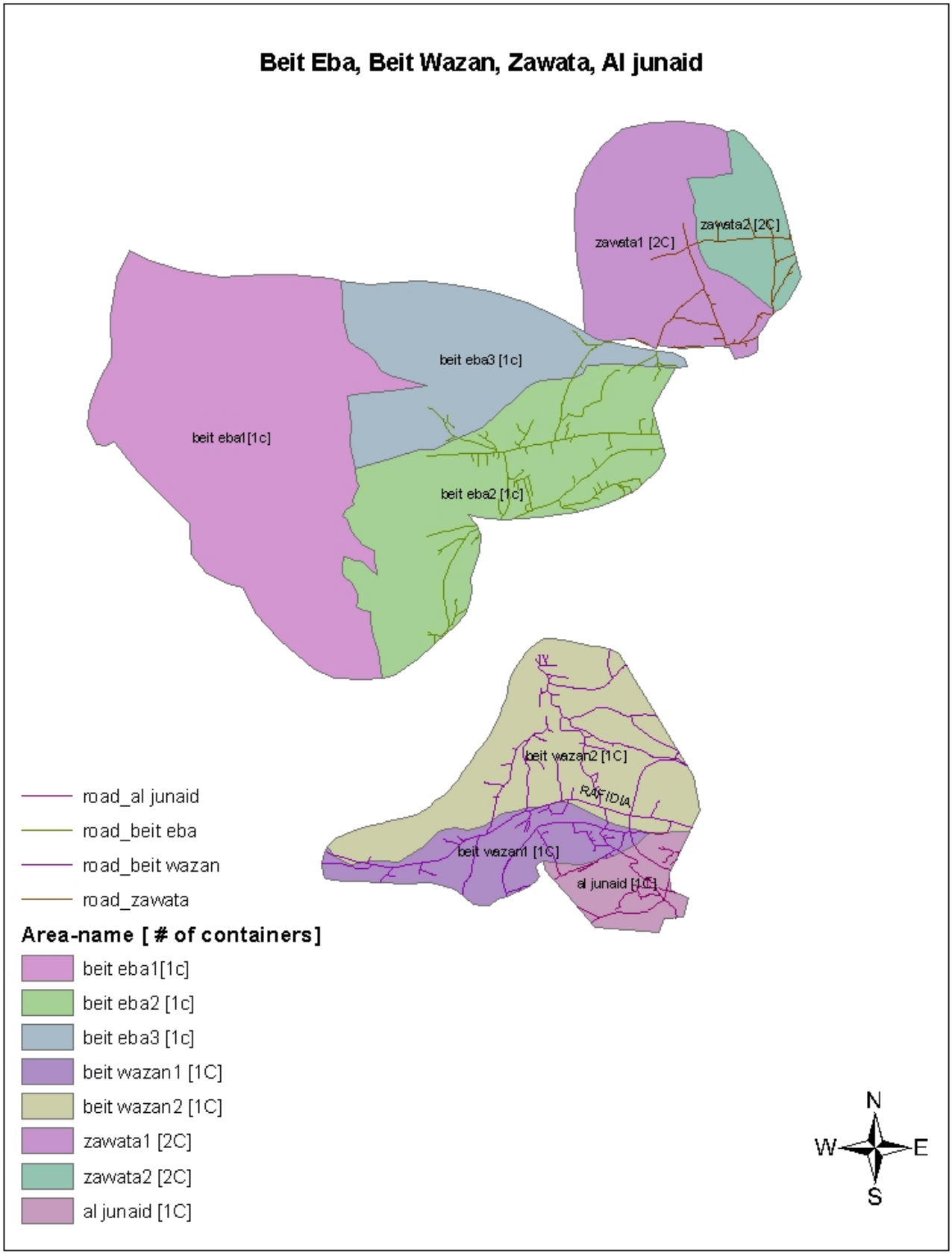


Photo 4.8 Recommend distribution of HHW containers in Beit Eba, Beit Wazan, Zawata and Al Junaid

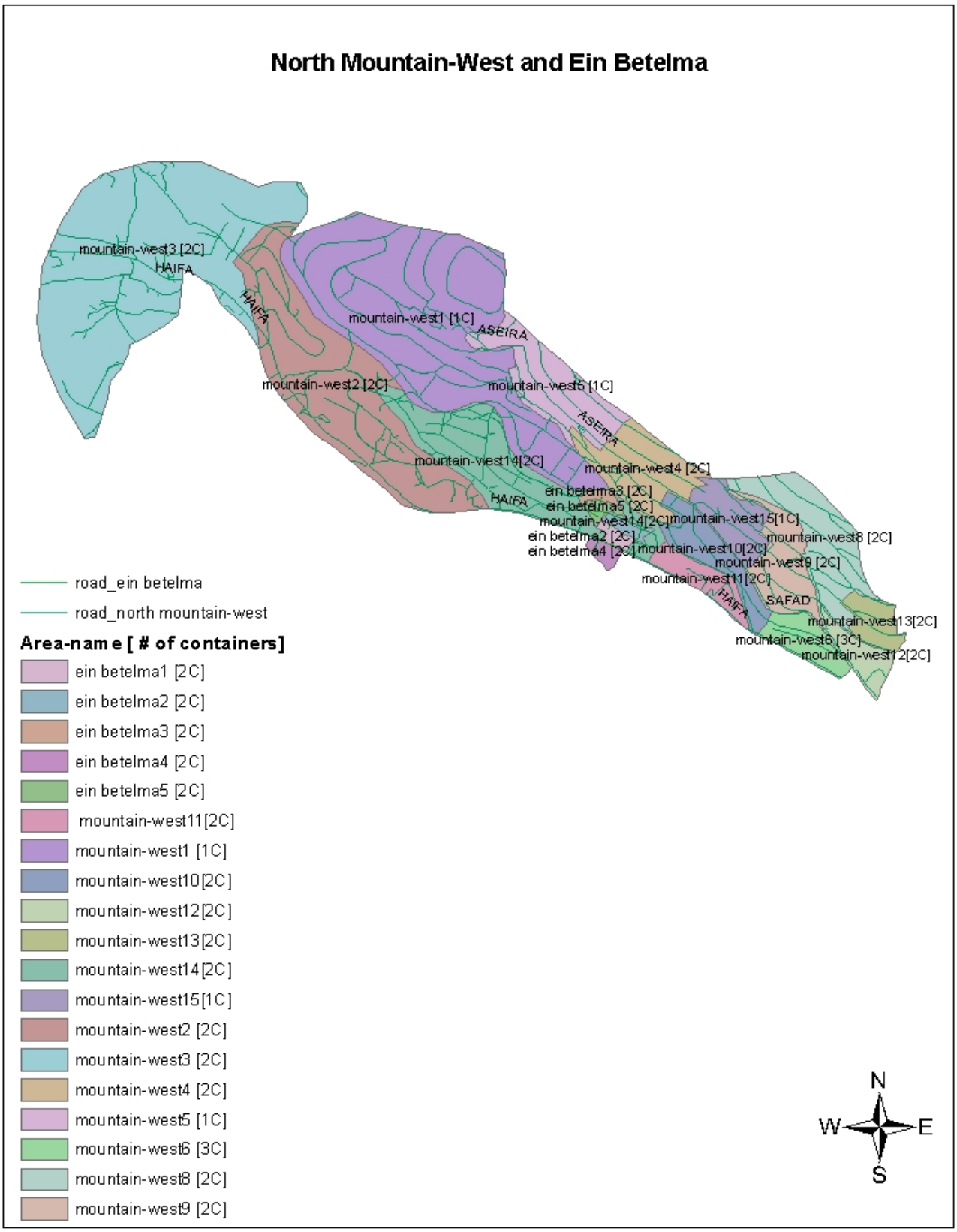


Photo 4.9 Recommend distribution of HHW containers in Ein Betelma and North Mountain West

4.9.3.4 HHW Collections Time

Analysis of collection time

Y = a + b + c (d) + e + f + g……..(University of Central Florida, 2001).

Where:

Y = total collection time
a = garage to route time
b = actual time collecting waste
c = number of trips to disposal site
d = time to drive fully loaded truck to disposal facility, unload and return to collection area
e = time to drive to garage at the end of the trip
f = official breaks, including bathroom visits
g = other lost time such as traffic jams, breakdowns
f + g = off route time, usually a fraction of Y

Calculate the number of trucks (N) and Calculate the truck volume (v)

Data:

- Total number of locations = 300 loc/week
- Waste generation per location = 148.6 kg/loc
- Waste specific weight = 297.3 km/m^3
- Collection time = 8 min/location
- Total collection time = 8 hours/day, 5 days per week
- Disposal time (total) = 30 min/trip

- Time to and from garage (total) = 20 min/day
- Off route time = 15% of total collection time
- Number of trips/day possible = 2

Step 1: Calculate N using time per week for each truck

Y = a + b + c (d) + e + f +g

Y = 8(5) (60) min/wk = 2400 min/wk/truck

a + e = 5 x 20 min/wk = 100 min/wk/truck

b = no. loc /wk x time/loc

b = 300 x 8 min/week/**N** trucks

c = 3trips/day x 5 days/week/truck

d = 30 min/trip/truck

f + g = 2400 x 0.15 = 360min/wk/truck

Step 2: Solve for N

Y = a + b + c (d) + e + f +g

2400 = 100 + 2 (30) (5) + 360 + (300*8)/N

N = 1.61

N ~ 2 trucks needed

Step 3: Calculate minimum truck volume required

- Truck volume is equal to volume/trip
- Calculate the required volume/trip

Vol/trip = vol/wk / trips/week

$$(v) = \frac{(300 loc / wk)(148.6 kg / loc)}{(297.3 / m^3)(10 trips / wk / truck)(2 trucks)}$$

$v = 7.5\ m^3$

$V \sim 10\ m^3$

4.9.4 Separation and Processing of HHW

The ultimate destination of household hazardous wastes depends upon the individual characteristics of each waste. For example, used motor oil and antifreeze can be recycled; some acids and bases can be neutralized; and some flammable or combustible liquids can be fuel blended and burned. Other wastes must be packaged and sent to a hazardous waste facility (Joan, 1997).

Separating can occur through either mechanical or manual processes, with different associated risks. Sorting occurs on various inputs, including source separated or mixed waste streams.

Mechanical separating and processing: Equipment used to sort waste may cause the release of explosive or flammable materials, causing subsequent explosions or fires.

Manual separating and processing: Workers sorting HHW (e.g. extracting recyclable materials) may be exposed to accidentally released materials including toxins, corrosives, or pathogen-bearing medical sharps.
The facility must be able to adequately separate each HHW type that will be accepted, without causing hazards to employees or the environment.

The wastes accepted at an EPA Household Hazardous Waste Collection are recycled or disposed of in a number of environmentally safe ways.

4.9.5 HHW Transfer and Transport

The functional element transfer and Transport involves two steps:

- The transfer of wastes from the smaller collection vehicles to the larger transport equipment.
- The subsequent transport of the waste, usually over long distance, to a processing or disposal site.

The transportation system should have adequate infrastructure, including road and vehicles, to ensure the safe transport of hazardous waste. Also, the transportation system should operate under clear and well-defined regulation that are specific enough to be easily understood and followed. These regulation should be designed to protect the health and safety of drivers, waste handlers, emergency response personal and the public. All citizens should be made aware of the requirements for the safe collection and transport of hazardous waste in their communities (Hussein, 2006).

The public and collection workers may be exposed to hazards if materials are released from the vehicle during transport. These released materials may also enter the environment through air, soil, or water. Materials that promote spontaneous combustion may create a fire hazard or expose the environment to consequent emissions of a fire.

4.9.6 HHW Disposal

- HHW received unable to be recycled shall be correctly disposed.
- Determination of treatment and disposal methods to be carried out by authorized site personnel, consultant or contractor.
- Ensure proper transportation and disposal of wastes to off-site disposal sites using approved contractors.

4.9.6.1 HHW Treatment

Treatment technologies reduce the volume and/or toxicity of HHW after it is generated. These technologies include chemical, physical, biological, and thermal treatment. Common treatment procedures are neutralization of acids and bases, distillation of solvents, and incineration. The methods are dictated by the types of waste, proximity to treatment facilities, cost, and the contractor's access to treatment facilities. However, the contract can specify the waste management methods to be used. If the waste is sent off site for treatment, the contractor should provide the sponsor with documentation verifying the waste's final destination.

