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Industrial Solid Waste Management in Hebron Governorate and the Opportunities for the Application of Cleaner Production Principles

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Member ....

Date of Defense: 23 Jan. 2013

Dedication

I would like to dedicate my thesis to my beloved husband, to my dear parents, and my big family for their love, endless support and encouragement.

Also, this thesis is dedicated to my Dr. Issam Al-Khatib who has been a great source of motivation and inspiration.

Finally, this thesis is dedicated to all those who believe in the truth, justice, and freedom.

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Finally, many thanks to all of my friends, colleagues and everyone helped me to achieve this research.

المستخلص

الخليل محافظة صناعية في جنوب فلسطين، وتتركز الصناعة فيها في مدينة الخليل. وجاءت فكرة هذه الدراسة نظرا لعدم وجود دراسات تقيم وضع النفايات الصلبة الصناعية في المحافظة . تعرض هذه الدراسة الوضع القائم لإدارة النفايات الصلبة الصناعية في المحافظة والفرص المتاحة لتطبيق مبادئ الإنتاج الأنظف. تمت هذه الدراسة من خلال نوعين من الاستبيانات، الأولى على مستوى الهيئات المحلية ممثلة عن ١٦ بلدية ومجلس محلي واحد. والثانية على مستوى المصانع وممثلة عن ٩١ مصنع. الاهداف التي سعت استبانة الهيئات المحلية الى تحقيقها هي أولا دراسة ممارسات إدارة النفايات الصلبة الصناعية الحالية وثانيا تقييم مستوى الخدمات التي تقدمها الهيئات المحلية من حيث الجمع والنقل والتخزين المؤقت والمعالجة والمعاملة والتخلص النهائي. و سعت استبانة المصانع الى تحقيق أولا دراسة ممارسات إدارة النفايات الصلبة الصناعية الحالية على مستوى المصانع من حيث توليد النفايات و التخزين المؤقت و الجمع والنقل والمعالجة والمعاملة والتخلص النهائي ، وثانيا تقدير كميات النفايات الصلبة الصناعية، وثالثا الى تحديد الفرص لممارسة الانتاج الأنظف.

أظهرت النتائج حقيقة ان النفايات الصلبة الصناعية يتم التعامل معها كالنفايات البلدية. وكانت الطريقة الرئيسية لجمع وتخين النفايات هي نظام الحاويات، وكانت نتيجة نسبة الجمع من المصانع ١٠٠%. لا يوجد في منطقة الدراسة حاويات مخصصة للنفايات الصلبة الصناعية باستثناء ٦ مصانع في مدينة الخليل، لكن كان عمال البلدية مسؤولون عن الجمع والنقل للنفايات الناتجة من هذه المصانع بنسبة ١٠٠%. وجد ان ٥٢,٩٤% من الهيئات المحلية لديها مشاكل في جمع ونقل النفايات الصلبة من المصانع.

كانت معدلات توليد النفايات الصلبة الصناعية بالترتيب من الأعلى إلى الأقل على النحو التالي: ٧١٩,٣٨ كغم/يوم من الصناعات المعدنية، و ٢٠٠ كغم/يوم من الصناعات الورقية والطباعة، و ١٦٦,٦٤ كغم/يوم من الصناعات الغذائية والمشروبات، و ١٢٧,١٤ كغم/يوم من الصناعات البلاستيكية، و٣٩,٤ كغم/يوم من الصناعات الكيميائية، و٢٠ كغم/يوم من صناعات الأنسجة. من حيث الكميات كانت النفايات المعدنية والورقية والبلاستيكية والنباتات هي أكثر النفايات الناتجة. شكلت الحاويات المعدنية ما نسبته ٣٦% من مجموع الحاويات المستخدمة للتخزين المؤقت في المصانع، وشكلت الحاويات البلاستيكية نفس النسبة ٣٦%.

بلغت نسبة المركبات والشاحنات التابعة للهيئات المحلية التي تنقل النفايات الصلبة للمكب النهائي ٥٢%. وجد أن ٢١ مصنع من أصل ٩١ دائما يعالجون النفايات بعد الجمع وقبل التخلص النهائي منها، وكان ٨٣,٣٣% منهم يعالجون النفايات بإعادة تدويرها و ١٦,٦٧% بفصلها. بلغت نسبة المصانع التي تنتج نفايات من عمليات الإنتاج ومن مصادر أخرى كالتغليف مثلا ٥١,٦٥%، كما كان معدل انتاج النفايات من مصادر أخرى غير عمليات الإنتاج هو ٢٣,٢٢ كغم/يوم. وجد أن ٨,٤% فقط من المصانع دائما تفصل النفايات من عمليات الإنتاج عن النفايات من مصادر أخرى. كما أظهرت النتائج أن ٨٥,٧% من المصانع لا تفصل النفايات إلى مكوناتها الرئيسية.

كانت مؤشرات إدراة النفايات الصلبة الصناعية على مستوى المصانع كالآتي: مؤشر التخزين المؤقت متوسط بنسبة (٨٠,٢%)، وكان مؤشر التجميع والنقل جيد بنسبة (٩٠,١%)، وكان مؤشر المعالجة والتخلص النهائي جيد بنسبة (٨١,٣%)، وكان مؤشر تطبيق مبادىء الإنتاج الأنظف جيد بنسبة (٩٧,٨%)، وكان مؤشر الأمن والسلامة للعمال في المصانع جيد بنسبة (٣٩,٦%) و متوسط بنسبة (٤٠,٧%) وسيء بنسبة (١٩,٨%).

أما بالنسبة لمؤشرات معوقات الإنتاج الأنظف فكانت كالآتي: مؤشر معوقات الإنتاج الأنظف والمتعلق بسياسة الدولة والسوق كان قوي بنسبة (٨٦,٨%)، مؤشر معوقات الإنتاج الأنظف والمتعلق بالنواحي المالية والإقتصادية كان قوي بنسبة (٨٩%)، مؤشر معوقات الإنتاج الأنظف والمتعلق بالنواحي التقنية والمعلومات كان قوي بنسبة (٨٥,٧%)، مؤشر معوقات الإنتاج الأنظف والمتعلق بالنواحي الإدارية والتنظيمية كان قوي بنسبة (٨٣,٥%).

وأخيرا توصي الدراسة بفرض قوانين وسياسات لتنظيم العلاقات بين جميع المؤسسات المعنية بقطاع إدارة النفايات الصلبة الصناعية من أجل إيجاد نظام متكامل لإدارة النفايات الصلبة الصناعية.

Abstract

Hebron is an industrial governorate in the south of Palestine, and industries are concentrated in Hebron City. The idea of this study launched due to the lack of studies that evaluate status of industrial solid waste management in the governorate. This study presents the current status of industrial solid waste management in Hebron governorate and the opportunities for the application of cleaner production principles. Two surveys were conducted, one on localities level which represent 16 municipalities and one local council and the other on factories level which represent 91 factories. The localities survey aimed firstly to examine the current industrial solid waste management (ISWM) practices in terms of collection and transferring, temporal storage, and (treatment, processing, and final disposal), and secondly to assess level of services provided by localities for ISWM. The factories survey aimed firstly to examine the current ISWM practices on factories level in terms of ISW generation, temporal storage, collection and transferring, and (treatment, processing, and final disposal), and secondly to estimate quantities of ISW, and thirdly to identify the opportunities of practicing cleaner production (CP).

The results revealed the fact that ISW has been treated as MSW from sources to final disposal in the study area. Community container collection system is the main common practice used in the solid waste collection and storage, the percent of collecting solid wastes from the factories was 100%. There were no special containers for ISW in the study area, excluding six factories in Hebron city; but 100% of municipality's laborers who are responsible for collecting and transferring waste from containers to Yatta dumpsite. 52.94% of localities have problems in collecting and transferring ISW from factories.

The outcomes of the mean generation rates of ISW produced from factories was ordered from highest to lowest rate as: 719.38 kg/day from metals industries, 200 kg/day from paper and

printing industries, 166.64 kg/day from food and beverage industries, 127.14 kg/day from plastic industries, 39.4 kg/day from chemicals industries, and 20 kg/day from textile industries. In terms of ISW quantities; metals, papers, plastic, plants are the most common wastes resulted in the survey. Steel and plastic containers, which account for 36% for each of all temporal storage facilities, are the commonest method of ISW storage. Localities vehicles and trucks account for 52% of the means of transferring solid waste to the final disposal.

It was found that 21 out of 91factories always treat SW after collection and before final disposal, 83.33% of them treat their waste by recycle and 16.67% by separation. 51.65% of factories produce a mixture of process and non-process ISW, the average rate of non-process ISW was 23.22 kg/day. Only 8.4% of factories always separate process ISW from non-process ISW. 85.7% of factories don't separate their ISW into specific components.

It is found that 66.3% of factories respondents said that they adopt an integrated preventive environment strategy. 23.1% of respondent heard about CPP. It is found that 13.6% of factories reuse and 16.5% recycle ISW as intra-industry reuse and recycle. 77.3% of the recyclable materials used as raw materials, and 22.7% of them use as an initial materials help in production. The study revealed that inter-industry reuse of paper recycling is practiced in recycling plant in Al-Khderah.

The outcomes of ISWM indicators are as follows: TSI is moderate (80.2%), CTI is good (90.1%), TFDI is good (81.3%), and CPI is good (97.8%), and SSI is good (39.6%), moderate (40.7%), and bad (19.8). The outcomes of cleaner production obstacles indicators are as follows: POCPI is strong (86.8%), FOCPI is strong (89%), TOCPI is strong (85.7%), and AOCPI is strong (83.5%). The outcomes of all cleaner production obstacles indicators are strong; all of them over 80%.