4.9.6.2 Landfill

The efforts of communities to reduce the amount of HHW sent to municipal solid waste landfills, more HHW is being reused, recycled or treated. As with waste destined for offsite treatment the hazardous waste hauler should provide the sponsor with manifests, state-approved shipping documents, or similar documentation verifying the waste's final destination and showing that the hazardous waste landfill is properly permitted.

Landfill performance issues to be considered in a design included (Hussein, 2006):

- Proposed volume of waste for disposal.
- Physical and chemical characteristics of the waste
- Hydro geological characteristics of the site
- Quantity, quality , and direction of ground-water flow
- Ground-water use and withdrawal rates.
- Topographic information
- Climatologically conditions.
- Hydrologic data including surface flow patterns.
- Amount and uses of nearby surface waters, along with associated water quality standards
- Quality of nearby surface waters.
- Potential for waste volatilization and wind dispersal.
- Existing quality of the air
- Land use and zoning patterns.
- Physical and chemical properties of the soil underlying the facility that supports an in place liner.
- Permeability of linear material
- Potential pressure head of leachate on the liner.
- Potential for damage to the liner system during installation of an in place liner.
- Potential volume of leachate or contaminated run-off that could be produced at the facility.
- Source and characteristics of potential cover material.

- Potential for health risks due to human exposure to waste constituents.
- Potential damage to wildlife, crops, vegetation, and physical structures due to exposure to waste constituent.

Chapter Five

Conclusions and Recommendations

5.1 Conclusions

In the Nablus city and its refuge camps, most homes contain hazardous substances that have the potential for posing risk to life, health, property, or the environment, if improperly consumed, stored, or disposed. This study indicates that the level of households' awareness of hazardous substances is generally low.

Most of the HHW waste generated in Nablus city and its refugee camps are mixed with household waste due to bad segregation practice at the source. Accordingly, the amount of HHW increase.

HHW constitutes 2.89% and 1.88% of the generated municipal solid waste in Nablus city and its refugee camps, respectively. It is found that HHW was proportional to the family income.

In Nablus city, the largest HHW categories detected were home products (59.2%), lawn and garden (11.4%) and personal care products (9.5%). In Nablus refugee camps, the main categories were represented by home products (77.9%) and personal care products (9.25%). From results related to the characteristics of household hazardous waste in Nablus city and its refugee camps, there is high percentage of HHW in home products (68.5%) of HHW.

17.9% of the respondents had accidents (physical injury, poisoning and burning) from HHW. Significant differences in the accidents from HHW were found, suggesting the influence of a complex range of variables, e.g. educational level of housewife, type of work housewife, monthly income for the family, Who are responsible for transferring solid waste from home to the container, The houses contain hazardous materials related to the work of the householder, presence of children of age range between 8 months to 10 years, presence of industrial waste in or around the solid waste container, presence inappropriate behavior of children near solid waste container.

In Nablus city and its refugee camps, there is a lack of information about HHW management, 49% of homes in Nablus city and its refugee camps dispose HHW by throwing with the household solid waste, compared to 35% of the households were separately saved (special place) at source (home), 12% recycling and 4% throwing randomly.

From site visits and meeting with different related persons in Nablus municipality, there was lack of information about HHW Management. It was clear from the study that there was no authorized specific body responsible for household hazardous waste management in Nablus city and its refugee camps and there was no procedure for managing HHW.

5.2 Recommendation

- There is a need for establishing a regulated HHW by laws and rules. The role of the Environmental Quality Authority and Nablus municipality should be developed to provide controls for collection, treatment, storage, transport, disposal and monitoring of HHW.

- Awareness, training and capacity building program and activates in HHW management should target the public.

- Awareness must be in safe use, storage and disposal of hazardous materials and focus on: Identifying and avoiding potentially hazardous products, recycling those materials that can be recycled and buying the least hazardous product.

- Environmental Quality Authority should organize awareness program for segregation of wastes to ensure full community involvement of waste segregation and shall encourage recycling/ reusing of segregated materials.

- Segregation of HHW should be performed at the house where it is being produce to minimize the cost of segregation at transfer station.

- For the whole Nablus district there must be one landfill that shall be done after proper environmental impact assessment.

- HHW Management must cope with limitations in financial and human resources. Therefore, HHW management decisions should be based on the best available science and technology.

- The study recommended to establish management system for HHW management is needed that would help the Palestinian health to enhance and develop health and environmental services. A management system, including new approach for storage, collection, separation, transportation, treatment and disposal of HHW was proposed. This system will deal with at least 1600 tons/year of HHW.

- Because of economic limitations, an incremental approach can be followed in managing HHW. Low –technology efforts to reduce the health and environmental impacts of hazardous wastes are better than none.

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Annexes

Annex A: Description of Household Hazardous Waste Products

AUTOMOTIVE PRODUCTS (SWMD, 2004)

ANTIFREEZE	
Hazardous Components	Ethylene glycol
Property	Toxic
Proper Disposal	Recycle Drain into leakproof container, seal, label and save for HHW collection.
Less Toxic Alternative	Antifreeze with propylene glycol is less toxic to animals. When possible, have antifreeze changed at professional facility which recycles antifreeze.
AUTO BATTERY	
Hazardous Components	Sulfuric acid, lead
Property	Corrosive, Toxic
Proper Disposal	Recycle
Less Toxic Alternative	Trade in old battery for recycling when buying new one.
AUTOMATIC TRANSMISSION FLUID	
Hazardous Components	Hydrocarbons, mineral oils, glycols, heavy metals
Property	Flammable, Toxic
Proper Disposal	Recycle; save for HHW collection; can be mixed with used motor oil and recycled.
Less Toxic Alternative	When possible have fluid changed at professional facility which recycles transmission fluid.
BRAKE FLUID	
Hazardous Components	Glycols (ethers), heavy metals
Property	Toxic

Proper Disposal	Save for HHW collection. can be mixed with used motor oil and recycled.
Less Toxic Alternative	When possible have brake fluid changed at a professional facility which recycles brake fluid.
CAR WAX, POLISH, CLEANER WITH SOLVENTS	
Hazardous Components	Caustics, acids, petroleum distillates (petroleum naphtha)
Property	Corrosive, Toxic, Flammable
Proper Disposal	Save for HHW collection. if hardened, place in trash.
Less Toxic Alternative	Not Applicable
CARBURETOR CLEANER (FUEL INJECTORS)	
Hazardous Components	Cresol, methylene chloride, sodium cromate
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Not Applicable
DEGREASER	
Hazardous Components	Chlorinated solvents
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Use water-based detergents or citrus-based degreasers. Use car wash which has with coin-operated steam cleaning equipment.
DIESEL	
Hazardous Components	Hydrocarbons, mineral oils
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Not Applicable
FUEL OIL	
Hazardous	Hydrocarbons, mineral oils

Components	
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Not Applicable
GASOLINE	
Hazardous Components	Hydrocarbons; Tetraethyl lead (leaded gasoline); Benzene, ethyl dichloride, methanol (unleaded gasoline)
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection. Store in an approved air-tight container away from heat, sparks and flame.
Less Toxic Alternative	Not Applicable
KEROSENE	
Hazardous Components	Hydrocarbons, mineral oils
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Not Applicable
METAL POLISH WITH SOLVENT	
Hazardous Components	Caustics, acids, petroleum distillates
Property	Corrosive, Flammable, Toxic
Proper Disposal	Save for HHW collection. If hardened, place in trash.
Less Toxic Alternative	To polish chrome, make paste of baking soda and water; apply with soft cloth; and after few minutes rinse clean and dry.
MOTOR OIL	
Hazardous Components	Hydrocarbons, mineral oils, lead, heavy metals
Property	Flammable, Toxic
Proper Disposal	Pour into container, seal and label container and then recycle.; call District to find out where used motor oil is accepted. automatic transmission fluid and brake fluid can be mixed

	with used motor oil and recycled. Do not mix solvents, gasoline or antifreeze with used oil.
Less Toxic Alternative	Consider use of re-refined or synthetic motor oil. Have oil changed at professional facility which recycles motor oil.
OIL FILTER	
Hazardous Components	Hydrocarbons, mineral oils, lead, heavy metal
Property	Combustible, Toxic
Proper Disposal	Recycle; Save for HHW collection; Place filter in leakproof container, puncture filter and let drain for 24 hours. Recycle used motor oil. Filter can be placed in trash or saved for HHW collection.
Less Toxic Alternative	Not Applicable
WINDSHIELD WASHER SOLUTION	
Hazardous Components	Methyl alcohol, ethylene glycol, isopropanol
Property	Flammable, Toxic
Proper Disposal	If connected to sanitary sewer, small quantities can be flushed down drain with plenty of water. Do not flush methanol. Save for HHW collection.
Less Toxic Alternative	Use plain water

HOME PRODUCTS (SWMD, 2004)

AEROSOL PRODUCTS	
Hazardous Components	Various components
Property	Flammable, toxic
Proper Disposal	Finish up container or share; put empty can in trash. If not empty, save for HHW collection. Or, spray into deep cardboard box outdoors until can is empty, allow box to dry and place empty can and box in trash.

Less Toxic Alternative	Consider pump spray, roll-on, liquid or non-aerosol spray
AIR FRESHENER	
Hazardous Components	Formaldehyde, petroleum distillates, p-dichlorobenzene, aerosol propellents
Property	Flammable, Toxic
Proper Disposal	If used up or dried up, put in trash. If not, save for HHW collection.
Less Toxic Alternative	Clean or remove cause of odor. Improve ventilation. Leave baking soda in open containers in refrigerator and freezer, closets and bathrooms. Sprinkle baking soda or set vinegar out in open dish in odor-producing areas. Use potpourri, simmer cinnamon or cloves in water on top of stove or burn scented candles.
BATTERIES - BUTTON, RECHARGEABLE	
Hazardous Components	Zinc, lead, alkalines, nickel, cadmium, mercury, silver, electrolytes
Property	Corrosive, Toxic Flammable, Reactive
Proper Disposal	Call District about recycling button batteries and nickel cadmium batteries. Place alkaline batteries in trash. Save for HHW collection.
Less Toxic Alternative	Consider rechargeable batteries. Rechargeable Battery Recycling Corporation has list of retailers which accept Nickel-Cadmium batteries at
BLEACH	
Hazardous Components	Chlorine, 5% sodium hypochlorite solution
Property	Irritant
Proper Disposal	Liquid - If home is connected to sewer system, pour less than 1 cup in drain or toilet and flush with plenty of water. If home is connected to septic tank, pour less than 1 cup down drain at a time and flush with plenty of water. Do not mix products.

	Powder - Put sealed box in bag and place in trash.
Less Toxic Alternative	Consider non-chlorine bleach, hydrogen peroxide-based bleach, borax or washing soda. Reduce the amount of chlorine bleach used. Non-chlorine bleach does not have disinfectant properties.
CLEANER - ALL PURPOSE	
Hazardous Components	Ammonia, ethylene glycol, monobutyl acetate, sodium hyperchlorite or trisodium phosphate
Property	Toxic
Proper Disposal	Liquid - If home is connected to sewer system, flush down drain with plenty of water. Liquid - If home is connected to septic tank, flush no more than 1 cup at a time down the drain with plenty of water. Do not mix products. Aerosol - Finish up container or share, put empty can in trash.
Less Toxic Alternative	Wipe surfaces down after use. Dissolve 4 tablespoons of baking soda in 1 quart warm water or sprinkle baking soda on a damp sponge. Or, mix 1 quart hot water, 1 teaspoon vegetable oil-based soap/detergent, 1 teaspoon borax and 2 tablespoons vinegar. Or, mix ½ cup vinegar in 1 quart warm water. Or, mix ½ cup ammonia, 1/4 cup vinegar and a handful of baking soda in a gallon of warm water. Can be used on tile. Do not use on wood.
CLEANER - AMMONIA-BASED	
Hazardous Components	Ammonia, ethanol
Property	Corrosive, Toxic
Proper Disposal	Flush down drain with plenty of water. do not mix products.
Less Toxic Alternative	Wipe surfaces down after use. Dissolve 4 tablespoons of baking soda in 1 quart warm water or sprinkle baking soda on a damp sponge. Or, mix 1 quart hot water, 1 teaspoon vegetable oil-based soap/detergent, 1 teaspoon borax and 2 tablespoons vinegar. Or, mix ½ cup vinegar in 1 quart warm water.