Finally, the study recommends imposing laws and policies to regulate the relations between all institutions involved in industrial solid waste management sector in order to create an integrated system for the industrial solid waste management.

Table of contents

List of Tables

List of Figures

List of Acronyms

AOCPI	Administrative Obstacles for Cleaner Product Indicator
ARIJ	Applied Research Institute – Jerusalem
CP	Cleaner Production
CPI	Cleaner Product Indicator
CPP	Cleaner Production Principles
CSW	Chemicals in a Sustainable World
CTI	Collection and Transfer Indicator

EPA	Environmental Protection Agency
EQA	Environmental Quality Authority
FOCPI	Financial Obstacles for Cleaner Product Indicator
HCCI	Hebron Chamber of Commerce and Industry
HM	Hebron Municipality
ISW	Industrial Solid Waste
ISWM	Industrial Solid Waste Management
MNE	Ministry of National Economy
oPT	occupied Palestinian Territories
POCPI	Policy Obstacles for Cleaner Product Indicator
SSI	Safety and Security Indicator
SW	Solid Waste
SWM	Solid Waste Management
TFDI	Treatment and Final Disposal Indicator
TOCPI	Technical Obstacles for Cleaner Product Indicator
TSI	Temporary Storage Indicator

1. Chapter One: Introduction

1.1 Thesis structure

This research thesis consists of five chapters. Chapter one provides an introduction covering the background, constraints and restrictions in SWM, cleaner production concept, goal and objectives, and characteristics of the study area. Chapter two describes the literature review. Chapter three describes the methodology. Chapter four presents and discusses the results, and Chapter five presents the conclusions and recommendations.

1.2 Background

In the last decade industrial operations development are significantly impacted particularly in developing countries due to radical changes in the global economy (Hogland and Stenis, 2000; El-Fadel et al., 2001; Casares et al., 2005). The movement from centrally planned economies into market economies, the establishment of large economic blocks, liberalization of international trade, rapid advances in the fields of science and technology, and the introduction of the ISO 14 000 standards for environmental control and other total quality management control measures are the most important examples of these changes (ESCWA, 1996; UNIDO, 1997; El-Fadel et al., 2001). Developing economies, initiated industrial restructuring programs to promote the private manufacturing sector as a response to global changes. While in the other governments around the world new policies are being adopted and implemented to face the challenges of the new international environment (El-Fadel et al., 2001).

Wastes generated by industrial development are complex in both their quantities and composition (Wei and Huang, 2001; Casares et al., 2005). These wastes are generally associated with more hazardous constituents and as such have a higher public health and environmental risk potential and imply a serious challenge to local government authorities especially in developing countries. The impacts of disposed waste can be summarized as the contamination of surface and groundwater through leachate; soil contamination through direct waste contact or leachate; air pollution through burning of wastes; spreading of diseases by different vectors like birds, insects, and rodents; odor in landfills, and uncontrolled release of methane by anaerobic decomposition of waste (Ngoc et al, 2009).

The term industrial waste refers to all wastes produced by industrial operations or derived from manufacturing processes (Abduli, 1996; Casares et al., 2005). Industrial solid waste management (ISWM) can be defined as: "the control of waste generation, storage, collection, transfer and transport, processing and disposal with the best practices of public health, economics and financial, engineering, administrative, and legal and environmental considerations (Omran et al., 2009)". According to the regulatory definition that established by Taiwan's EPA, industrial waste management methods include the intermediate treatment (e.g., incineration and solidification), final disposal (e.g., sanitary landfill and secure landfill) and reuse (Tasi, 2010).

Many studies on industrial solid waste management are available; however, these studies have focused mainly on quantities and general description (Mbuligwe et al, 2006). This study will take a look in-depth on management practices, as this is difficult to obtain in the literature.

1.3 Constraints and restrictions in SWM

The rapid economic development and accelerated industrialization in recent years has resulted in great complexity in handling industrial waste management (Tasi, 2010). Palestinian Territories as well as other developing countries has faced many hurdles in SWM at the political, legislative, organizational, technical, environmental, and financial levels.

1.3.1 Political level

Palestinian Territories shares the other developing countries in lacking of information about accurate national statistics of the amounts of SW produced, the source of waste, or its composition, but the biggest challenge in the region is the existence of the Israeli occupation, which controls the resources, including land and prevent the implementation of development projects. Moreover, Israeli policy in the disposal of their waste, especially hazardous in the Palestinian territories, which increases the negative impact on the citizens and the environment and displays them at risk. As a result of these circumstances, there are difficulties in the planning; management and decision-making regarding SW sector (National Strategy for SWM in Palestinian Territory 2010-2014).

1.3.2 Legislative and organizational levels

In recent years, SW issue in Palestinian Territories has gained significant attention due its environmental, social, and economical consequences. The Palestinian government has sought to promote and advance this sector through the adoption of some actions such as the passage of Law No. (1) of 1997 regarding Local Government, Environment Law No. (7) of 1999 and the Public Health Law of 2004, which are the most relevant laws to SWM. In addition to other laws, such as the Investment Law, the Water Law, the Agriculture Law and other laws which are indirectly related to SWM sector. The Palestinian government has also prepared regulation drafts of SWM (National Strategy for SWM in Palestinian Territory 2010-2014). But laws enforcement are not been effectively implemented.

In general there is a lack of organization and planning in waste management due to insufficient information about regulations and due to financial restrictions in many developing countries (Al-Khatib et al., 2007).

1.3.3 Technical and environmental levels

In the Palestinian territory and particularly in the West Bank, MSW disposal is considered a problem due to several reasons mainly: groundwater aquifers location, the small area of the West Bank, the lack of sanitary landfills, and the lack of any serious recycling programs (Talahmeh, 2005; Al-Khatib et al., 2007). And as mentioned before there is a shortage in information about accurate national statistics of the amounts of SW produced and the source of waste, or its composition.

1.3.4 Financial level

Palestinian occupied territories as any developing country typically have insufficient funds to plan for, design, construct and/or operate and maintain even basic solid waste management collection, processing, and disposal systems and facilities. Often grant, foreign aid, and/or loan funds have been made available to pay for or subsidize the construction of modern waste management facilities, but adequate funding mechanisms typically are absent to cover debt service, on-going operations and maintenance expenses, and/or recruiting and adequately training skilled facility operators (World Bank, 2012).

1.4 Cleaner production concept

Cleaner Production can be defined as "the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase overall efficiency, and reduce risks to humans and the environment" (Abbasi et al, 2004; ˇZarkoviˊca et al, 2011). Cleaner Production can be applied to the processes used in any industry, to products themselves and to various services provided in society" (UNDP, 2002). Waste minimization, reduction at source, pollution prevention, eco-efficiency etc. are synonyms for cleaner production (Shkoukani, 2008; Cagno, et.al, 2005).

Sustainable development strives for continued introduction of preventive techniques into production processes, services and our everyday lives. The two most important actors in the disseminating of sustainable principles through industry and society are cleaner production centers (CPC) and spin-off companies (Petek et al, 2000). Three main requirements for sustainable development are: resource conservation (water, energy, nonrenewable raw materials), environmental protection (reduction of the adverse impact on the environment of all human activities), and social and economic development (restraint of population growth) (CSW, 1993; Glavic et al, 1996).

Across the world, a growing commitment to sustainable development is leading to businesses reassessing their management practices. Cleaner production is now the basis for industries' approach to waste avoidance. Increasingly companies are looking beyond compliance and are focusing their investments to optimize both environmental and economic outcomes. The role of government in these changes is to set the signposts, to map out the pathways for the future and to provide a safety net for when systems fail (EPA, 1998).

Different industrial sectors have applied cleaner production concepts as preventive measures in order to increase eco-efficiency, reduce risks to both humans and the environment, and save natural resources since people are becoming increasingly aware, more than ever, of shortages in natural resources and of increases in air, land, and water pollution (Abbasi and Abbasi, 2004). Waste minimization techniques can provide long-term benefits to industries such as waste reduction, promoting a positive public image, improving product quality, improving the health and safety of employees, cost savings, improved compliance, process and operation efficiency, and reducing liabilities (Taylor, 2006; Glavic and Petek, 1996).

The waste minimization procedure developed by the United States Environmental Protection Agency (US EPA) was first used and later extended by additional steps which were found appropriate for use in process industries in order to obtain optimal waste minimization options (Glavic and Petek, 1996).

Improvements in the operating practices, product design, process design, the work culture and the technology had been realized that the fundamental solutions to the industrial pollution problems. The experience of various industries world-wide, which have implemented pollution prevention measures, reveals that with proper housekeeping and some minor modifications in the operating practices and techniques, it is possible to achieve at least a 20–30% improvement in productivity. Moreover, the rate of return on investments in pollution prevention and waste minimization projects is often found to be very attractive (Rathi, 2003).

The focus of international cooperation as well as multilateral funding agencies has been on environmental management professionals for promoting cleaner production rather than on project/process professionals. This has led to environmental management agencies and pollution control boards as the focal points rather than the industrial developmental agencies and the financial institutions (Rathi, 2003).

The hierarchy of the waste management practices with regard to environmental protection priority ranking of waste management methods are: elimination: which is complete elimination of waste, prevention of waste production shall be considered as the initial feasibility at design stage and may determine if the project proceeds, waste minimization by source reduction: avoidance, reduction or elimination of waste generally within the confines of the production unit, through changes in industrial processes, procedures, products or input materials, recycling: the use, re-use and recycling of waste in existing or another processes, treatment: destruction, detoxification, neutralization, etc. of waste to obtain less harmful substances, and finally disposal: discharge of waste to air, water or land in properly controlled or safe ways such that compliance is achieved; secure land disposal may involve volume reduction, encapsulation, leaching of containment and monitoring techniques (Glavic et al, 1996).

1.5 Goal and objectives

The main goal of this research study is to evaluate the existing ISWM practices and assess the opportunities for the application of cleaner production principles in six industrial categories in Hebron governorate. These categories comprise: food and drink manufacturing, textile manufacturing, pulp and paper products, basic metal manufacturing, basic chemicals manufacturing, and plastic manufacturing; these classifications were based on Standard Industrial Classification of All Economic Activities For West Bank and Gaza Strip (PISIC) that based on International Standard Industrial Classification of All Economic Activities, Third Revision (ISIC), (PCBS, 1996).

In order to achieve this main goal, the following objectives should be accomplished:

- Examine the current ISW management practices on localities and factories levels.
- To assess level of services provided by municipalities or village councils for ISWM.
- To estimate quantities of ISW generated from the six industrial categories.
- Identify the opportunities of practicing cleaner production (to recycle, and reuse of ISW) in industries and the readiness of the owners and managers for that.

1.6 Characteristics of the study area

1.6.1 Location:

The study area is Hebron governorate which is bounded by Bethlehem district from the north and by the 1948 green line from the other directions; it is located in the southern part of the West Bank at about 36 km to the south of Jerusalem, and figure 1.1 shows its location within the West Bank.

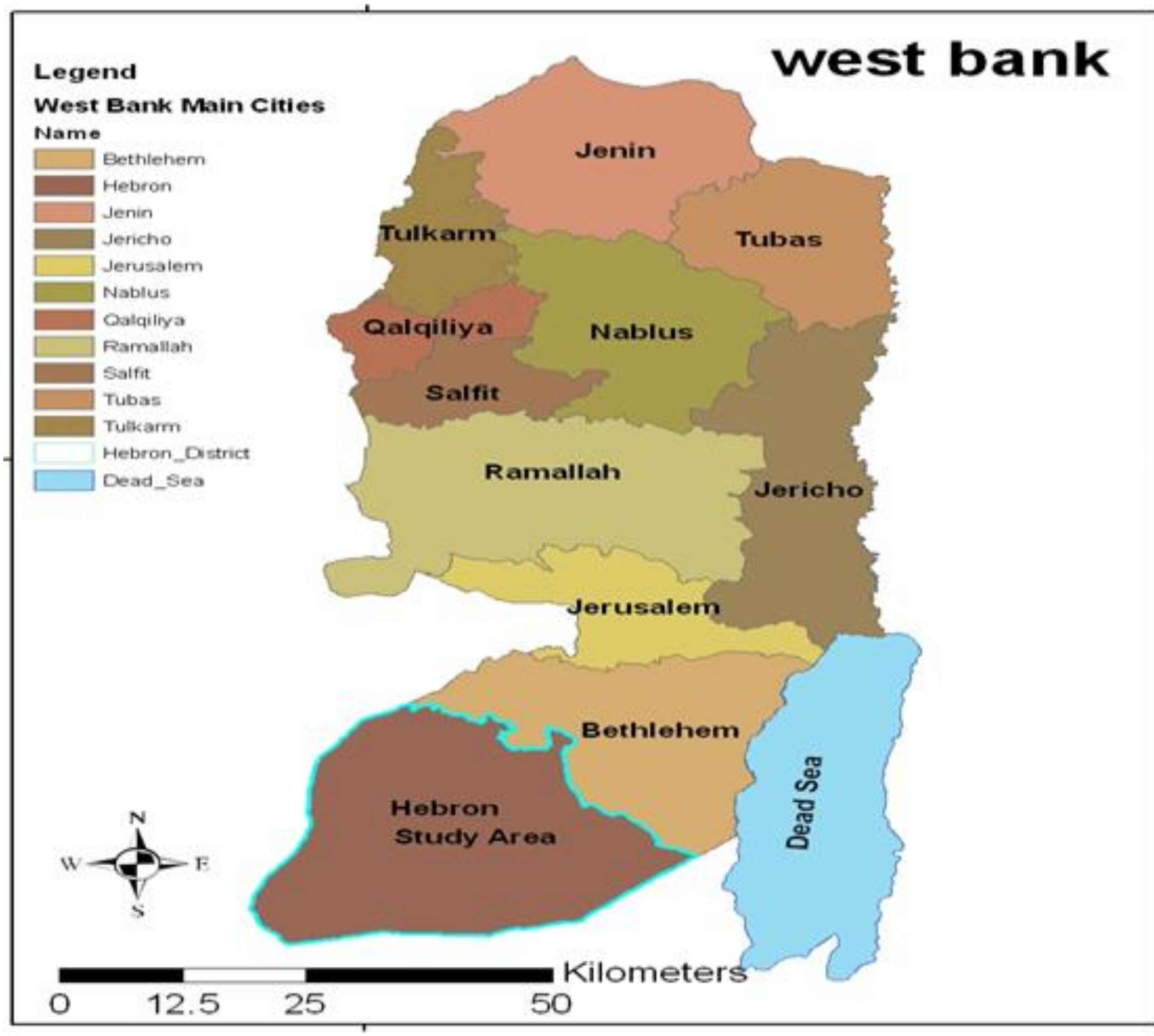


Figure 1.1: The study area within the West Bank. (Source: Al-Batnij, 2009)

1.6.2 Demographic Features

Hebron governorate is the largest one in the West Bank in terms of size and population; total population of Hebron governorate was 551,130 persons which represent 14.7 % of the total population of Palestine, the large number of population indicates large number of housing units, so Hebron governorate contains 103,086 housing unit (PCBS, 2008). Around 182 Palestinian built up areas are located within the governorate, and the total area is about 1,067.0 km^2 (ARIJ, 2009).

The population has many activities, including: Agriculture, Industry, and trade. Figure 1.2 shows that Hebron and Yatta are the only communities that their inhabitants exceed 40,000, while Dura, Halhoul, adh-Dhahiriye, Bani Na'im and Idhna fall in the 20001-40000 population class. Beit Ummer, Beit Fajjar, Beit Ula, Surif, Sa'ir, Tarqumiya, Taffuh, and As Samu fall in the 10001-20000 population class, and other villages have a population less than 10000 inhabitants.

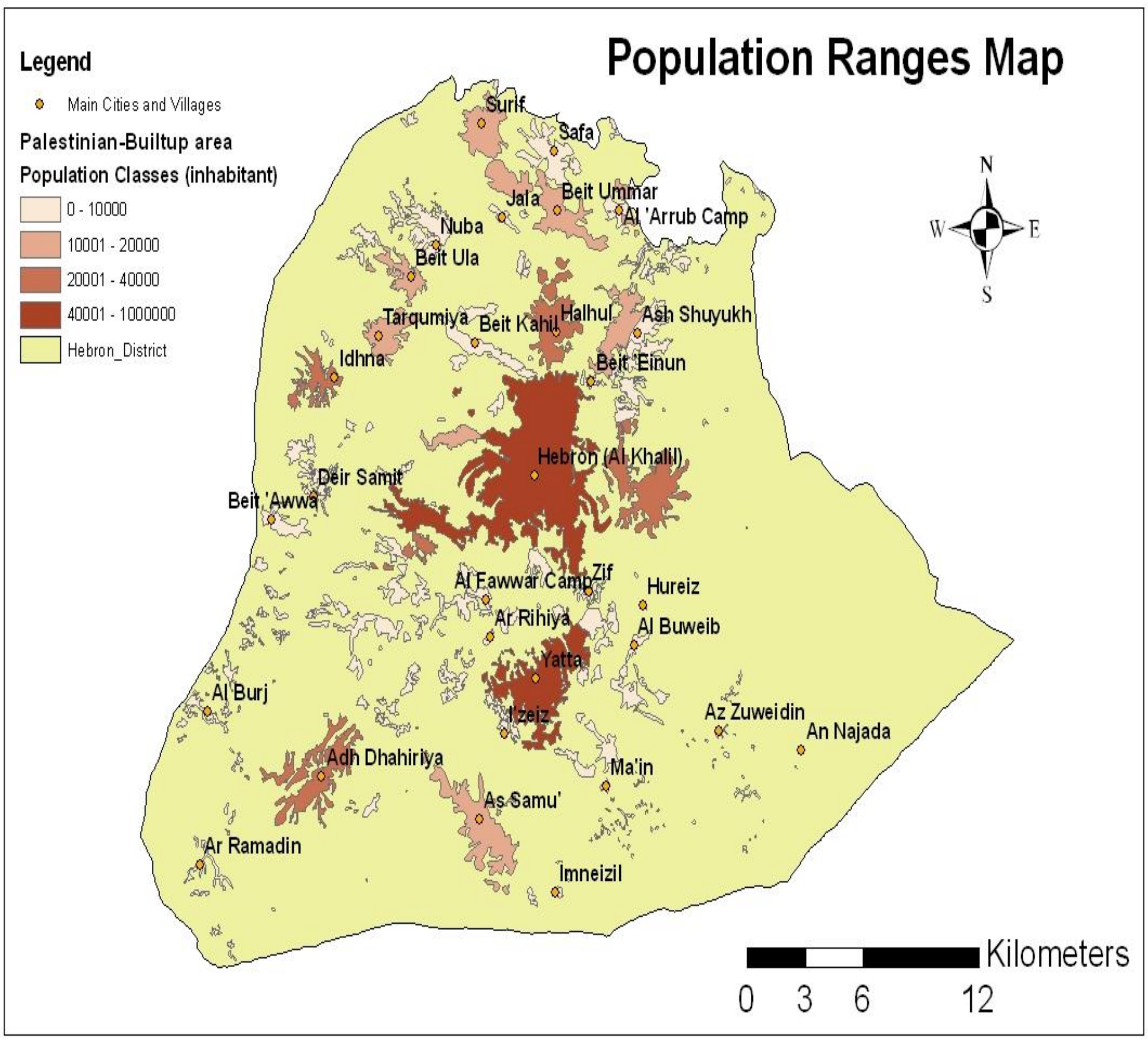


Figure 1.2: Population ranges of the Hebron District. (Source: Al-Batnij, 2009)

1.6.3 Topography

The elevation of Hebron plateaus as shown in figure 1.3 are ranges from 100m above sea level, (east of 'Arab az-Zuweidin community at the eastern part of the study area), to 1021m above sea level (at Hebron Mountains) and between 450m and 1021m high, with dominating breaker and barer rocky landscapes (PCBS, 2005).