	Or, mix ½ cup ammonia, 1/4 cup vinegar and a handful of baking soda in a gallon of warm water. Can be used on tile. Do not use on wood.
CLEANER - BLEACH-BASED	
Hazardous Components	Sodium or potassium hydroxide, hydrogen peroxide, sodium or calcium hypochlorite
Property	Corrosive, Toxic
Proper Disposal	If home is connected to sewer system, flush down drain with plenty of water. If home is connected to a septic tank, flush no more than 1 cup at a time down drain with plenty of water. Do not mix products.
Less Toxic Alternative	Wipe surfaces down after use. Dissolve 4 tablespoons of baking soda in 1 quart warm water or sprinkle baking soda on a damp sponge. Or, mix 1 quart hot water, 1 teaspoon vegetable oil-based soap/detergent, 1 teaspoon borax and 2 tablespoons vinegar. Or, mix ½ cup vinegar in 1 quart warm water. Or, mix ½ cup ammonia, 1/4 cup vinegar and a handful of baking soda in a gallon of warm water. Can be used on tile. Do not use on wood.
DISINFECTANT	
Hazardous Components	Diethylene or methylene glycol, sodium hypochlorite, pine oil, ammonia, detergent, cresol, lye, phenol
Property	Corrosive/Caustic, Irritant, Toxic, Flammable
Proper Disposal	Liquid - If home is connected to sewer system, pour down drain and flush with plenty of water. If home is connected to septic tank, pour no more than 1 cup per day in drain at a time and flush with plenty of water. Do not mix products. Aerosol - Finish up container or share; put empty can in trash.
Less Toxic Alternative	Keep surfaces dry. Wash items with water and soap, borax or washing soda. Or, wash large surfaces with a solution of ½ cup borax dissolved in one gallon of hot water. Or, mix 1/4 cup liquid chlorine bleach in 1 gallon of water.

DRAIN CLEANER	
Hazardous Components	Sodium or potassium hydroxide, sodium hypochlorite, hydrochloric acid, lye, sulfuric acid
Property	Corrosive, Irritant, Reactive, Toxic
Proper Disposal	Liquid - If home is connected to sewer system, pour down drain and flush with plenty of water. Do not mix products. Crystals - If container, less than 1/4 full, wrap up closed container in newspaper and place in trash. Save larger amounts for HHW collection.
Less Toxic Alternative	To prevent clogging, cover all drains with screens. To prevent clogging of kitchen drain, use a strainer, collect grease in cans and pour a kettle of boiling water down the drain weekly to melt fat. Pour ½ cup baking soda into drain, then ½ cup white vinegar. Cover drain and let stand for 15 minutes. Flush with 2 quarts of boiling water. Then use plunger. For serious clogs, use plunger or plumber's snake.
FLOOR CARE PRODUCT (CLEANER/WAX/STRIPPER)	
Hazardous Components	Petroleum distillates, naphthas, pine oil
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	To remove wax, pour small amount of club soda on section of floor. Scrub well, let soak for a few minutes and wipe clean. Wood floors - Damp mop with mild vegetable oil soap and dry immediately. Painted or varnished floors - Mix 1 teaspoon washing soda in 1 gallon hot water, apply to floor, rinse with clear water, dry immediately. Polyurethane-sealed wood floors - Mix 1/4 cup white vinegar in 1 gallon water. Dry immediately. Vinyl and linoleum floor coverings - Mix 1/4 cup white vinegar, 1/4 cup washing soda in1 gallon warm water.
FLOURESCENT LIGHT BULBS, TUBES AND BALLAST	
Hazardous Components	Mercury

Property	Toxic
Proper Disposal	Call District for disposal or recycling information. Pack carefully to avoid breakage.
Less Toxic Alternative	Look for fluorescent light tubes with low mercury levels.
FURNITURE POLISH WITH SOLVENT	
Hazardous Components	Petroleum distillates, ammonia, naphtha, nitrobenzene, phenol
Property	Flammable, Irritant, Toxic
Proper Disposal	Aerosol - Finish up container or share; put empty can in trash. Other forms - If container is less than 1/4 full, wrap up closed container in newspaper and place in trash. Save larger amounts for HHW collection. If material contains nitrobenzenes or petroleum distillates, save for HHW collection.
Less Toxic Alternative	Mix 1 teaspoon lemon juice in 1 pint of mineral or vegetable oil in spray bottle. Apply and polish with soft cloth. Varnished wood - Clean and polish with mild vegetable oil soap. Unvarnished wood - Polish with almond, walnut or olive oil. Work in well and wipe off excess. Polish with soft, dry cloth. Painted wood - Wash with mix of 1 teaspoon washing soda in a gallon of hot water; rinse with clear water. Use soft cloth to dry.
FURNITURE CLEANER	
Hazardous Components	Petroleum distillates, oil of cedar
Property	Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Use non-aerosol/soap-based cleaner
METAL POLISH WITH SOLVENTS	
Hazardous Components	Acidified thiourea, sulfuric acid, petroleum distillates, naphthas
Property	Corrosive, Flammable, Toxic, Irritant
Proper Disposal	Save for HHW collection.

Less Toxic Alternative	Copper - Polish with paste of lemon juice and salt. Stainless steel - Clean and polish with baking soda and water paste or a commercial non-chlorinated scrubbing powder. Unlaquered brass - Clean and polish with a soft cloth dampened with Worcestershire sauce. Or, mix ½ teaspoon salt and ½ cup white vinegar with enough flour to make paste. Apply thickly and let sit for 15 to 30 minutes. Rinse thoroughly with water to avoid corrosion. Chrome - Wipe with vinegar, rinse with water and dry. To remove soap scum, clean with baby oil and a soft cloth. To remove lime and mineral deposits from fixtures, cover deposits with strips of paper towels soaked in vinegar. Let sit for 1 hour and then clean. Silver - Use non-abrasive toothpaste with a soft toothbrush or soft cloth. Or, rub silver with a baking soda and water paste and a soft cloth, rinse and polish dry. Silver - Pour water into an aluminum or enameled pan line with aluminum foil on the bottom. Fill with water to depth of 2-3 inches. Add 1 teaspoon baking soda and 1 teaspoon salt. Heat water until boiling. Add tarnished silver and boil for 3 minutes. Remove silver, wash in soapy water and polish dry. Not for use on silver jewelry, silver items with glued components or flatware with hollow handles. NOTE: boiling this mixture with aluminum foil can give off toxic hydrogen sulfide gas. Aluminum cookware - For inside of cookware, add 2 tablespoons creme of tartar for each quart of hot water in the cookware. Bring solution to boil and simmer 10 minutes. Wash as usual and dry. For stains on the outside, scrub vigorously with baking soda.
MOTH BALLS	
Hazardous Components	Naphthathalenes, paradichlorobenzene, methylene chlorides
Property	Irritant, Toxic
Proper Disposal	If container is less than 1/4 full, wrap up closed container in newspaper and place in trash. Save larger amounts for HHW collection.

Less Toxic Alternative	Try cedar chips or sprigs or the following dried materials: tansy, lavender flowers, rosemary, mint or white peppercorns. Store clothes in a cedar chest. Do not use mothballs continuously.
OVEN CLEANER (LYE-BASED)	
Hazardous Components	Sodium or potassium hydroxide, ammonia
Property	Corrosive, Irritant, Toxic
Proper Disposal	Aerosol - Finish up container or share; put empty can in trash. If not empty, save for HHW collection. Crystals - If container is less than 1/4 full, wrap up closed container in several layers of newspaper and place in trash. Save larger amounts for HHW collection.
Less Toxic Alternative	Protect oven bottom by placing cookie sheet or piece of foil under pans to catch drippings. Wipe away grease and spills after using oven; use non-metallic metal brush on charred spills. Use less toxic commercial products such as non-corrosive or fume free or non-chlorinated. Avoid aerosols. Sprinkle with dry baking soda and scrub with damp cloth after 5 minutes. Or, to remove baked-on grease and spills, scrub with a baking soda, salt and water paste. Do not let baking soda touch heating elements or wiring. Or, to remove baked-on grease and spills, mix 2 tablespoons liquid dish soap and 2 teaspoons borax in 2 cups of warm water. Apply to oven and let sit for 20 minutes, then scrub. Do not use abrasive material on self-cleaning or continuous cleaning ovens.
PET SUPPLIES/FLEA AND TICK CONTROL	
Hazardous Components	Organophosphates, carbamates
Property	Corrosive, Irritant, Toxic
Proper Disposal	If flea collar or spray used up, put in trash. Call District about disposal options.
Less Toxic	Perform regular vacuuming and pet housekeeping and

Alternative	maintenance. Put brewer's yeast or garlic in pet's food; sprinkle fennel, rue, rosemary or eucalyptus seeds or leaves around animal sleeping areas. Apply a dusting of diatomaceous earth or silica gel to pet bedding, under furniture and around house's foundation. Use Precor (methoprene), an insect growth regulator, which is low toxicity to mammals.
SCOURING POWDER OR ABRASIVE CLEANER	
Hazardous Components	Calcium carbonate, may contain chlorine bleach
Property	Toxic
Proper Disposal	If home is connected to sewer system, flush down drain with plenty of water. If home is connected to septic tank, dispose of 1 cup or less of product with plenty of water over several days .
Less Toxic Alternative	Use baking soda or diatomaceous earth products. Use nylon or non-metallic scrubbing pads.
SHOE POLISH	
Hazardous Components	Trichloroethylene, methylene chloride or nitrobenzene
Property	Flammable, Toxic
Proper Disposal	Put in trash.; Save for HHW collection.
Less Toxic Alternative	Use in well-ventilated area. Leather - Apply olive oil, walnut oil or beeswax, then buff with a chamois cloth. Patent Leather - Rub with dab of petroleum jelly.
SMOKE DETECTOR (IONIZING)	
Hazardous Components	Americium-241
Property	Radioactive
Proper Disposal	Return to manufacturer.
Less Toxic Alternative	Not Applicable - there are photoelectric smoke detectors which detect only the visible output of combustion.

SPOT REMOVER/CARPET	
Hazardous Components	Perchloroethylene, naphthalene
Property	Corrosive, Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Use non-aerosol/soap-based cleaner.
THERMOMETERS AND THERMOSTATS	
Hazardous Components	Mercury
Property	Toxic
Proper Disposal	Ask manufacturer if they will accept used thermostats. Save for HHW collection.
Less Toxic Alternative	Consider electronic/digital thermostats and thermometers.
TOILET BOWL CLEANER	
Hazardous Components	Muriatic (hydrochloric) acid or oxalic acid, calcium hypochlorite, paradichlorobenzene, sodium bisulfate, 5-dimethyldantoin, phenol
Property	Corrosive, Irritant, Toxic
Proper Disposal	Liquid - Pour less than 1 cup in toilet and flush. Do not mix products. If home is connected to septic system, pour no more than 1 cup in toilet during 1 day and flush ther - If container is less than 1/4 full, wrap up closed container in newspaper and place in trash. Save larger amounts for HHW collection.
Less Toxic Alternative	Consider cleaners labeled non-corrosive. Mix ½ cup borax in 1 gallon water to clean. Or, sprinkle baking soda into toilet and scrub. Stains - Make paste of lemon juice and borax. Spread on stains and let sit for 20 minutes, then scrub with toilet bowl brush and flush.
UPHOLSTERY AND RUG CLEANER	
Hazardous Components	Naphthalene, perchloroethylene, oxalic acid, diethylene glycol
Property	Irritant, Corrosive, Toxic

Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Regular vacuuming, clean up spills. Use a non-aerosol, soap-based cleaner. Mix 1 quart warm water, 1 teaspoon borax and a splash of vinegar, apply with a damp cloth or sponge and rub gently, then blot.
WINDOW/GLASS CLEANER	
Hazardous Components	Ammonia or isopropyl alcohol
Property	Toxic
Proper Disposal	Flush down drain with plenty of water.
Less Toxic Alternative	Mix 1/4 cup white vinegar in 1 quart water. Or, mix 1 tablespoon vinegar or lemon juice in 1 quart water. Or, mix 3 tablespoons ammonia, 1 tablespoon white vinegar and 3/4 cup water. Store mixture in clean, labeled spray bottle.

PERSONAL CARE PRODUCTS (SWMD, 2004)

HAIR SPRAY	
Hazardous Components	Polyvinylpyrolidone, propellent
Property	Flammable, Toxic
Proper Disposal	Use up or share, place in trash.
Less Toxic Alternative	Use non-aerosol pump spray or styling gels.
HAIR PERMANENT LOTION	
Hazardous Components	Ammonium thioglycolate
Property	Toxic
Proper Disposal	Flush down drain with plenty of water.
Less Toxic Alternative	Not Applicable
HYDROGEN PEROXIDE	
Hazardous Components	Hydrogen peroxide
Property	Toxic
Proper Disposal	If home is connected to sewer system, the 3-5% solution can be flushed down drain with plenty of water. If home is connected to septic tank, small amounts can be flushed down drain with plenty of water over several days.