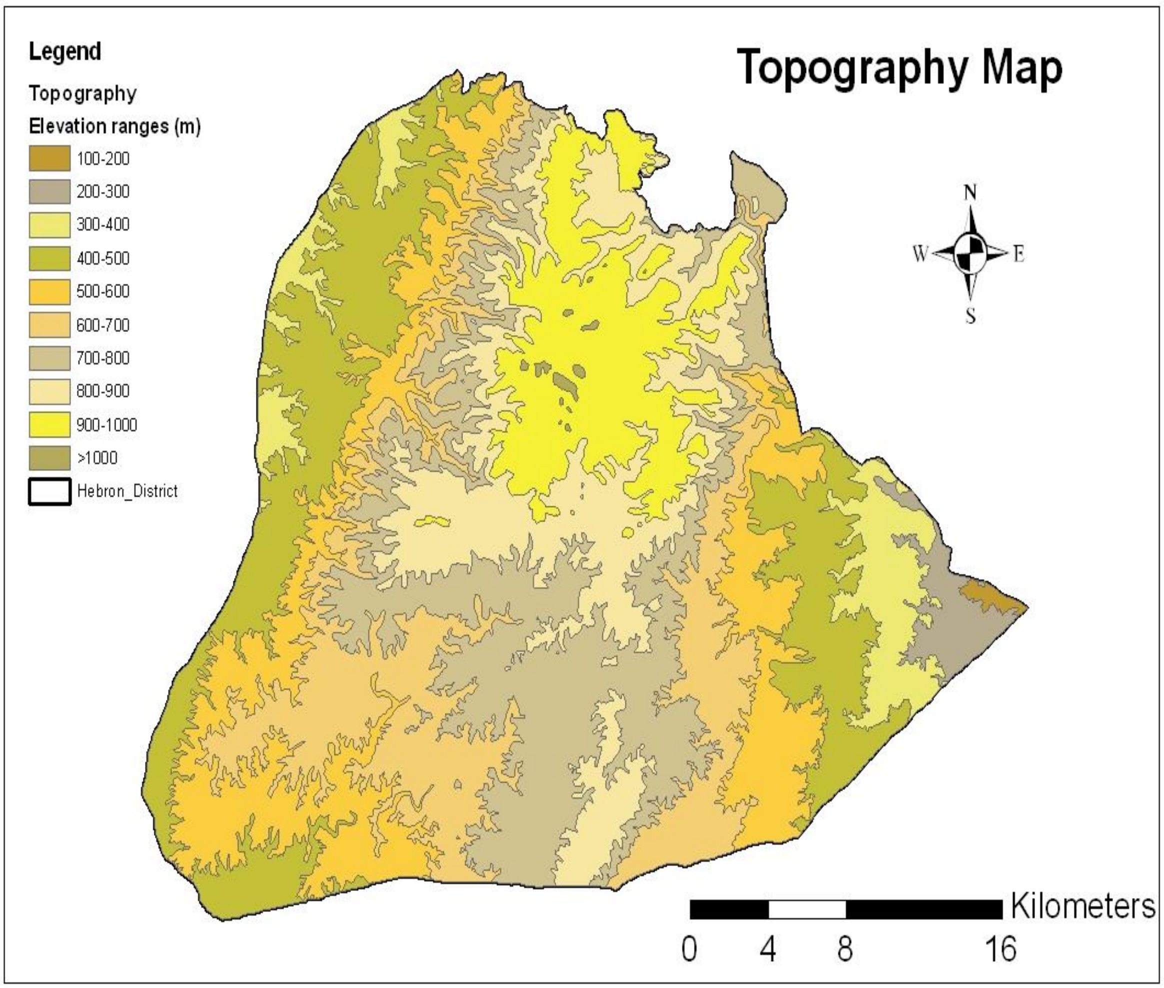


Figure 1.3: Topography Map of the Hebron District. (Source: Al-Batnij, 2009)

1.6.4 Local bodies

There are 56 local bodies in the Hebron Governorate, 17 of which are run by municipalities; compared with only four municipalities in the year 1994. These municipalities are Hebron, Halhul, Yatta, Dura, Surif, Beit Ula, Tarqumiya, Idhna, Beit Ummar, Sa'ir, Kharas, Esh Shuyukh, Bani Na'im, Taffuh, As Samu', Edh Dhahiriya, and Beit Awwa. There are also two refugee camps in the governorate, which are Al Fawwar and Al 'Arrub Refugee Camps, these are run by refugee camp committees. Other built-up areas are run by 20 village councils, and 17 project committees. Figure 1.3 shows local bodies of the Hebron District.

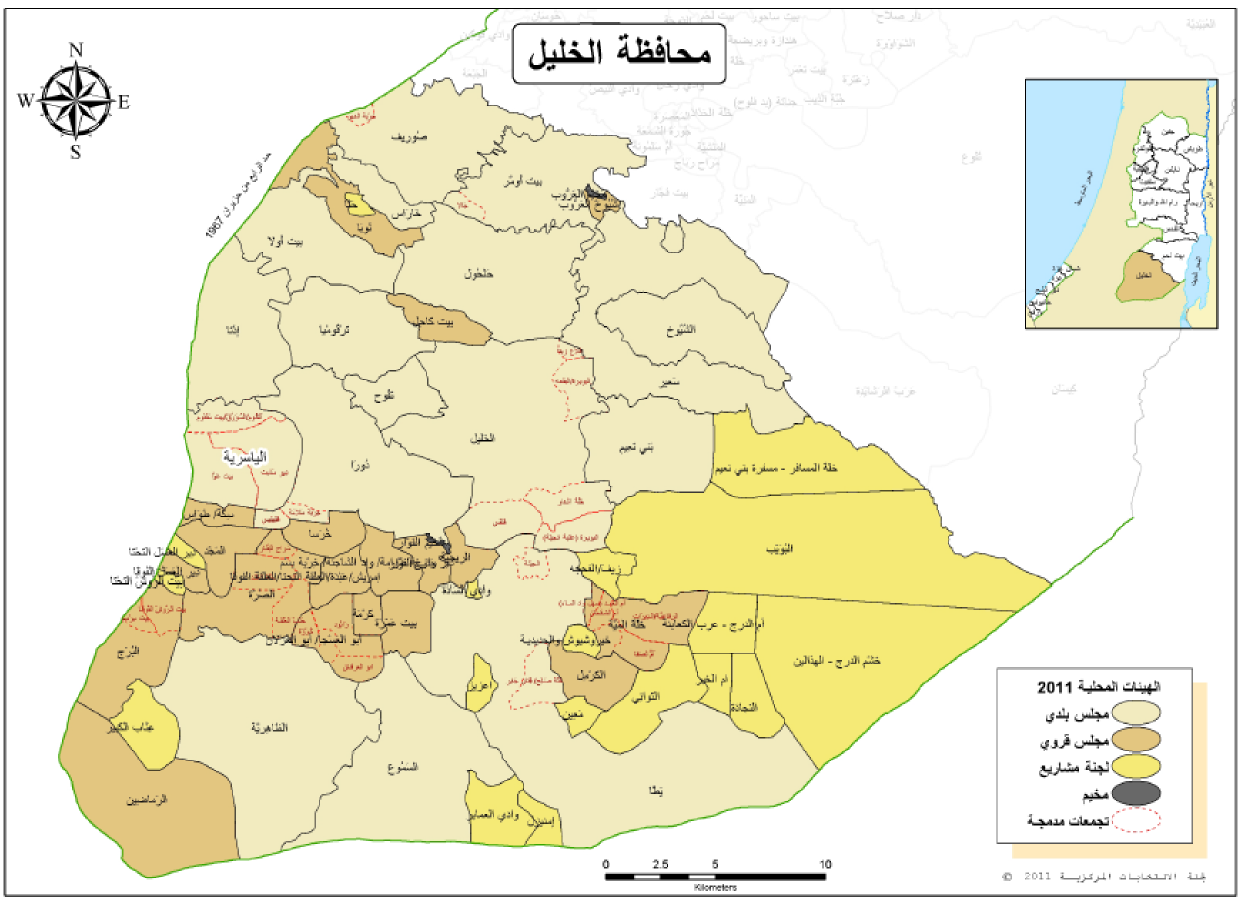


Figure 1.4: Local bodies of the Hebron District. (Source: Ministry of Local Government and the Central Election Commission, 2011)

1.6.5 Land use:

Land use classes are distinguished as: Palestinian built up areas, Israeli settlements, closed military areas and bases, natural reserves, forests and cultivated areas as shows in figure 1.5:

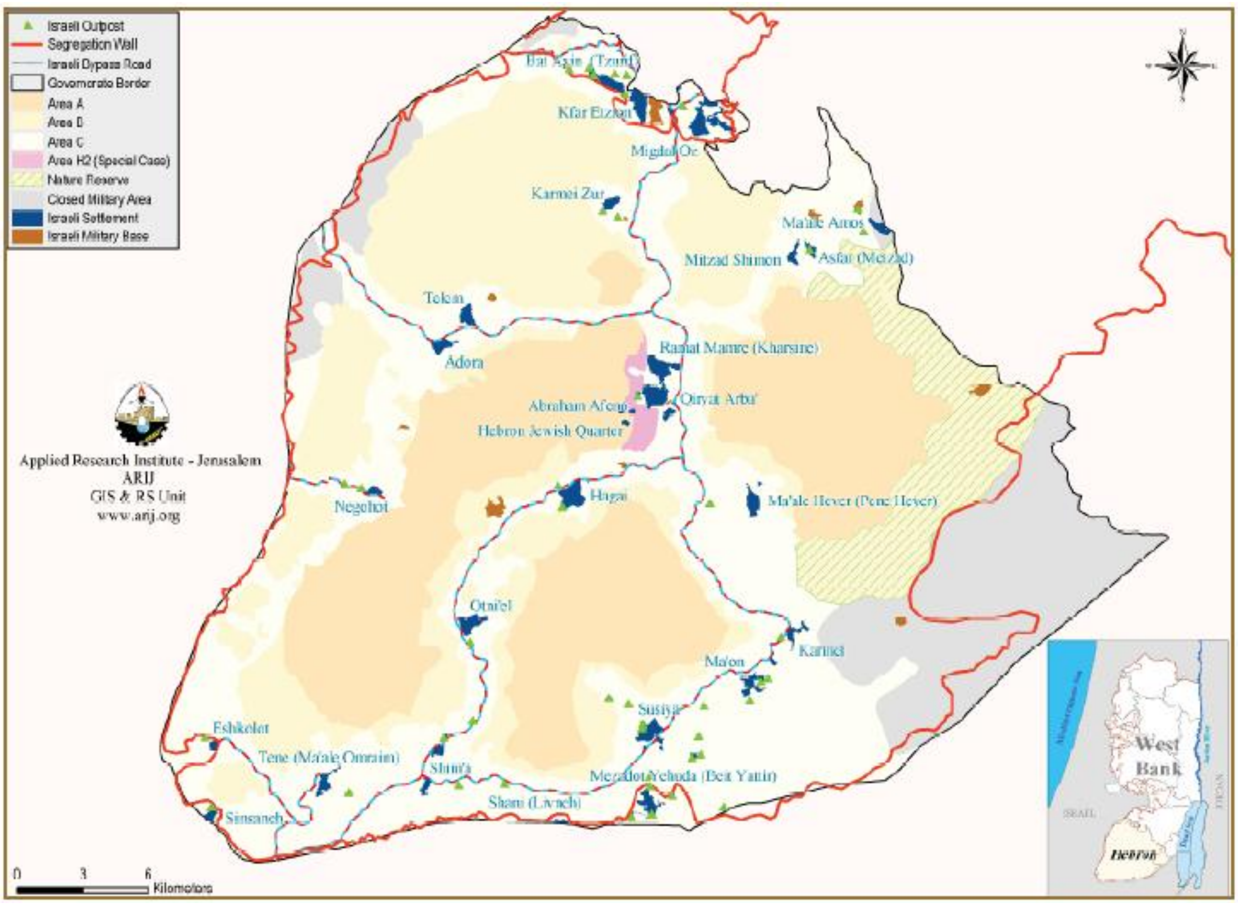


Figure 1.5: Land use of the Hebron District Map. (Source: ARIJ, 2009)

1.6.6 Hydrology:

1.6.6.1 Water Resources (springs and wells):

Hebron district is of highly valuable agricultural land and of low to highly sensitive recharge area. This is based on the relatively high rainfall averages in Hebron and Halhoul mountainous areas, being part of the recharge areas for the upper and lower regional aquifers of the West bank, karstic features, fertile soil, existence of about 170 springs and dug wells and the fact that more than 30% of the area is used for cropping and forestry. The study area is of high ecological significance and it contains so many springs and dug wells since the Romans period. Nowadays there are just 12 springs and 53 wells are used by Palestinian's (Awadallah et al, 2005). Figure 1.6 shows the water resources map.

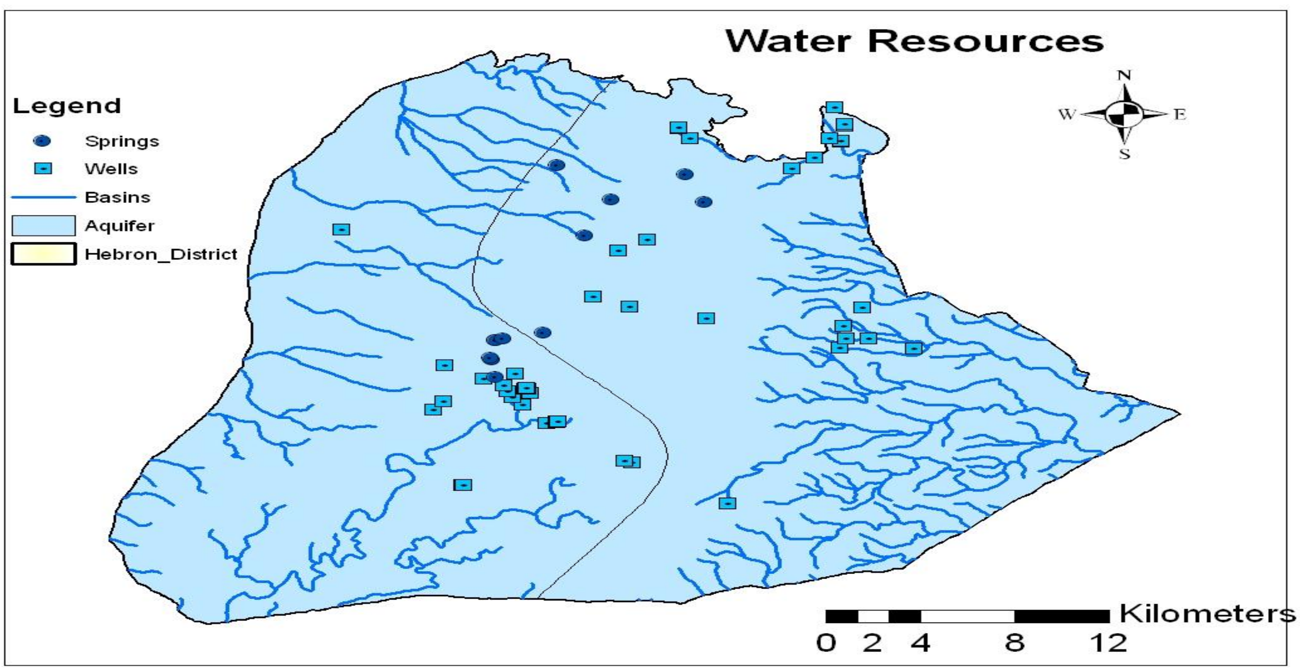


Figure 1.6: Water Resources Map. (Source: Al-Batnij, 2009)

1.6.6.2 Precipitation:

Hebron district has a semi-arid, Mediterranean climate and has about four rainy months (November-March). The average annual rainfall in the western part of the study area varies from 300 mm in the south to 500 mm in the north. In the eastern part it varies from 100 mm to 200 mm. in the mountains, the average annual rainfall varies from 500 to 700 mm in Hebron and Halhoul regions (PCBS, 2005) as shown in Figure 1.7.

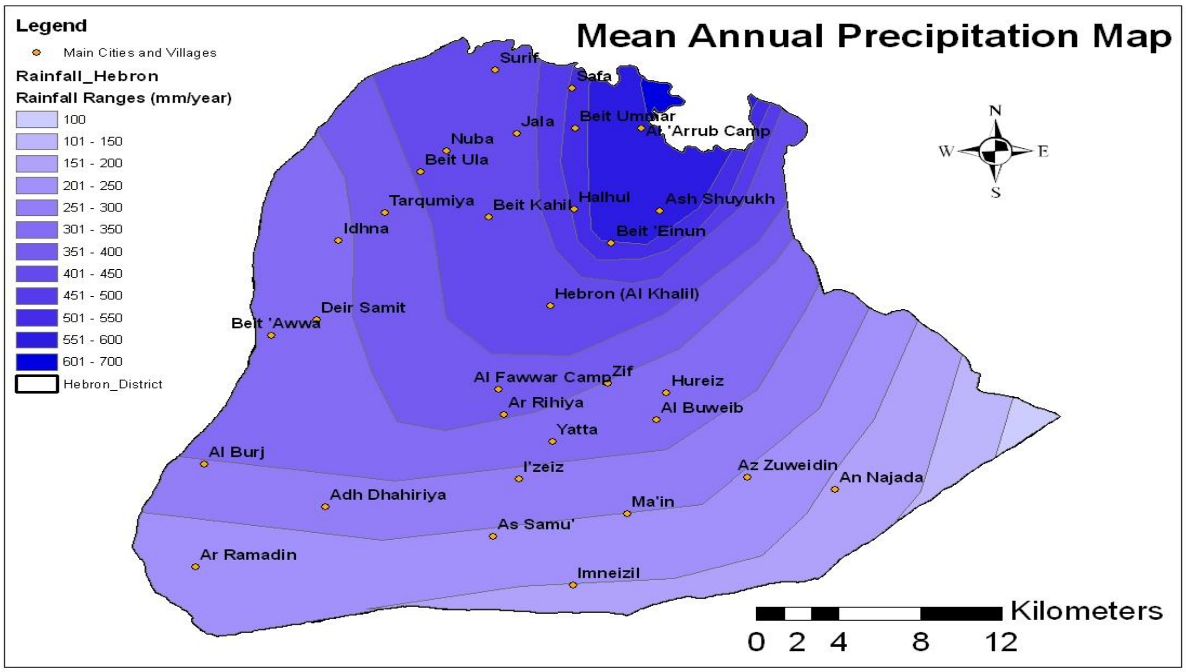


Figure 1.7: Mean Annual Precipitation Map. (Source: Al-Batnij, 2009)

1.6.6.3 Climate:

The Study area is highly influenced by the Mediterranean climate, which is characterized by long, hot, dry summer and short, cool, rainy winter. Rainfall is limited to the winter and spring months, mostly between November and March, summer is completely dry. Snow and hail, although uncommon, may occur in the area especially over the highlands, Hebron, Halhoul, Dura, and Beit Ummer (PCBS, 2005; Awadallah et al, 2005).