	If it has 10% solution contact District about disposal. Save for HHW collection.
Less Toxic Alternative	Not Applicable
ISOPROPYL ALCOHOL (RUBBING ALCOHOL)	
Hazardous Components	Isopropanol
Property	Flammable, Toxic
Proper Disposal	If home is connected to sewer system, flush down drain with plenty of water. If home is connected to septic tank, dispose down drain in small amounts with plenty of water over several days.
Less Toxic Alternative	Not Applicable
NAIL POLISH	
Hazardous Components	Toluene, xylene
Property	Flammable, Toxic
Proper Disposal	If hardened, put in trash. Otherwise save for HHW collection.
Less Toxic Alternative	Apply in well ventilated room.
NAIL POLISH REMOVER	
Hazardous Components	Acetone, ethyl acetate
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Apply in well ventilated room.

Health care products (SWMD, 2004)

Medical products	
Hazardous Components	Various ingredients
Property	Toxic
Proper Disposal	Take unused prescriptions back to pharmacy. If home is connected to sewer system, over-the-counter items and prescription drugs can be flushed down toilet. Return chemotherapy drugs and antineoplastic medicine back to dispensing clinic. Save head lice shampoo for HHW collection.

	Save for HHW collection.
Less Toxic Alternative	Not Applicable

HOME IMPROVEMENTS (SWMD, 2004)

ADHESIVE AND GLUE (SOLVENT-BASED)	
Hazardous Components	Naphthalene, phenol, ethanol, vinyl chloride, formaldehyde, acrylonitrile
Property	Flammable, Toxic, Irritant
Proper Disposal	If hardened, put in trash. Check with District about placing in trash. Save for HHW collection.
Less Toxic Alternative	Use water-based product.
FURNITURE STRIPPER	
Hazardous Components	Methylene chloride, phenols, solvents, petroleum distillates
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Not Applicable
LATEX PAINT OR PRIMER (WATER-BASED)	
Hazardous Components	Exterior paint may have a mildew protector containing mercury
Property	Toxic
Proper Disposal	Check with District on paint recycling opportunities. If paint does not contain mercury and there is less than 1 inch or less of paint in can, let it dry out. Open can outdoors and let liquid evaporate. Keep children and pets away. Place dried paint can in trash. Save for HHW collection.
Less Toxic Alternative	Not Applicable
OIL-BASED PAINT OR PRIMER	
Hazardous Components	Petroleum distillates, mineral spirits, naphthas, alcohol, acetone, esters, ketones, other volatile organic compounds, toluene, xylene
Property	Flammable, Toxic
Proper Disposal	Check with District on paint recycling opportunities.

	Save for HHW collection.
Less Toxic Alternative	Consider using latex-based paint.
PAINT BRUSH CLEANER (SOLVENT-BASED)	
Hazardous Components	Petroleum distillates
Property	Flammable, Toxic,Corrosive
Proper Disposal	Reuse Save for HHW collection.
Less Toxic Alternative	Clean brushes immediately after use and soak them in water or soap and water. Or, clean paint brushes hardened with dried oil-based paint by soaking them in hot vinegar. Or, work mechanic's "waterless" hand cleaner into brush and wash with soap and water.
PAINT REMOVER AND STRIPPER	
Hazardous Components	Benzene, methylene chloride, toluene, phenol, cresol
Property	Flammable, Toxic, Corrosive, Irritant
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Consider a less toxic or water soluble product. Use heat gun, paint scrapper or sanding block (wear protective equipment). Do not strip lead-based paint. Old paint (pre 1974) may contain lead and removing it is hazardous. If must use, use outdoors or in well ventilated room.
PAINT THINNER	
Hazardous Components	Alcohols, chlorinated solvents, esters, hydrocarbons, ketones, toulene, turpentine, ethyl acetate, mineral spirits, toluene
Property	Flammable, Toxic, Irritant
Proper Disposal	Reuse product. Pour into screw-top container, allow solids to settle. Pour clean thinner back into original container and reuse. Let settled material dry outdoors. Keep away from children and animals. Wrap hardened material in newspaper and put in trash. Save for HHW collection.

Less Toxic Alternative	Use latex-based paint which does not require solvent thinners for cleanup.
STAIN AND VARNISH	
Hazardous Components	Glycols, ethers, ketones, mineral spirits, naphtha, toluene, xylene, halogenated hydrocarbons, other volatile organic compounds
Property	Flammable, Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Use finishes derived from natural sources such as shellac, tung oil and linseed oil. Use water-based stains.
WOOD PRESERVATIVE (PRE 1986)	
Hazardous Components	Chlorinated phenols, copper or zinc naphthenate, creosote, magnesium fluorosilicate, penthachlorophenol
Property	Flammable, Toxic Corrosive
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Use pretreated lumber or water-based preservatives. In 1986 use was restricted to licensed applicators.

INDOOR PESTICIDES (SWMD, 2004)

ANT/COCKROACH SPRAY AND BAIT	
Hazardous Components	Numerous ingredients, organophosphates, carbamates
Property	Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Keep counters, floors and pet feeding area clean. Close openings into house with caulk, screening or weather-stripping. Apply boric acid dust (a poison) around points of entry. It has some toxicity and should not be applied to areas where small children or animals are likely to come in contact with it. Or, apply diatomaceous earth or silica gel to ant/roach walkways. Place bay leaves in pantry and cupboard and on shelves to

	repel roaches.
RODENT POISONS AND BAITS	
Hazardous Components	Numerous ingredients, warfarin
Property	Toxic
Proper Disposal	Save for HHW collection.
Less Toxic Alternative	Remove food sources. Try traps and caulk entry ways. Choose least toxic or non-toxic pest control solutions.

LAWN AND GARDEN (SWMD, 2004)

FERTILIZER WITH WEED KILLER	
Hazardous Components	Numerous ingredients
Property	Corrosive, Toxic, Reactive
Proper Disposal	Call District about disposal options. Save for HHW collection. Regular fertilizer can go in trash.
Less Toxic Alternative	Consider spot herbicides plus fertilizer. Choose least toxic or non-toxic solution.
FUNGICIDE	
Hazardous Components	Numerous ingredients
Property	Corrosive, Toxic, Irritant
Proper Disposal	Call District about disposal options. Save for HHW collection.
Less Toxic Alternative	Avoid overwatering plants. Choose least toxic or non-toxic pest control solutions.
HERBICIDE	
Hazardous Components	Numerous ingredients
Property	Toxic, Irritant
Proper Disposal	Call District about disposal options. Save for HHW collection.
Less Toxic	Pull weeds, use mulch and use ready-to-use formulas.

Alternative	Choose least toxic or non-toxic solution.
INSECTICIDE (INSECT REPELLENT, BUG SPRAY)	
Hazardous Components	Butopyronoxyl, diethyl toluanide, cimethyl phthalate, dimethyl phthalate, ethyl hexanediol, indalone, di-n-propylisocinchorate, bicycloheptene dicarboximide, tetrahydro furaldehyde, diethyltoluamide (DEET), organophosphates, carbamates
Property	Toxic, Irritant
Proper Disposal	Call District about disposal options. Save for HHW collection.
Less Toxic Alternative	Try baits or traps. Use ready-to-use formulas. Choose least toxic or non-toxic pest control solutions. Mosquitos - Eliminate standing water. Try herbal formula repellent composed of citronella and/or eucalyptus oils. A chemical repellent is diethyltuolomide (DEET). It should not be used on children or infants. Flies - Maintain trash cans, compost piles and animal waste. Add diatomaceous earth to pet food (1% of food weight). Or, use non-chemical fly trap or fly swatter or a labeled spray bottle filled with rubbing alcohol.
EMPTY PESTICIDE CONTAINERS	
Hazardous Components	Pesticide residue
Property	Toxic
Proper Disposal	Triple rinse empty containers. Rinsewater in container can be used same as a pesticide. Do not rinse in kitchen sink or near wellhead outdoors. Empty, punctured container can go in trash. If can not use rinsewater, do not rinse container. Save the container for HHW collection.
Less Toxic Alternative	Not Applicable

MISCELLANEOUS (SWMD, 2004)

AMMUNITION	
Hazardous Components	Explosive material
Property	Explosive
Proper Disposal	Contact local law enforcement officials for proper disposal.
Less Toxic Alternative	Not Applicable
ART SUPPLIES	
Hazardous Components	Various ingredients
Property	Flammable, Toxic, Corrosive, Irritant
Proper Disposal	Place hardened or solid (crayon) material in trash. Save for HHW collection.
Less Toxic Alternative	Non toxic, water-based supplies are labeled. Arts and Crafts Materials Institute has a certification program. Use water based paints, glues and inks.
PHOTOGRAPHIC CHEMICALS (DILUTED/UNDILUTED)	
Hazardous Components	Acids, caustics, hydroxides, nitrates, others
Property	Corrosive, Toxic
Proper Disposal	If diluted and mixed and if home is connected to sewer system, pour down drain with plenty of water. If unmixed or home is connected to septic tank, save for HHW collection.
Less Toxic Alternative	Buy amount that is needed. Talk to retailer.
POOL CHEMICALS	
Hazardous Components	Sodium hypochlorite, other chlorinated compounds, sodium carbonate
Property	Corrosive, Toxic, Explosive, Reactive
Proper Disposal	If undiluted, save for HHW collection. If home is connected to sewer system, can pour small quantities down drain with plenty of water. Contact sewer district about disposal.
Less Toxic Alternative	Buy amount that is needed.

	Talk to retailer.
PROPANE GAS CYLINDERS	
Hazardous Components	Propane gas
Property	Explosive, Flammable
Proper Disposal	Check with retailer about exchange program. Return 20 lb cylinders to local propane retailer.
Less Toxic Alternative	Not Applicable

Annex (B)

Methods For HHW Management at the Source in Nablus City

	Products	throwing with the household solid wastes	Save to HHW at source (special place)	reusing	throwing randomly
Automotive Products					
1	Antifreeze	23%	62%	8%	8%
2	Auto Battery	15%	69%	12%	4%
3	Automatic Transmission Fluid& Motor Oil	10%	55%	25%	10%
4	Brake Fluid	40%	60%	0%	0%
5	Car Wax with Solvent	39%	46%	12%	4%
6	Carburetor Cleaner (fuel injectors)	25%	75%	0%	0%
7	Degreasers	38%	50%	0%	13%
8	Diesel	25%	54%	18%	4%
9	Fuel Oil	20%	60%	20%	0%
10	Kerosene	19%	47%	31%	3%
11	Metal Polish with Solvent	24%	51%	22%	3%
12	Oil Filters	27%	73%	0%	0%
13	Windshield Washer Solution	31%	42%	22%	6%
Home Products					
14	house Air Freshener	47%	38%	12%	4%
15	Batteries - Button, Rechargeable	58%	24%	12%	7%
16	Bleach	45%	40%	13%	2%
17	Cleaner - All Purpose	42%	43%	14%	2%
18	Cleaner - Ammonia-based	46%	41%	10%	4%
19	Cleaner - Bleach- based	41%	43%	13%	3%
20	Disinfectant	40%	45%	13%	3%
21	Drain Cleaner	33%	55%	12%	0%
22	Floor Care Products (wax/stripper)	43%	41%	14%	3%
23	Flourescent Lights	44%	36%	17%	4%
24	Furniture Polish with Solvents & Furniture Cleaner	47%	42%	11%	0%
25	Oven Cleaner (lye based)	44%	46%	7%	3%
26	Pet Supplies/Flea and Tick Control	13%	53%	33%	0%

27	Scouring Powder or Abrasive Cleaners	43%	41%	14%	2%
28	Shoe Polish	49%	35%	12%	4%
29	Smoke Detector	67%	0%	33%	0%
30	Spot Removers/Carpet & Upholstery and Rug Cleaner	49%	30%	18%	3%
31	Thermometers and Thermostats	33%	44%	22%	2%
32	Toilet Bowl Cleaner	44%	40%	12%	4%
33	Window/Glass Cleaner	44%	38%	16%	3%
Personal Care Products					
34	Hair Spray	55%	31%	12%	3%
35	Hair Permanent Lotion	53%	30%	13%	4%
36	Hydrogen Peroxide	57%	25%	13%	5%
37	Isopropyl Alcohol (rubbing alcohol)	48%	36%	12%	4%
38	Nail Polish	59%	26%	11%	4%
39	Nail Polish Remover	59%	29%	11%	2%
Medical products					
40	Medical products	48%	41%	8%	3%
Home Improvements					
41	Adhesives and Glues (solvent-based)	55%	32%	11%	2%
42	Oil-based Paint and Primer	57%	28%	12%	3%
43	Paint Brush Cleaner	38%	37%	20%	5%
43	Paint Remover and Stripper	51%	28%	16%	5%
44	Paint Thinner	51%	30%	14%	5%
45	Wood Preservative	28%	32%	40%	0%
Indoor Pesticides					
46	Ant/Cockroach Spray and Bait	44%	42%	9%	5%
47	Rodent Poisons and Bait	31%	58%	8%	2%
Lawn and Garden					
48	Fertilizer with Weed Killer	46%	27%	23%	5%
49	Fungicide	46%	46%	9%	0%
50	Herbicide	19%	44%	19%	19%
51	Insecticide	43%	46%	7%	4%
Miscellaneous					
52	Ammunition	56%	33%	0%	11%
53	Art Supplies	48%	32%	19%	2%
54	Photographic Chemicals (diluted/undiluted)	25%	25%	50%	0%
55	Pool Chemicals	20%	40%	40%	0%
Average		56%	31%	8%	4%

Annex (c)

Methods for HHW Management at the Source in Nablus Refugee Camps

	Products	throwing with the household solid wastes	Save to HHW at source (special place)	reusing	throwing randomly
Automotive Products					
1	Antifreeze	30%	50%	10%	10%
2	Auto Battery	23%	43%	30%	3%
3	Automatic Transmission Fluid& Motor Oil	18%	68%	9%	5%
4	Brake Fluid	43%	50%	0%	7%
5	Car Wax with Solvent	49%	39%	7%	5%
6	Carburetor Cleaner (fuel injectors)	27%	73%	0%	0%
7	Degreasers	25%	56%	19%	0%
8	Diesel	9%	69%	20%	3%
9	Fuel Oil	14%	53%	28%	6%
10	Kerosene	20%	46%	33%	2%
11	Metal Polish with Solvent	46%	34%	19%	2%
12	Oil Filters	44%	28%	22%	6%
13	Windshield Washer Solution	49%	32%	15%	5%
Home Products					
14	house Air Freshener	68%	20%	8%	4%
15	Batteries - Button, Rechargeable	79%	13%	3%	6%
16	Bleach	64%	23%	8%	5%
17	Cleaner - All Purpose	69%	20%	8%	3%
18	Cleaner - Ammonia-based	64%	25%	7%	4%
19	Cleaner - Bleach- based	63%	24%	10%	3%
20	Disinfectant	65%	24%	8%	3%
21	Drain Cleaner	67%	22%	9%	1%
22	Floor Care Products (wax/stripper)	71%	20%	6%	4%
23	Flourescent Lights	64%	21%	10%	4%
24	Furniture Polish with Solvents & Furniture Cleaner	68%	21%	7%	4%
25	Oven Cleaner (lye based)	69%	23%	5%	4%
26	Pet Supplies/Flea and Tick	44%	35%	12%	9%

	Control				
27	Scouring Powder or Abrasive Cleaners	66%	22%	8%	4%
28	Shoe Polish	69%	20%	6%	5%
29	Smoke Detector	64%	29%	7%	0%
30	Spot Removers/Carpet & Upholstery and Rug Cleaner	62%	24%	10%	5%
31	Thermometers and Thermostats	53%	24%	21%	3%
32	Toilet Bowl Cleaner	67%	22%	7%	4%
33	Window/Glass Cleaner	70%	18%	9%	4%
Personal Care Products					
34	Hair Spray	71%	19%	7%	3%
35	Hair Permanent Lotion	67%	18%	10%	5%
36	Hydrogen Peroxide	74%	19%	2%	5%
37	Isopropyl Alcohol (rubbing alcohol)	68%	20%	8%	4%
38	Nail Polish	71%	17%	6%	6%
39	Nail Polish Remover	71%	19%	6%	5%
Medical products					
40	Medical products	66%	26%	5%	4%
Home Improvements					
41	Adhesives and Glues (solvent-based)	67%	22%	7%	4%
42	Oil-based Paint and Primer	72%	18%	7%	3%
43	Paint Brush Cleaner	62%	26%	9%	4%
43	Paint Remover and Stripper	66%	24%	7%	3%
44	Paint Thinner	58%	33%	6%	3%
45	Wood Preservative	50%	43%	4%	4%
Indoor Pesticides					
46	Ant/Cockroach Spray and Bait	64%	24%	7%	5%
47	Rodent Poisons and Bait	45%	42%	7%	7%
Lawn and Garden					
48	Fertilizer with Weed Killer	52%	39%	6%	3%
49	Fungicide	36%	46%	14%	5%
50	Herbicide	43%	43%	11%	2%
51	Insecticide	63%	25%	7%	5%
Miscellaneous					
52	Ammunition	60%	20%	15%	5%
53	Art Supplies	66%	20%	10%	4%
54	Photographic Chemicals (diluted/undiluted)	25%	50%	13%	13%
55	Pool Chemicals	60%	33%	0%	7%
Average		41%	40%	15%	4%

Annex (D)

Weight Components of HHW from the Solid Waste Samples

1.0								
date 29/6/2007								
city	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**S5(Kg)**	**S6(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	137.0	149.0	135.0	154.0	130.0	152.0	857.0	
Automotive Products				2.0		2.0	4.0	15.1
Home Products	0.3	3.5	2.5	2.2	2.3	3.0	13.8	52.2
Personal Care Products		0.2	2.0	0.5	1.5	0.8	5.0	18.7
healthcare waste	0.1	0.3	1.0	0.2	0.2	0.2	1.9	7.0
Home Improvements		0.2					0.2	0.8
Indoor Pesticides			0.4	0.2		0.1	0.6	2.3
Lawn and Garden							0.0	0.0
Miscellaneous	0.0			0.5	0.5		1.0	3.9
Sum of HHW	0.4	4.1	5.9	5.6	4.5	6.1	26.4	
Percentage of HHW	0.3	2.8	4.4	3.6	3.4	4.0	**Average of HHW**	**3.1**

2.0								
date :30/6/2007								
city	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**S5(Kg)**	**S6(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	150.0	145.0	140.0	147.0	155.0	155.0	892.0	
Automotive Products	1.0				0.2	0.2	1.4	5.1
Home Products	2.0	3.0	3.5	3.0	4.0	2.8	18.3	67.2
Personal Care Products	0.6	1.5	1.0	0.2	0.3	1.0	4.6	16.7
healthcare waste	0.2	0.4	0.5	0.2	0.3	0.2	1.7	6.1
Home Improvements		0.2		0.1		0.1	0.3	1.1
Indoor Pesticides	0.1	0.2	0.2	0.1			0.5	1.9
Lawn and Garden							0.0	0.0
Miscellaneous					0.5		0.5	1.8
Sum of HHW	3.9	5.3	5.2	3.5	5.3	4.2	27.2	100.0
Percentage of HHW	2.6	3.6	3.7	2.4	3.4	2.7	**Average of HHW**	3.1

3.0								
date :1/7/2007								
city	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**S5(Kg)**	**S6(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	160.0	135.0	147.0	150.0	145.0	135.0	872.0	
Automotive Products	0.1	0.2					0.2	0.9
Home Products	2.0	2.5	3.0	2.2	3.5	2.6	15.8	74.9
Personal Care Products	0.4	0.1	1.0	0.1	0.4	0.3	2.3	10.7
healthcare waste	0.2	0.1	0.4	0.1		0.2	0.9	4.0
Home Improvements	1.0		0.3		0.1	0.5	1.8	8.5
Indoor Pesticides		0.1		0.1			0.2	0.7
Lawn and Garden							0.0	0.0
Miscellaneous	0.1						0.1	0.2
Sum of HHW	3.7	2.9	4.7	2.4	4.0	3.5	21.1	100.0
Percentage of HHW	2.3	2.1	3.2	1.6	2.7	2.6	**Average of HHW**	2.4

4.0								
date :2/7/2007								
city	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**S5(Kg)**	**S6(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	145.0	170.0	150.0	140.0	180.0	147.0	932.0	
Automotive Products	0.1	0.3			0.2		0.5	2.0
Home Products	2.0	3.0	3.0	2.5	2.5	1.5	14.5	57.3
Personal Care Products	0.2	0.5	1.5	0.5	1.0	0.2	3.8	15.0
healthcare waste	0.1	0.1	0.2	0.2	0.3	0.1	0.8	3.2
Home Improvements	0.0			0.8			0.8	3.3
Indoor Pesticides	0.5		0.1	0.2		0.1	0.9	3.4
Lawn and Garden		4.0					4.0	15.8
Miscellaneous							0.0	0.0
Sum of HHW	2.8	7.8	4.8	4.2	4.0	1.8	25.3	100.0
Percentage of HHW	1.9	4.6	3.2	3.0	2.2	1.2	**Average of HHW**	2.7

5.0								
date :3/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	135.0	148.0	155.0	137.0	150.0	145.0	870.0	
Automotive Products			0.5	0.2			0.7	2.5
Home Products	3.0	3.5	2.2	3.0	2.5	1.5	15.7	55.8
Personal Care Products	0.5	1.0	0.2	0.5	0.3	0.2	2.7	9.6
healthcare waste	0.1	0.2	0.1	0.2	0.1	0.2	0.8	2.8
Home Improvements	0.5		0.2	0.2			0.8	2.8
Indoor Pesticides	0.1	0.1		0.1	0.1	0.2	0.5	1.6
Lawn and Garden	3.0	4.0					7.0	24.9
Miscellaneous							0.0	0.0
Sum of HHW	7.2	8.8	3.1	4.1	3.0	2.1	28.2	100.0
Percentage of HHW	5.3	5.9	2.0	3.0	2.0	1.4	Average of HHW	3.3

6.0								
date :4/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	152.0	140.0	150.0	160.0	147.0	155.0	904.0	
Automotive Products		0.1	3.0		0.3		3.3	11.6
Home Products	2.5	3.0	2.5	3.0	2.0	2.5	15.5	54.3
Personal Care Products	0.3	0.1	1.0	0.5	0.7	0.3	2.9	10.0
healthcare waste	0.5	0.1	0.3	1.5	0.1	0.1	2.5	8.6
Home Improvements	0.1		0.1				0.2	0.5
Indoor Pesticides	0.1	0.0	0.0	0.1	0.1	0.1	0.3	1.1
Lawn and Garden				4.0			4.0	14.0
Miscellaneous							0.0	0.0
Sum of HHW	3.4	3.2	6.8	9.1	3.1	3.0	28.6	100.0
Percentage of HHW	2.2	2.3	4.6	5.7	2.1	1.9	Average of HHW	3.1

7.0								
date :5/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	165.0	145.0	150.0	150.0	147.0	155.0	912.0	
Automotive Products	1.5		0.2		0.1		1.8	6.0
Home Products	3.0	2.0	3.0	2.5	1.7	2.0	14.2	48.7
Personal Care Products	0.5	0.3	0.2	0.5	0.1	0.2	1.8	6.0
healthcare waste	0.2	0.1		0.2	0.1	0.1	0.5	1.7
Home Improvements	0.3	1.2			.	2.0	3.5	12.0
Indoor Pesticides	0.1	0.1	0.1	0.2		0.0	0.4	1.3
Lawn and Garden	7.0						7.0	24.0
Miscellaneous				0.1			0.1	0.2
Sum of HHW	12.6	3.6	3.4	3.4	1.9	4.3	29.1	100.0
Percentage of HHW	7.6	2.5	2.3	2.3	1.3	2.8	Average of HHW	3.1

8.0								
date :6/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	150.0	145.0	157.0	160.0	150.0	157.0	919.0	
Automotive Products		0.2		0.2			0.4	1.6
Home Products	2.5	3.5	2.0	3.0	2.0	2.5	15.5	69.3
Personal Care Products	0.5	0.2	0.1	0.5	0.2	0.1	1.5	6.7
healthcare waste	0.1	0.1	0.0	0.1	0.1	0.1	0.3	1.4
Home Improvements			0.1		0.5		0.6	2.5
Indoor Pesticides	0.3	0.7		0.1		0.1	1.2	5.1
Lawn and Garden		3.0					3.0	13.4
Miscellaneous							0.0	0.0
Sum of HHW	3.4	7.6	2.1	3.9	2.7	2.7	22.4	100.0
Percentage of HHW	2.3	5.2	1.4	2.4	1.8	1.7	Average of HHW	2.5