1.6.6.4 Temperature and Humidity:

The mean annual temperature in the western and eastern parts of the study area varies from 19 to 21 ºc at Idhna, Tarqumya, Beit Awwa, Beit Ula and east of Arab az-Zuweidin and an-Najade, and decreases to 15ºc at mountainous regions. At these mountainous areas, the average temperatures vary slightly from one part of the region to another depending on the altitude. Lower temperature characterizes Hebron and Halhoul areas, which include mountainous areas with elevations exceeding 1000 meters above sea level. The average monthly air temperature in the study area was 8ºc in winter and 26ºc in summer, with a maximum average monthly temperature of 38ºc and a minimum temperature of -3ºc (Awadallah et al, 2005). The annual mean relative humidity ranges from 55% to 60% at the western part of the study area, it reaches 50 % at the eastern part of the study area, and decreases to 50%-55% at mountainous regions (PCBS, 2005).

1.7 Economic situation in the governorate

Hebron district is one of the most economically active districts, with its exports reaching 10.75 million dollars, out of the 39.3 million dollars of the overall Palestinian exports, as stated by a statement by the Palestinian Federation of commerce chambers on 03/12/2008 (Hilal et al, 2011). The Palestinian industrial sector developed significantly and increased its share in GDP after the creation of the Palestinian Authority in 1994 from 13.3% in 1994 to 16.5% in 1998 (Hilal et al, 2011), while this percentage decreased to 14.6% in 2003, according to the Palestinian Central Bureau of Statistics 2001, The contribution of the industrial production to Palestinian GDP was 15.3%, 14.9% and 14.6% in 2007, 2008 and 2009 respectively (PCBS, 2010).

The economic situation in the Hebron governorate is not largely different from other Palestinian cities. It moves through a fluctuation range and depends, to the large extent, on the stability of the political situations. The industrial sector still suffers from dependence on Israeli industry which has affected its development and growth. In addition, the procedures and practices of Israel since 2000 such as closures and the Israeli military siege on Palestinian areas in the West Bank and Gaza Strip has negative impact on Palestinian industrial sector; productive ability dropped in all Palestinian industries and in all governorates of the West Bank and Gaza Strip, and the industrial sector sustained much damage because of the siege and its impact on the movement of people and goods, the increase in time, the associated costs, and creating unpredictability in trade flows and market shrinkages (World Bank, 2007; and Hilal et al, 2011). Another difficulty that Palestinian industries suffer from is the reliance of many of them on Israeli and foreign raw materials, which leads to rising production costs, reduces the quality of the product, and makes these industries vulnerable to changes and the political situation, resulting in the decline of these industries (Hilal et al, 2011).

1.8 Industrial sector and development

Hebron is one of the largest industrial governorates in Palestine, comprising 33% of the Palestinian national economy (Hilal et al, 2011), as the value of exports for the years 2009 and 2010 in the food and drink manufacturing, textile manufacturing, pulp and paper products, basic metal manufacturing, basic chemicals manufacturing, and plastic manufacturing was 51,695 and 54,420 in thousand US$ respectively (PCBS, 2012).

The industrial sector is one of the important productive sectors, playing a special role in economic development and having the ability to create the required growth in all economic, political and social areas. The development of the industry sector has become a major goal for developing countries in order to achieve desired economic development. Developing the industry sector means achieving a high rate of economic growth, creating many job opportunities and increased economic diversification necessary to achieve general economic and social growth. The Palestinian industry sector consists of three main activities: mining and quarrying (extractive industries), manufacturing, and supply of electricity, gas and water. Manufacturing is considered the largest branch of the industrial sector, accounting for more than 95.8% of its facilities (Hilal et al, 2011).

The advantage of Hebron is the availability of one of the most important components of any industry: raw materials, where it is endowed with raw materials for food industries (agricultural products and milk) as well as leather (livestock in the governorate) in addition to raw materials for the construction industries (stone, marble and remnants of cut stone), and also cosmetics and other crafts, these industries could provide economic opportunities, according to the situation of the governorate; complementary services to industries in general also provide an important economic opportunity, particularly those that support them through marketing and packaging and those that provide design work for the timber, mineral and leather industries (Hilal et al, 2011).

Hebron is famous for shoemaking and leather industries which constitute about 40% of the total industries in the governorate, the stone industry which constitutes 15% (the marble and stone industry known as the white petrol of Hebron), the textile industry at 22% and metallurgical industries at 14%, and it is also famous for concrete, basic metals, plastics, dairy and food products, furniture, soft drinks and also traditional industries such as making pottery, glass, ceramics, clothing, embroidered hand-made carpets and other crafts, (Alhalahlah, 2006; Hilal et al, 2011). The most famous Hebron institutions factories are: Petropal Factory, Spongy Mattress

Factory, Plastic Factory, Sandpaper Factory, Cleaning Substances Factory, Milk Products Factory, Electrod Factory, Shoes Factory, Solar Heat Factory, Metallic Manufacture, Concrete Factory and Cutting Stone Factory (ARIJ, 2009).

The majority of establishments of the industrial sector were found to be micro, small and medium enterprises, and these industrial facilities face many problems in the areas of administration, finance, marketing and packaging (Hilal et al, 2011). Table 1.1 below shows the number of establishments in operation in the private sector, nongovernmental organization sector and government companies in Hebron Governorate by main economic activity and employment size group.

Table 1.1: Number of establishments by main economic activity and employment size group, 2007

No.	Economic Activity	Employment Size Group						Total
		+100	99-50	49-20	19-10	9-5	4-1	
1	Manufacture of food and beverages	3	1	3	12	51	247	317
2	Manufacture of textiles	1	0	1	10	9	80	101
3	Manufacture of paper and its products	0	1	2	1	3	7	14
4	Manufacture of chemicals & its products	0	0	2	1	5	20	28
5	Manufacture of rubber and plastic	1	0	5	10	21	26	63
6	Manufacture of basic metals	0	0	2	4	6	20	32

Source: PCBS Palestinian General Census of Population, Housing and Establishment Census, 2007

Hebron municipality data indicated that nearly 50% of the total labor force in the city is mainly dependent on Trade sector. Agriculture and Industrial sectors form the same percentage as 15% for each. The Employment in governmental and private sector is only about 5% of the labor force working in this sector. The Israeli labor market sector comprises of about 5% of Hebron workers (ARIJ, 2009).

2. Chapter Two: Literature Review

2.1 Introductory remarks

Industrial solid waste has been a problem since the Industrial Revolution. Globally, countries have been divided into developing and developed on the basis of their development, different abilities, polices, and resources to deal with solid waste problems. Developed countries have established legislation to deal with such problems while for developing countries such legislation and polices have still been under processing and some countries can't even create an action plan to deal with industrial pollution (Al-Qaydi, 2005). Developed countries are busy in developing and implementing waste-to-energy technologies associated with energy recovery, composting for waste avoidance, and recycling and reuse, while developing countries are still struggling to decide on the best options to treat and dispose of waste (Mrayyan and Hamdi, 2006).

Industrial solid waste management forms an essential issue that related directly with public health and environment. Industrial wastes vary considerably in quality and degree of seriousness, depending on the type of industry, manufacturing methods, and material used. Industrial wastes can be classified into hazardous and non-hazardous wastes due to their constituents, non-hazardous wastes can be stored, collected, treated and disposed of along with domestic solid waste. Hazardous wastes are more dangerous due to their nature and need more attention to deal with. Industries in general are more likely to exceed ecosystem self-remediation capacities, which will pose a higher public health and environmental risk potential, many of the problems associated with the ISW produced from malpractices during storage, collection, transferring, and treatment as well as disposal (Mbuligwe et al, 2006).

Worldwide, in the early 1980s the management of hazardous wastes has received much attention due to its toxicity and infectious nature. Many industries produce solid waste materials from fabrication, chemical, refining, power generation and other processes. Toxic chemicals found in industrial wastes include metals and inorganics, PCBs, polyaromatic hydrocarbons (PAH), halogenated aliphatics etc. (Mato et al, 1999).

An advanced system of industrial solid waste management is composed of several functional elements. In such a system, all steps of management from the generation of waste to the final disposal step are considered carefully. The different functional elements of modern industrial waste management are: generation and storage; pollution prevention and waste minimization; recycling and reusing; collection and transferring; treatment; and disposal (LaGrega et al. 2001; Mokhtarani et al, 2012).

2.2 Industrial Solid Waste Management in developed Countries

The usual way to dispose of industrial waste in the developed countries was to discharge into the sea, rivers, and watercourses, or buried in dumpsites. However, with increase industrial activities in Europe and America during the modern industrial rise, and increased quantities of hazardous wastes that caused many problems to environment, prompting them to issue strict laws to protect the environment from the dangers of waste and not allowed the burial in their territories. As a result the developed countries have found ways to dispose of their waste without leaving adverse effects on the their environment, although in turn polluting the Third World environments, which is known as the export of waste from the developed world to the developing world.

Developed countries like the US, the UK, France, Germany, Japan and the Netherlands, among others; have detailed lists of substances, processes, industries, or wastes considered hazardous. The US Environmental Protection Agency (EPA) has a list of at least 126-priority pollutants (LaGrega, 1994; and Mato et al, 1999) and similar lists exist in the European Community (EC) as well. Regulatory requirements in developed countries prevent the disposal of industrial hazardous waste in sanitary landfills; however, violations occur in most developing countries (Mrayyan and Hamdi, 2006).