9.0								
date :7/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	173.0	155.0	150.0	157.0	150.0	147.0	932.0	
Automotive Products		0.3		0.1		2.0	2.4	10.7
Home Products	3.0	1.5	3.5	3.0	2..5	3.0	14.0	63.5
Personal Care Products	0.5	0.1	0.5	0.5	0.2	0.3	2.0	9.1
healthcare waste	0.3	0.0	0.1	0.1	0.1	0.3	0.8	3.5
Home Improvements	0.1			0.1		0.1	0.2	0.7
Indoor Pesticides		0.1	0.1		0.1		0.2	0.9
Lawn and Garden			2.0				2.0	9.1
Miscellaneous	0.5			0.1			0.6	2.5
Sum of HHW	4.4	1.9	6.2	3.7	0.3	5.6	22.0	100.0
Percentage of HHW	2.5	1.2	4.1	2.4	0.2	3.8	Average of HHW	2.4

10.0								
date :8/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	150.0	157.0	173.0	165.0	150.0	145.0	940.0	
Automotive Products	0.1		0.3		0.1	3.0	3.5	11.9
Home Products	2.5	3.0	3.5	2.5	3.0	2.0	16.5	56.7
Personal Care Products	0.5	0.2	0.3	0.3	0.2	0.5	1.9	6.5
healthcare waste	0.2	0.1	0.1	0.1	0.2	0.2	0.8	2.7
Home Improvements	0.5	0.2	0.1		0.5		1.2	4.1
Indoor Pesticides				0.1		0.1	0.2	0.5
Lawn and Garden						5.0	5.0	17.2
Miscellaneous		0.1					0.1	0.3
Sum of HHW	3.8	3.5	4.2	3.0	3.9	10.8	29.1	100.0
Percentage of HHW	2.5	2.2	2.4	1.8	2.6	7.4	Average of HHW	3.2

11.0								
date 9/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	153.0	147.0	156.0	150.0	145.0	155.0	906.0	
Automotive Products	0.1		0.3				0.4	1.3
Home Products	3.0	3.0	2.5	3.0	2.5	2.8	16.8	60.1
Personal Care Products	0.5	0.4	0.3	0.2	0.3	0.2	1.8	6.4
healthcare waste	0.3	0.2	0.1	0.0	0.2	0.1	0.8	2.8
Home Improvements	0.2		0.5		4.0	0.2	4.9	17.3
Indoor Pesticides	0.1	0.1	0.1	0.1		0.1	0.3	1.1
Lawn and Garden			3.0				3.0	10.7
Miscellaneous					0.1		0.1	0.2
Sum of HHW	4.1	3.7	6.6	3.3	7.0	3.3	28.0	100.0
Percentage of HHW	2.7	2.5	4.2	2.2	4.8	2.1	Average of HHW	3.1

12.0								
date :10/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	135.0	148.0	150.0	155.0	140.0	157.0	885.0	
Automotive Products	0.3	0.1			0.7		1.1	4.2
Home Products	2.0	3.0	3.0	2.5	2.0	3.0	15.5	58.6
Personal Care Products	0.5	0.3	0.2	0.5	0.3	0.2	2.0	7.4
healthcare waste	0.1	0.0	0.2	0.1	0.1	0.2	0.5	1.8
Home Improvements		0.2	0.1			0.1	0.3	1.1
Indoor Pesticides					7.0		7.0	26.5
Lawn and Garden				0.1			0.1	0.4
Miscellaneous							0.0	0.0
Sum of HHW	2.9	3.6	3.4	3.2	10.0	3.4	26.4	100.0
Percentage of HHW	2.1	2.5	2.3	2.0	7.1	2.2	Average of HHW	3.0

13.0								
date :11/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	145.0	157.0	170.0	165.0	150.0	160.0	947.0	
Automotive Products		0.2			0.5		0.7	2.2
Home Products	3.0	2.5	3.5	2.3	2.0	3.0	16.3	51.1
Personal Care Products	0.5	1.0	0.3	0.3	0.2	0.3	2.5	7.8
healthcare waste	0.2	0.5	0.1	0.1	0.1	0.2	1.1	3.4
Home Improvements	4.0	2.0		0.1		0.1	6.1	19.1
Indoor Pesticides	0.1		0.1		0.1		0.2	0.6
Lawn and Garden		5.0					5.0	15.7
Miscellaneous				0.0			0.0	0.1
Sum of HHW	7.8	11.2	4.0	2.7	2.8	3.5	31.9	100.0
Percentage of HHW	5.3	7.1	2.4	1.6	1.8	2.2	Average of HHW	3.4

14.0								
date :12/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	153.0	160.0	165.0	145.0	150.0	155.0	928.0	
Automotive Products		0.2	0.1			0.1	0.3	1.1
Home Products	2.5	3.0	3.0	2.0	1.7	2.5	14.7	55.1
Personal Care Products	0.5	0.3	0.2	0.1	0.2	0.3	1.5	5.6
healthcare waste	0.2	0.1	0.1	0.1	0.1	0.2	0.6	2.1
Home Improvements	0.1	2.0	0.2		0.1	0.1	2.4	9.0
Indoor Pesticides		0.1	0.1	0.1	0.1		0.2	0.7
Lawn and Garden			5.0			2.0	7.0	26.2
Miscellaneous							0.0	0.0
Sum of HHW	3.2	5.6	8.6	2.2	2.1	5.0	26.7	100.0
Percentage of HHW	2.1	3.5	5.2	1.5	1.4	3.2	Average of HHW	2.8

15.0								
date :13/7/2007								
city	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	S5(Kg)	S6(Kg)	sum	percentage HHW Categories
weight of the sample	170.0	150.0	155.0	145.0	150.0	135.0	905.0	
Automotive Products	3.0				0.1		3.1	14.1
Home Products	2.5	3.0	3.0	2.5	2.0	1.0	14.0	64.5
Personal Care Products	0.5	0.3	0.2	0.2	0.2	0.1	1.4	6.2
healthcare waste	0.2	0.1	0.2	0.1	0.1	0.0	0.6	2.5
Home Improvements	0.1	0.2	2.0	0.2	0.2		2.6	11.8
Indoor Pesticides			0.1	0.1	0.1		0.2	0.9
Lawn and Garden							0.0	0.0
Miscellaneous							0.0	0.0
Sum of HHW	6.2	3.5	5.5	3.0	2.5	1.1	21.7	100.0
Percentage of HHW	3.6	2.3	3.5	2.0	1.7	0.8	Average of HHW	2.3

1.0						
date :29/6/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	120.0	145.0	130.0	150.0	545.0	
Automotive Products					0.0	0.0
Home Products	1.0	2.5	2.0	2.0	7.5	72.0
Personal Care Products	0.2	1.0	0.3	0.1	1.6	15.4
healthcare waste		0.6	0.2	0.1	0.8	7.7
Home Improvements		0.2		0.2	0.4	3.4
Indoor Pesticides	0.0			0.1	0.1	0.7
Lawn and Garden					0.0	0.0
Miscellaneous			0.1		0.1	1.0
Sum of HHW	1.2	4.3	2.6	2.4	10.4	100.0
Percentage of HHW	1.0	1.6	2.0	1.5	Average of HHW	1.5

2.0						
date :30/6/2007						
camp	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	155.0	149.0	135.0	145.0	584.0	
Automotive Products		2.0		2.5	4.5	21.0
Home Products	3.5	2.5	3.0	3.0	12.0	56.1
Personal Care Products	1.5	0.2	0.7	1.2	3.6	16.6
healthcare waste	0.2	0.1	0.2	0.1	0.5	2.1
Home Improvements	0.1	0.1		0.0	0.3	1.2
Indoor Pesticides	0.1	0.1	0.5		0.6	2.8
Lawn and Garden					0.0	0.0
Miscellaneous		0.1			0.1	0.2
Sum of HHW	5.3	4.9	4.4	6.8	21.4	100.0
Percentage of HHW	3.4	3.3	3.3	4.7	**Average of HHW**	3.7

3.0						
date :1/7/2007						
camp	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	135.0	146.0	130.0	155.0	566.0	
Automotive Products		0.4			0.4	3.8
Home Products	2.0	3.0	2..4	3.2	8.2	77.4
Personal Care Products	0.1	0.5	0.2	0.5	1.3	12.3
healthcare waste	0.1	0.3	0.2	0.1	0.6	5.2
Home Improvements		0.1	0.1		0.1	0.9
Indoor Pesticides				0.1	0.1	0.5
Lawn and Garden					0.0	0.0
Miscellaneous					0.0	0.0
Sum of HHW	2.2	4.3	0.4	3.8	10.6	100.0
Percentage of HHW	1.6	2.9	0.3	2.5	**Average of HHW**	1.8

4.0						
date :2/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	150.0	135.0	137.0	147.0	569.0	
Automotive Products					0.0	0.0
Home Products	2.5	1.5	2.0	2.0	8.0	92.2
Personal Care Products	0.1		0.1		0.2	1.7
healthcare waste	0.1	0.1	0.2	0.1	0.4	5.0
Home Improvements					0.0	0.0
Indoor Pesticides	0.1	0.1			0.1	1.2
Lawn and Garden					0.0	0.0
Miscellaneous					0.0	0.0
Sum of HHW	2.7	1.7	2.3	2.1	8.7	100.0
Percentage of HHW	1.8	1.2	1.6	1.4	Average of HHW	1.5

5.0						
date :3/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	130.0	150.0	147.0	140.0	567.0	
Automotive Products	0.5				0.5	3.2
Home Products	3.0	3.2	1.5	2.0	9.7	61.4
Personal Care Products	0.2	0.1	0.5	0.3	1.1	6.6
healthcare waste	0.1	0.0		0.1	0.2	1.3
Home Improvements			0.2	0.1	0.3	1.6
Indoor Pesticides	0.1				0.1	0.3
Lawn and Garden	4.0				4.0	25.3
Miscellaneous		0.1			0.1	0.3
Sum of HHW	7.9	3.3	2.2	2.4	15.8	100.0
Percentage of HHW	6.1	2.2	1.5	1.7	Average of HHW	2.9

6.0						
date :4/7/2007						
camp	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	135.0	155.0	150.0	145.0	585.0	
Automotive Products					0.0	0.0
Home Products	1.5	2.5	2.0	3.0	9.0	79.8
Personal Care Products	0.3	0.1	0.5	0.5	1.4	12.0
healthcare waste	0.0	0.5	0.0	0.1	0.6	5.3
Home Improvements	0.1	0.0	0.1		0.1	1.2
Indoor Pesticides	0.1			0.1	0.2	1.8
Lawn and Garden					0.0	0.0
Miscellaneous					0.0	0.0
Sum of HHW	1.9	3.1	2.6	3.7	11.3	100.0
Percentage of HHW	1.4	2.0	1.7	2.5	**Average of HHW**	1.9

7.0						
date :5/7/2007						
camp	**S1(Kg)**	**S2(Kg)**	**S3(Kg)**	**S4(Kg)**	**sum**	**percentage HHW Categories**
weight of the sample	135.0	145.0	155.0	147.0	582.0	
Automotive Products	0.5			0.1	0.6	5.7
Home Products	2.0	3.0	2.0	1.5	8.5	88.1
Personal Care Products	0.1	0.1	0.1		0.2	2.1
healthcare waste	0.0	0.1	0.1	0.1	0.2	2.0
Home Improvements					0.0	0.0
Indoor Pesticides	0.1	0.1	0.1		0.2	2.1
Lawn and Garden					0.0	0.0
Miscellaneous					0.0	0.0
Sum of HHW	2.6	3.2	2.2	1.6	9.6	100.0
Percentage of HHW	1.9	2.2	1.4	1.1	**Average of HHW**	1.7

8.0						
date :6/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	140.0	155.0	150.0	156.0	601.0	
Automotive Products			0.1		0.1	1.3
Home Products	1.5	2.0	1.7	1.0	6.2	80.7
Personal Care Products	0.2	0.2	0.1	0.5	0.9	11.7
healthcare waste	0.2	0.1	0.1	0.0	0.3	3.6
Home Improvements	0.1			0.1	0.1	1.3
Indoor Pesticides		0.1			0.1	0.7
Lawn and Garden					0.0	0.0
Miscellaneous				0.1	0.1	0.7
Sum of HHW	1.9	2.3	1.9	1.6	7.7	100.0
Percentage of HHW	1.4	1.5	1.3	1.0	Average of HHW	1.3