2.3 Industrial Solid Waste Management in developing Countries

Developing countries has many pressing problems of poverty, population, hunger, water, sanitation, public health, or ethnic and political strife, so proper environmental management had not considered as key issue in these countries. Competing priorities of municipalities often consider other public works programmes more important than solid waste management improvements. These include the reliable supply of safe drinking water, the need to collect and treat wastewater, road construction and maintenance, and schools (World Bank, 2012).

World Bank report is cited that the improper solid waste management frequently leads to degradation of local water quality, undue flooding, and increased frequency of vector-borne diseases. Hence, investments in waste management infrastructure can result in many societal benefits, beyond just an increase in the effectiveness and efficiency of waste management and improved aesthetics (World Bank, 2012).

Developing countries has lack of proper management strategies to manage industrial wastes. In these countries hazardous wastes have not received sufficient due attention. In many countries, industrial waste both hazardous and non-hazardous wastes are still handled and disposed of together with domestic wastes and thus posing a great health risks to municipal staff, the public and the environment (Mato et al, 1999). Many treaties, agreements, and conventions were held to overcome the problems of industrialization in developing countries (Halla et al, 1999), as an example the Basel Convention requested from developing countries to take some steps toward creating strategies to manage their industrial solid wastes (Kante, 1999). These steps include: (a) administration and legal issues, and (b) development of the infrastructure and support services, such as establishing recycling and treatment facilities (Al-Qaydi, 2005).

2.4. Industrial solid waste management overview

A study by Liang et al, (2012) showed that China produced 2.0 billion tonnes of industrial solid wastes and 0.2 billion tonnes of household garbage in 2009. China enforced the Circular Economy Promotion Law in 2009 in order to encourage the ‘‘decrement, recycling and resource recovery’’ of solid wastes. Solid waste recycling can reduce resource demands and solid waste generation simultaneously.

The manufacturing industry in Southeast Asian areas (Ngoc et al, 2009) generates many different waste streams from a wide range of industrial processes. Some of the largest waste generating industrial sectors, especially in Singapore and Malaysia, include the production of basic metals, tobacco products, wood and wood products, and paper and paper products. An estimated 19 million tons of industrial waste were generated in 2000 in the Southeast Asian Nations (Hotta, 2007). Waste from the manufacturing sector continues to rise, despite national and international declarations to reduce waste from industry. Although some governments have formulated policies for environmental protection, these policies have been implemented only in the national capital cities. In rural areas, open dumping is still the most commonly used method of solid waste disposal (Ngoc et al, 2009). In Singapore, solid waste is generated by domestic as well as non-domestic commercial and industrial activities. Approximately 1400 tons/ day of this type of waste was generated, from which a maximum of only 9% can be processed.

A study of solid industrial wastes and their management in Asegra (Granada, Spain) was carried out by (Casares et al, 2005) presented percentages of classification of industrial activities that encompassed: services (53%), transport and distribution (16%), metal (4%), food (1%), construction (1%), cars (3%), agriculture (1%), wood (1%), and others (20%). This study also presented the percentages of types of wastes as: paper and cardboard (27.99%), glass and crystal (4.33%), plastic (21.12%), wood (15.52%), metals (11.45%), textiles (1.27%), inert (2.8%), organic wastes (3.56%), tires (1.78%), and hazardous wastes (10.18%). The mean generation rate of industrial waste was 83,063 kg per week and the total waste volume is 427.6 m3 per week. For the waste management about 69% by weight of the wastes generated are well managed, while 31% has many management problems, this study defines the correct management that takes into account activities without negative environmental impact as: minimization, reuse, recycling, valorization and elimination in sanitary landfill. Paper and cardboard are correctly managed in 75% of the cases, as well as 75% of metals, 86% of inert wastes, 41% of tires, and 83% of hazardous wastes. Industries that produce hazardous wastes in large quantities were correctly managed them, whereas they were incorrectly managed by most of the small producers.

According to this study, 10.5% of the industries had an employee responsible for waste management and about 20.6% were interested in being involved in waste management activities. Only 7 industries out of 170 had a quality certification; and just 4 of them had plans to implement an Environmental Management System.

A study of industrial solid waste disposal in Dubai by (Al-Qaydi, 2005) showed that more than half of Dubai's establishments were specialized in manufacturing fabricated metal, non-metallic products, food, and furniture. In 2001 industrial solid and hazardous wastes came in the third level of the solid waste quantities, representing significant growth in this sector. Most of the industrial solid wastes consist of various types of used or unfinished materials such as used parts, wood, glass, metals, asbestos, aluminum, plastic materials, tires, and electronic devices.

A study by (Mbuligwe et al, 2006) in Dar es Salaam City investigated the industrial solid waste management practices as follows:

- Solid waste sources and generation: 11% of the industries in Dar es Salaam city produce significant quantities of non-process ISW which is the wastes that produced from the activities that support industrial operations, the other 89% of the industries produce process ISW which is produced from industrial operations. The total quantity of ISW generated in Dar es Salaam City depends on whether or not intra- and inter-industry reuse and recycling are taken into consideration. The food and beverage category of industries generates the largest quantity of waste.

- Solid waste storage: Open-air piles account for 43% of all storage facilities, other storage facilities are metal and plastic bins (34%), open masonry enclosures (11%), 200 l used oil drums (6%), covered masonry enclosures (4%), and concrete silos (2%).

- Industrial solid waste collection and transportation: 40% of the total quantity of ISW is collected by private SWM contractors, while the individual industries that collect and transport their own waste collect the remaining 60%.

- Industrial solid waste treatment/processing and disposal: the main methods for the final disposal of ISW are Vingunguti and Mbagala municipal disposal sites, the proportion of the industries that use these disposal sites are (56.9%), (37.9%) respectively, and (5.2 %) of industries use onsite disposal.

- Cleaner production practices - cleaner production technologies (CPTs): The categories of the industries that practice CPTs formally in Tanzania are:

- Pulp and paper industry with intra- and inter-industrial recycling of waste paper and waste minimization as main CPT aspects practiced.
- Basic industrial chemicals with General waste minimization and inter-industry reuse and recycling of waste soap as raw materials as main CPT aspects practiced.
- Metal industries with Intra- and inter-industrial recycling of scrap metal; recycling of waste metal bars and general waste minimization as main CPT aspects practiced.

-Industrial reuse and recycling of solid waste: the major categories of industries in which recycling and reuse of recovered solid waste materials take place in Dar es Salaam city are

Pulp and paper industry, Chemical industries, Food and edible oil, Beverage industries, Fabricated metal, basic metal products, and Agro-industries.

A study in Poland by (Jurczak, 2001) shown that the issue of waste is increasingly topical, because of the increase in the amount and due to the lack of an efficient system for its management with its impact and utilization on the environment. Of approximately 145 million tonnes of waste produced currently every year in Poland, 133 million tonnes of them are account for industrial wastes. By 1992 Poland used to be one of the Europe's largest sources of industrial waste. The main sources of industrial wastes were coal and ore extraction, the power industry and metallurgy. Landfilling is still the cheapest and most common method of both industrial and municipal waste disposal in Poland. Incineration, composting, and neutralization are other utilization methods of wastes but in small scales. More than half of the industrial wastes are re-used, specially wastes from coal mining and processing, the power and metallurgical industries. The amount of re-used wastes has increased at the end of the last decade (50.2% in 1985, 61.3% in 1998). The highest degree of utilization is noted for metallurgical slag, fly ash from bituminous coal combustion in power stations (66%), waste lime from carbide production, and mining wastes

Hogland and Stenis (2000) describe a method of organizing an industrial waste management system in Sweden, this method is characterized by both an energy recovery and a material recovery system and proposed emphasizes the optimization of waste management with regard to energy, economy and environmental impact in separate evaluations (Casares et al, 2005).

(Raymond and Cohen-Rosenthal, 1998) in Finland, Australia, Austria, Canada, and (i.e., Dallas, TX, Albuquerque, NM, Detroit, MI, Los Angeles, and Alameda, CA) (Deppe et al., 2000) in the United States refer to the concept of an ‘‘eco-industrial park’’, which integrates business, environmental excellence, and community relations to create economic opportunities and improved ecosystems (Casares et al, 2005).

(Jurczak, 2001) in Poland, and (Collins, 2000) Germany, (Hogland and Stenis, 2000) Sweden and (Deppe et al., 2000) the United States there is active tax policy which is considered a solution that are using at the moment with the cooperation of local authorities or under the pressure of public opinion (Casares et al, 2005).

In 1988 Haskoning and Konsult Ltd (Consulting firms), jointly did the study on industrial solid waste for the Dar es Salaam City. They studied 33 industries, including various categories of production processes and levels as follows: Food and beverage, Cotton industry, Metal industry, Paper and wood industry, Shoe and leather industry, Plastic industry, Pesticide industry, Pharmaceutical, and industry Products (Mato et al, 1999).

Kiunsi in 1993 conducted an inventory study and found that more than 122 industrial establishments in Dar es Salaam produce hazardous wastes summarized as: Paint products, Plastics, Paper products, Agricultural and livestock ,Abattoirs Heavy industries, Drugs and chemicals, Petroleum, Canning, Vegetable mills, Rubber, Tobacco, Milling and food processing, Textiles (Kiunsi, 1993 and Mato et al, 1999).