9.0						
date :7/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	137.0	155.0	145.0	150.0	587.0	
Automotive Products		0.2			0.2	2.4
Home Products	1.5	2.2	1.7	2.0	7.4	88.3
Personal Care Products	0.2	0.1	0.2	0.1	0.5	6.0
healthcare waste	0.1	0.0	0.1	0.1	0.2	2.4
Home Improvements	0.1				0.1	0.6
Indoor Pesticides					0.0	0.0
Lawn and Garden					0.0	0.0
Miscellaneous		0.0			0.0	0.4
Sum of HHW	1.8	2.5	2.0	2.1	8.4	100.0
Percentage of HHW	1.3	1.6	1.3	1.4	Average of HHW	1.4

10.0						
date :8/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	147.0	156.0	150.0	140.0	593.0	
Automotive Products		0.1		0.3	0.4	2.8
Home Products	1.7	2.0	2.7	2.0	8.4	67.4
Personal Care Products	0.1	0.2	0.1	0.5	0.9	6.8
healthcare waste	0.0	0.1	0.1	0.1	0.2	1.8
Home Improvements		0.0		0.5	0.5	4.3
Indoor Pesticides	0.1		0.1		0.1	0.8
Lawn and Garden		2.0			2.0	16.1
Miscellaneous					0.0	0.0
Sum of HHW	1.8	4.3	2.9	3.4	12.5	100.0
Percentage of HHW	1.2	2.8	1.9	2.4	Average of HHW	2.1

11.0						
date :9/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	145.0	154.0	167.0	150.0	616.0	
Automotive Products		0.2			0.2	2.0
Home Products	1.7	2.0	2.5	2.0	8.2	80.8
Personal Care Products	0.4	0.2	0.2	0.3	1.0	9.9
healthcare waste	0.1	0.1		0.1	0.2	2.0
Home Improvements		0.1	0.2	0.1	0.3	3.0
Indoor Pesticides	0.1		0.2		0.2	2.0
Lawn and Garden					0.0	0.0
Miscellaneous				0.1	0.1	0.5
Sum of HHW	2.2	2.5	3.1	2.4	10.2	100.0
Percentage of HHW	1.5	1.6	1.8	1.6	Average of HHW	1.6

12.0						
date :10/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	160.0	135.0	140.0	155.0	590.0	
Automotive Products		0.1			0.1	0.4
Home Products	3.0	1.7	1.5	2.2	8.4	75.3
Personal Care Products	0.3	0.2	0.3	1.5	2.3	20.2
healthcare waste	0.1	0.0	0.1		0.2	1.6
Home Improvements	0.1		0.1		0.1	0.9
Indoor Pesticides			0.1	0.1	0.2	1.6
Lawn and Garden					0.0	0.0
Miscellaneous					0.0	0.0
Sum of HHW	3.5	2.0	1.9	3.8	11.2	100.0
Percentage of HHW	2.2	1.5	1.4	2.5	Average of HHW	1.9

13.0						
date :11/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	145.0	153.0	155.0	140.0	593.0	
Automotive Products					0.0	0.0
Home Products	1.5	2.0	1.7	2.5	7.7	82.6
Personal Care Products	0.1	0.3	0.1	0.2	0.7	7.0
healthcare waste	0.3	0.1		0.1	0.5	5.0
Home Improvements		0.3	0.1		0.4	3.8
Indoor Pesticides	0.1			0.1	0.1	1.1
Lawn and Garden					0.0	0.0
Miscellaneous			0.1		0.1	0.5
Sum of HHW	2.0	2.7	1.9	2.8	9.3	100.0
Percentage of HHW	1.3	1.7	1.2	2.0	Average of HHW	1.6

14.0						
date :12/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	145.0	156.0	160.0	140.0	601.0	
Automotive Products	0.1				0.1	0.7
Home Products	1.5	1.0	2.0	2.0	6.5	87.7
Personal Care Products	0.1	0.2	0.2	0.1	0.5	6.7
healthcare waste	0.0	0.1	0.1	0.1	0.2	2.8
Home Improvements			0.1		0.1	0.7
Indoor Pesticides	0.1			0.1	0.1	1.3
Lawn and Garden					0.0	0.0
Miscellaneous					0.0	0.0
Sum of HHW	1.7	1.2	2.3	2.2	7.4	100.0
Percentage of HHW	1.2	0.8	1.5	1.6	Average of HHW	1.2

15.0						
date :13/7/2007						
camp	S1(Kg)	S2(Kg)	S3(Kg)	S4(Kg)	sum	percentage HHW Categories
weight of the sample	140.0	150.0	155.0	147.0	592.0	
Automotive Products		0.1			0.1	0.4
Home Products	2.0	1.7	4.5	2.0	10.2	78.8
Personal Care Products	0.1	0.2	0.1	0.2	0.5	3.9
healthcare waste	0.3	0.1	0.1	0.1	0.5	3.9
Home Improvements	0.1			0.1	0.1	0.8
Indoor Pesticides	0.1				0.1	0.4
Lawn and Garden				1.5	1.5	11.6
Miscellaneous			0.1		0.1	0.4
Sum of HHW	2.5	2.0	4.7	3.9	13.0	100.0
Percentage of HHW	1.8	1.3	3.0	2.6	Average of HHW	2.2

Annex (E)

GIS shapefile (population and area name)

Al masri (2007)

#	AREA_NAME	LAYER	AREA	Population 2010
1	al dahyeh	111	264967	1198
2	al dahyeh	94	90349	866
3	al dahyeh	93	519005	1560
4	al dahyeh	101	243438	1176
5	al dahyeh	102	97496	1354
6	al dahyeh	100	195568	1312
7	al junaid	1	486034	1452
8	al makhfiya	31	376591	1449
9	al makhfiya	30	229294	1288
10	al makhfiya	29	101429	1095
11	al makhfiya	36	1829560	516
12	al makhfiya	34	1388728	0
13	al makhfiya	40	94702	1151
14	al makhfiya	39	92631	1058
15	al makhfiya	33	74975	958
16	al makhfiya	37	70609	992
17	al makhfiya	38	49930	1042
18	al makhfiya	28	715938	667
19	al makhfiya	35	468105	1383
20	al masaken	122	349708	1058
21	al masaken	121	669812	932
22	al masaken	124	283809	932
23	al masaken	125	767066	1223
24	al masaken	123	817743	0
25	al quds street	96	518341	1061
26	al quds street	97	267155	365
27	al quds street	95	66921	807
28	al quds street	99	61290	966
29	al quds street	98	159033	854
30	askar area	128	129258	1039
31	askar elbalad iraqeltayeh	127	411518	858
32	askar elbalad iraqeltayeh	126	367965	957
33	askar elbalad iraqeltayeh	120	61714	1028
34	askar elbalad iraqeltayeh	112	67939	1192

35	askar elbalad iraqeltayeh	114	88515	1055
36	askar elbalad iraqeltayeh	116	147215	1186
37	askar elbalad iraqeltayeh	115	550884	960
38	askar elbalad iraqeltayeh	117	554767	0
39	askar elbalad iraqeltayeh	119	204892	1253
40	askar elbalad iraqeltayeh	118	139524	1147
41	askar elbalad iraqeltayeh	113	157820	857
42	balata camp	8	270779	1260
43	beit eba	1	60849	1692
44	beit eba	3	161182	1249
45	beit eba	2	33116	1072
46	beit wazan	2	26648	1111
47	beit wazan	1	23344	1103
48	der el hatab	130	80849	1091
49	ein betelma	4	37666	1558
50	ein betelma	3	31835	1094
51	ein betelma	1	107986	1388
52	ein betelma	5	282069	1064
53	ein betelma	2	19786	972
54	industrial area	129	33568	1368
55	khalet al amoud	92	11098	1248
56	khalet al amoud	89	12525	1103
57	khalet al amoud	91	8498	1184
58	khalet al amoud	90	31389	1369
59	khalet al amoud	88	89103	980
60	khalet al amoud	84	28027	1440
61	khalet al amoud	103	65601	1292
62	khalet al amoud	85	75210	1393
63	kufr kallel	2	61570	1360
64	kufr kallel	1	53264	1052
65	new askar camp		82666	879
66	north mountain-east	107	91736	1538
67	north mountain-east	109	92616	1128
68	north mountain-east	110	78039	1323
69	north mountain-east	108	87668	1214
70	north mountain-east	105	55855	1154
71	north mountain-east	106	82441	1192
72	north mountain-east	80	12708	1225
73	north mountain-east	83	79008	832
74	north mountain-east	104	39297	1388
75	north mountain-middle	77	184091	1254
76	north mountain-middle	76	113060	1489

77	north mountain-middle	82	380372	1059
78	north mountain-middle	81	26293	1362
79	north mountain-middle	78	40072	1228
80	north mountain-middle	79	135704	1193
81	north mountain-west	48	132755	1206
82	north mountain-west	47	35340	1366
83	north mountain-west	46	52600	1179
84	north mountain-west	66	83491	1273
85	north mountain-west	67	42863	1270
86	north mountain-west	73	48262	1038
87	north mountain-west	70	47732	1170
88	north mountain-west	69	27440	1206
89	north mountain-west	65	55466	1161
90	north mountain-west	64	22883	1256
91	north mountain-west	68	17767	896
92	north mountain-west	72	18879	1078
93	north mountain-west	71	20710	1006
94	north mountain-west	49	40339	1312
95	old askar camp	1	22484	1206
96	old city-east part	13	48112	921
97	old city-east part	12	145620	1572
98	old city-east part	15	66796	1190
99	old city-east part	14	130451	1359
100	old city-east part	11	53551	1112
101	old city-east part	10	31846	1334
102	rafeedya	55	300553	1027
103	rafeedya	54	285360	1455
104	rafeedya	32	48698	1860
105	rafeedya	45	42898	1586
106	rafeedya	53	98252	1373
107	rafeedya	42	62574	1460
108	rafeedya	41	65704	1190
109	rafeedya	44	96910	1063
110	rafeedya	43	78458	1077
111	rafeedya	60	78759	1441
112	rafeedya	58	41891	1454
113	rafeedya	52	23551	1075
114	rafeedya	59	23328	1161
115	rafeedya	57	60214	1625
116	rafeedya	56	137702	1256
117	rafeedya	63	265909	1472
118	rafeedya	50	1573035	1117

119	rafeedya	51	2594152	1332
120	rafeedya		272544	1028
121	rasel ein krom ashor+tour	17	482919	1052
122	rasel ein krom ashor+tour	19	644364	1142
123	rasel ein krom ashor+tour	18	665375	1315
124	rasel ein krom ashor+tour	24	219395	1337
125	rasel ein krom ashor+tour	26	470624	1279
126	rasel ein krom ashor+tour	25	742317	746
127	rasel ein krom ashor+tour	27	77933	1028
128	rasel ein krom ashor+tour	21	215318	2368
129	rasel ein krom ashor+tour	22	541153	1212
130	rasel ein krom ashor+tour	23	84166	1274
131	rasel ein krom ashor+tour	20	82184	1316
132	rasel ein krom ashor+tour	87	89122	1197
133	rasel ein krom ashor+tour	86	92283	1315
134	rasel ein krom ashor+tour	16	81660	1446
135	rojeeb	2	126335	1265
136	rojeeb	3	65277	1265
137	rojeeb	4	64809	1179
138	rojeeb	1	95312	1483
139	yasmina+gharnata st	8	89155	1097
140	yasmina+gharnata st	3	93071	1073
141	yasmina+gharnata st	75	475307	1380
142	yasmina+gharnata st	74	132346	1165
143	yasmina+gharnata st	62	127323	1198
144	yasmina+gharnata st	6	269827	20545
145	yasmina+gharnata st	5	125771	8813
146	yasmina+gharnata st	61	10478	1105
147	yasmina+gharnata st	4	254055	1570
148	yasmina+gharnata st	1	1216143	0
149	yasmina+gharnata st	7	338375	1011
150	yasmina+gharnata st	9	109551	5981
151	yasmina+gharnata st	2	155475	0
152	zawata	1	627042	939
153	zawata	2	0	0

Annex (F)

Questionnaire of the Study (Arabic)

بسم الله الرحمن الرحيم

جامعة النجاح الوطنية
كلية الدراسات العليا
قسم هندسة المياه والبيئة

تحية طيبة وبعد :

الاستبانة التي بين أيدكم تهدف إلى **تقيم إدارة النفايات المنزلية الخطرة :دراسة مقارنة بين مدينة نابلس ومخيماتها**. وسعيا لمزيد من المعرفة لما فيه من فائدة للمجتمع بإذن الله. يرجى تعبئة الاستبانة بكل دقة وموضعية. علما بان المعلومات سيتم التعامل معها بسرية وضمن حدود البحث العلمي فقط.

مع الشكر الجزيل لتعاونكم وحسن اهتمامكم

ما المقصود بالنفايات الخطرة المنزلية؟

_____
_____
_____

ما هي أهم النفايات الخطرة المنزلية التي تنتج في بيتك؟

_____
_____
_____
_____

النّفايات الخطرة المنزليّة هي جزء من النفايات الصّلبة ، هنالك العديد من المنتجات كثيرة الاستخدام في البيت، الحديقة و الكراج تحتوي على مكوّنات خطيرة (مثال مواد التنظيف) و تحتاج لأن تُسْتَخْدَم و تُخَزَّن بأمان . إذا تقرّر التّخلّص من هذه المنتجات تصبح النّفايات الخطرة المنزليّة الّتي تتطلّب التّخلّص المناسب

القسم الأول المعلومات الشخصية:

ضع دائرة في المكان المخصص وفق ما تراه مناسب.

1) مكان الإقامة؟
1- المدينة **2-** مخيم

2) عمر ربة البيت ؟
1- اقل من 25 **2-**26-35 **3-**36-45 **4-** أكثر من 45

3) المستوي التعليمي لربة البيت؟
1- أمية **2-** شهادة مدرسية **3-** شهادة جامعية أولى **4-** شهادة جامعية عليا

4) ما نوع عمل ربة البيت ؟
1- ربة بيت فقط **2-** تعمل في الحكومة **3-** تعمل في قطاع خاص

5) هل يحتوي البيت على مواد خطره لها علاقة بعمل الأب ؟
1- نعم **2-** لا

6) إذا كانت الإجابة لسؤال(**5**) نعم فنرجو الإجابة على ما يلي:
أ- مكان حفظ هذه المواد ؟
1- داخل المطبخ **2-** داخل الحمام **3-** في حديقة المنزل **4-** سدة المنزل **5-** مكان خاص لا يمكن الوصول إليه من قبل الأطفال

7) عدد الأفراد المقيمين في البيت ؟
1- 2-4 **2-** 5-7 **3-** 7 <

8) يوجد أطفال في الأسرة في الفئة العمرية من (8) أشهر إلى (10) سنوات ؟
1- نعم **2-** لا

9) طبيعة السكن؟
1 - شقة **2-** بيت مستقل

10) إذا كانت الإجابة لسؤال (**9**) شقة فالرجاء اخبرنا هل يوجد للشقة مكان تخزين مع باقي الشقق ؟
1- نعم **2-** لا

11) معدل الدخل الشهري للأسرة ؟

1- أقل من 300 دينار **2-** 300-500دينار **3-** 500-1000دينار **4-**1000دينار فاعلى

12) من هم القائمون على نقل النفايات من المنزل إلى الحاوية ؟
1- رب الأسرة **2-** ربة الأسرة **3-** الأطفال **4-** حارس العمارة **5-** غير ذلك

13) متى تتم عملية التخلص من النفايات الصلبة من البيت ؟
1- كل يوم **2-** يوم بعد يوم **3-** كل ثلاثة أيام **4-** كل أسبوع **5-** تتراكم بدون نقل

14) موعد نقل النفايات الصلبة من المنزل للحاوية؟
1- صباحا **2-** عند الظهيرة **3-** مساء

15) أقرب حاوية نفايات عن منزلك ؟
1-اقل من 100 متر **2-** 100-300 متر **3-** 300-500 متر **4-** اكثر من 500 متر

16) هل حجم الحاوية في منطقتك كافية للنفايات ؟
1- نعم **2-** لا

17) هل تلاحظ وجود نفايات صناعية داخل او حول الحاوية؟
1- نعم **2-** لا

18) إذا كانت الإجابة لسؤال (**17**) نعم فالرجاء اخبرنا هل هي نفايات خطرة ؟
1- نعم **2-** لا

19) هل هنالك سلوك غير سليم للأطفال (عبث) اتجاه محتويات الحاوية في منطقتك؟
1- نعم **2-** لا

20) هل عانى احد أفراد الأسرة من حوادث نتيجة التعرض للمواد المنزلية الخطرة؟
1- نعم **2-** لا

21) إذا كانت الإجابة لسؤال (**20**) **نعم** فالرجاء الإجابة على الأسئلة التالية؟
أ- ما هي نوع الإصابة؟
1 - حروق **2-** تسمم **3-** جروح
ب- كيف تم إعادة حفظ وتخزين المواد المنزلية الخطرة؟
1- لم يتم أي تغير **2-** حفظها في مكان امن **3-** عدم تخزينها في البيت كليا
ت- هل كان هناك تأثير نفسي سيء على المصاب؟
1- نعم **2-** لا

القسم الثاني:
الإدارة المتبعة في التعامل والتخلص من النفايات المنزلية الخطرة
ضع دائرة في المكان المخصص وفق ما تراه مناسبا.

22) هل يوجد في منزلك **السائل المبرد في الرديتر ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

23) هل يوجد في منزلك **بطّاريّات سيارات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

24) هل يوجد في منزلك **زيت محركات السيارات؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

25) هل يوجد في منزلك **زيت الفرامل ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

26) هل يوجد في منزلك **ملمعات السيارة بشكل سائل ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

27) هل يوجد في منزلك **منظف الكاربارتير(حاقن الوقود)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟

1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

28) هل يوجد في منزلك **مزيل شحمة السيارات؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

29) هل يوجد في منزلك **الدّيزل (سولار)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

30) هل يوجد في منزلك **المازوت ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

31) هل يوجد في منزلك **كاز ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

32) هل يوجد في منزلك **ملمعات المعادن مذابة في سائل ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

33) هل يوجد في منزلك **فلتر زيت ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

34) هل يوجد في منزلك **سائل تنظيف زجاج السيارات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

35) هل يوجد في منزلك **معطّر الجوّ ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

36) هل يوجد في منزلك **بطّاريّات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

37) هل يوجد في منزلك **مبيضّ الغسيل ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

38) هل يوجد في منزلك **منظف لجميع الاستخدامات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

39) هل يوجد في منزلك **منظف خاص يحتوي على مادة الامونيا(مثل المدهش) ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

40) هل يوجد في منزلك **منظف خاص يحتوي على الكلور ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

41) هل يوجد في منزلك **المطهّر ؟** **1- نعم** **2- لا**

أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

42) هل يوجد في منزلك **مسلك البالوعة(سوائل تسليك البواليع)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

43) هل يوجد في منزلك **منظفات الأرضيات المحتوية على مواد شمعية ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

44) هل يوجد في منزلك **مصابيح الأضاءه ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

45) هل يوجد في منزلك **ملمعات الأثاث بشكل سائل ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

46) هل يوجد **في منزلك منظّفات الفرن البتوغاز ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

47) هل يوجد في منزلك **مواد لتطهير أماكن تواجد الحيوانات الأليفة ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

48) هل يوجد في منزلك **مواد جلي لتنظيف الجدران والأرضيات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

49) هل يوجد في منزلك **ملمع الحذاء ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

50) هل يوجد في منزلك **جهاز كاشف دخان ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

51) هل يوجد في منزلك **منظف سجاد فعال يحتوي على كحول ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

52) هل يوجد في منزلك **ميزان الحرارة ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

53) هل يوجد في منزلك **منظّف المرحاض ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

54) هل يوجد في منزلك **منظف الزجاج والشبابيك ؟** **1- نعم** **2- لا**

أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

55) هل يوجد في منزلك **مثبّت الشّعر ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

56) هل يوجد في منزلك **كريم الشّعر (جل) ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

57) هل يوجد في منزلك **مواد لصباغة الشعر ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

58) هل يوجد في منزلك **عطور؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

59) هل يوجد في منزلك **ملمع الأظافر (المونوكير)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

60) هل يوجد في منزلك **مزيل طلاء الأظافر ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

61) هل يوجد في منزلك **أدوات طبية وأدوية ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

62) هل يوجد في منزلك **اللّاصقات و الصّمغ مثل الغراء ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

63) هل يوجد في منزلك **دّهان زيتي ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

64) هل يوجد في منزلك **منظّف فرشاة الدّهان ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

65) هل يوجد في منزلك **مزيل الدهان ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

66) هل يوجد في منزلك **مخفّف الدهان (التنر او التربنتين)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

67) هل يوجد في منزلك **مادّة حافظة الخشب(الزيت الحار)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟

1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

68) هل يوجد في منزلك **قاتل (مبيد)النمل و الصراصير ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

69) هل يوجد في منزلك **سموم القوارض(الفئران)؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

70) هل يوجد في منزلك **السّماد مع مبيد الأعشاب ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

71) هل يوجد في منزلك **مبيدات الفطريات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

72) هل يوجد في منزلك **مبيدات الأعشاب ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

73) هل يوجد في منزلك **مبيدات حشرات ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

74) هل يوجد **في منزلك مواد مفرقعه مثل الألعاب النارية وغير ذلك ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

75) هل يوجد في منزلك **أدوات ومواد الرسم ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

76) هل يوجد في منزلك **مواد تحميض الصور ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

77) هل يوجد في منزلك **موادّ كيميائيّة لحمّام السّباحة ؟** **1- نعم** **2- لا**
أ- إذا كان الجواب **نعم**، فكيف يتم التخلص منها والتعامل معها؟
1- إلقائها مع النفايات الصلبة المنزلية **2-** إيصالها إلى الموقع الخاص بذلك **3-** إعادة استخدامها
4- إلقائها بشكل عشوائي

تقيم إدارة المخلفات المنزلية الخطرة: دراسة مقارنة بين مدينة نابلس ومخيماتها

اعداد
ايهاب ميالله

اشراف
د. عامر الهموز
د. عصام الخطيب

الملخص

هذه الدراسة " تقيم إدارة المخلفات المنزلية الخطرة: دراسة مقارنة بين مدينة نابلس ومخيماتها) تهدف إلى دراسة نوع وكمية المواد الأكثر خطورة مستعملة في المنازل, وتحديد مستوى الوعي في التخلص من هذه المواد في الأسرة, وتحديد الحوادث نتيجة التعرض للمواد المنزلية الخطرة, واقترح إدارة متكاملة للمخلفات المنزلية الخطرة تأخذ بعين الاعتبار الطرق الهندسية المختلفة بإدارة المخلفات المنزلية الخطرة من بداية حتى التخلص منها.

جمعت المراجع وحللت لتحديد مدى المشكلة والنتائج المتعلقة بها. ووزعت الاستبانة على 1300 منزل, وتم فرز(23) طن من النفايات المنزلية الناتجة في 150 عينة في محطة نقل النفايات خلال 15 يوما .

إن نسبة النفايات الخطرة المنزلية في مدينة نابلس هي 2.89% , ونسبتها في مخيماتها 1.88%, وتتناسب مع الدخل للأسرة, وهناك مؤشر أن منتجات البيت, و العناية الشخصية هي أكثر المنتجات استهلاكا, وهذه الدارسة تبين وجود 17.9% لديهم حوادث حروق, تسمم, وجروح نتيجة التعامل مع المواد الخطرة المنزلية, وجدت الدراسة أيضا ان مستوى الوعي منخفض بالنسبة للمخلفات المنزلية الخطرة, وبحاجة إلى تحسين مستمر.

هذه الدراسة خلصت إلى العديد من التوصيات, والى نظام لإدارة المخلفات المنزلية الخطرة التي تساعد القطاع الصحي الفلسطيني, وستعزز وتطور الخدمات البيئية, والصحية. النموذج المقترح يتضمن تطبيقا جديدا لطرق الجمع, والفصل, والتخزين, والنقل, والمعالجة, والتخلص من النفايات الخطرة المنزلية. هذا النظام المقترح سوف يتعامل مع كمية 1600 طن سنويا من المخلفات المنزلية الخطرة الناتجة من مدينة نابلس ومخيماتها.

جامعة النجاح الوطنية

كلية الدراسات العليا

تقيم إدارة المخلفات المنزلية الخطرة: دراسة مقارنة بين مدينة نابلس ومخيماتها

اعداد

ايهاب ميالـه

اشراف

د. عامر الهموز

د. عصام الخطيب

قدمت هذه الأطروحة استكمالا لمتطلبات درجة الماجستير في هندسة المياه والبيئة، بكلية الدراسات العليا في جامعة النجاح الوطنية، نابلس، فلسطين.

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