2.5 Cleaner production overview

A recent study by Liang et al, (2012) investigated impacts of urban solid waste recycling on urban metabolism and how it contributes to sustainable urban solid waste management and urban sustainability by using a physical input–output model and scenario analysis; urban metabolism which can be defined as interactions between a particular economy with the natural environment and other economies through material flows and also economic sectors within the economy with one another. Urban metabolism of Suzhou in 2015 is predicted and impacts of four categories of solid waste recycling on urban metabolism are illustrated: scrap tire recycling, food waste recycling, fly ash recycling and sludge recycling. This study concluded that sludge recycling has positive effects on the reduction of all material flows. Thus, sludge recycling for biogas is regarded as an accepted method. Moreover, technical levels of scrap tire recycling and food waste recycling should be improved to produce positive effects on the reduction of more materials. Fly ash recycling for cement production has negative effects on the reduction of all the materials except solid wastes. Therefore, other fly ash utilization methods should be exploited. In addition, the utilization and treatment of secondary wastes from food waste recycling and sludge recycling should be concerned.

An article by (Imteaz et al, 2012) concluded that the recycled crushed glass is a viable material to be used as an aggregate in pavement sub-base material for road pavement construction without posing an undue risk of environmental contamination.

A study of analysis of the sustainability of reusing industrial wastes as energy source in the industrial sector of Taiwan by (Tasi, 2010) focused on the status of industrial waste generation and its management since the year 2002. This paper also presented the updated information about the new/revised regulations concerning the governmental regulations and policies for promoting industrial waste as energy source as well as controlling the emissions of hazardous air pollutants from industrial waste-to-energy facilities.

In high income countries such as Singapore, about 44.4% of solid waste is recycled. In the middle income countries of ASEAN, the percentage of waste recycled is about 12%, and it is approximately 8–11% for the rest of ASEAN. However, recycled waste is mainly composed of plastic, paper, glass, rubber and ferrous. Recycling has been done by the separation of valuable materials by waste-pickers. They remove the most valuable materials, either before garbage enters the waste stream or en-route at households, especially in the lower and middle income areas of many municipalities. Then, waste-pickers sell recovered materials to the mills where waste will be recycled into new products. Waste recycling activity is popular in ASEAN because it is an economically viable undertaking. This undertaking is currently accomplished by medium-scale or household enterprises, and is predicted to grow where it offers a beneficial economic impact (Ngoc et al, 2009).

A study in Europe (EU27, Norway and Switzerland) by (Varžinskas et al, 2009) presented that post-consumer beverage carton packages are treated in three ways: 36% of beverage cartons are dumped in a landfill, 30% serve as energy recovery by incinerated, and 34% recycled. According to this study; recycling reduces the consumption of virgin materials, energy and minimizes the disposal of residues in landfills. Although beverage cartons are a valuable source of second-hand raw materials, its composite structure makes the material recovery more difficult. The major issue is the handling of the poly aluminium mixture that remains after paper fiber recovery.

A study by (Glavic et al, 1996) showed seven heuristic rules of waste minimization procedures that have been proposed and can provide guidelines for the development of good design to decrease waste pollution load and production costs.

1. Eliminate waste materials at their source wherever possible.
2. Rapid low cost reduction in waste generation can often be achieved through changing set points or tightening control variations of key variables. Modifications to single equipment items can also yield significant improvements with little capital expenditures.
3. Recycle waste material within the process. If this is not possible, use off-site recycling.
4. If waste byproducts are formed reversibly within a reaction process, they should be recycled to extension.
5. Use the utility with the lowest practical temperature for all heating duties that require utilities.

6. Minimize the total number of main equipment items in the process, especially in areas that handle toxic materials. Also, minimize the total number of pipe work connections to and from equipment items.
7. Due to practical purposes, continuous processes are preferred to others because pollution prevention is generally more costly in batch operations.

These heuristic rules are useful tools and can be applied in each waste minimization program but they cannot be guaranteed to give the right answers in every case.

Schmidt suggests starting with a ‘closed-cycle economy’. This would prevent the impact of toxic and dangerous materials from affecting the environment and would cause the integration of existing industrial processes into ecological cycles. Materials that cannot be integrated must be completely recycled in the production processes or must be put back into the lithosphere (Schmidt, 1992).

3. Chapter Three: Research Methodology

3.1 Survey design

This study was conducted in Hebron Governorate in West Bank in the occupied Palestinian Territories (oPT). Survey research method was used to collect the data at both localities and factories' levels. The representatives of municipalities, local councils and factories were collaborated in process of assessment. Two structured questionnaires were used, the first was used on the locality level (survey1); particularly for municipalities and local councils and the second was used for factory level (survey 2).

The questions of the two questionnaires were adopted from scientific papers regarding the subject of this study directly and then modification and customization were added to some questions to suit the purpose of the study.

The period of surveying assessment was one week, in during distributed three municipalities questionnaire survey and five factories surveys to examine the questionnaires. Minor modifications were made to both questionnaires and then the final versions were ready for distribution.

During (June, 2012), 17 localities questionnaires were conducted; that included 54 questions distributed on seven parts; questions of these parts were addressed to: general information about the institution and the respondent, temporary storage, (treatment, processing and final disposal), information related to regulations, information related to financial, and information related to waste management employees. The 17 questionnaires were representing the total number of municipalities and local councils in the study area.

From April to December, 2012 the field survey 2 were conducted for the factories questionnaires which include 83 questions distributed on nine parts; questions of these parts were addressed to: introductory questions about the factory, introductory questions about the respondent, general information about the factory, source of wastes, temporary storage, collection and transportation, (treatment, processing, and final disposal), cleaner production principles application, and safety of employees.

Eventually the data were collected and analyzed and results are presented in the next chapter.

3.2 Database for Surveys

This study is not the first one of its kind conducted in the Occupied Palestinian Territories (oPT); however, the scarcity of available data was a challenge. Furthermore, one of the major obstacles found in this study was associated with obtaining data regarding factories from various sources such as Ministry of National Economy (MNE), Hebron Chamber of Commerce and Industry (HCCI), and Hebron Municipality (HM), data were incompatible and not updated recently.

Database was formulated for the six industrial categories: food and drink manufacturing, textile manufacturing, pulp and paper products, basic metal manufacturing, basic chemicals manufacturing, and plastic manufacturing depending on tables from the aforementioned sources. Data was collected using field survey; it was very difficult and took long time; the main constraints in the field survey were refusing of some factories managers or their representatives to respond to the questionnaire since they were afraid that this questionnaire was to do environment or tax audit, and some of them were not respondents due their time limits.

However, the findings of the study could lay the groundwork for further investigations and studies that could lead to the establishment of a reliable industrial solid waste database and of proper industrial solid waste management procedures in the Hebron and other Governorates.

3.3 Sample size

The localities questionnaire sought to cover all localities that responsible to manage industrial solid waste; 17 locality questionnaires were conducted that represent 100 % of returned rate.

The factories questionnaires were distributed among all factories in the six categories as shown in the table 3.1 below:

Table 3.1: Sample size of the factories questionnaires.

Industrial Category	No. of Factories	No. of Non Respondents	No. of Respondents	% of Respondents
Food and beverages	43	18	25	58
Textile	22	5	17	77
Pulp and paper products	23	9	14	61
Basic metal	37	21	16	43
Basic chemicals	15	10	5	33
Plastic	30	16	14	47
Total	170	79	91	Total No. of questionnaires = 170

A total of 170 questionnaires were distributed to conduct survey 2, the returned rate was 54%.

3.4 Industrial solid waste generation rates

To estimate quantities of ISW generated from the six industrial categories, the factories respondents were asked to fill the following table 3.2 which was one of the factories questionnaire questions.

Table 3.2: V10: what are the quantities of SW that produced from your factory?

SW produced	Kg/day

Paper	
Plastic	
Metals	
Textiles	
Plants	
Chemicals	
Others	
Sum	

Then, the answers of this question from 91 factories were analyzed.

3.5 Industrial solid waste management indicators

In this study nine indicators were formulated depending on the Likert scale to measure various attitudes of ISWM that including 5-7 items that relating to the same subject; dependent on each indicator subject, each one will be explained in detail and then results will be displayed in the following sections.

3.5.1 Temporary storage indicator (TSI):

It includes six items (questions) that related to temporary storage in the factories, these questions are:

V18: Is the process ISW separated from non-process SW?

V20: Is there cover for the containers?

V22: Is the number of containers enough?

V25: Are there problems in storage inside the factory?

V27: Are there some stray animals like dogs or cats near temporal storage containers?

V28: Is there separation of ISW to its original components (plastic, paper …)?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 6 which is the minimum value (6*1) to 18 which is the maximum value (6*3); the range of 6-18 is divided into three intervals as (6-9) is bad, (10-14) is moderate, and (15-18) is good.

3.5.2 Collection and transfer indicator (CTI):

It includes six items that related to collection and transfer of ISW in the factories, these items are:

V33: Is there bad odors, insects, or rodents because of the collected SW before its transfer?

V34: Was there complains from neighbors because of solid waste produced by the factory?

V35: Does the factory have problems in collecting inside the factory?

V39: Are the vehicles transferring SW from factory specialized for industrial solid waste?

V43: Is there monitoring for transferring and disposing of solid waste?

V45: Does the factory have problem in transferring solid waste outside the factory?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 6 which is the minimum value (6*1) to 18 which is the maximum value (6*3); the range of 6-18 is divided into three intervals as (6-9) is bad, (10-14) is moderate, and (15-18) is good.

3.5.3 Treatment and final disposal indicator (TFDI):

It includes seven items that related to treatment and final disposal of ISW, these items are:

V47: Is solid waste treated after collection and before final disposal?

V54: Is there a record for the daily quantity of solid waste?

V55: Do you have a written instruction (guide manual) about dealing with ISW?

V56: Is there a governmental authority that follows up the issue of ISWM?

V58: Does the governmental authorities that follow up the issue of ISWM impose regulations?

V59: Does the governmental authorities that follow up the issue of ISWM impose penalties or punishments?

V61: Are you satisfied with the service of transferring SW from factor to disposal site?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 7 which is the minimum value (7*1) to 21 which is the maximum value (7*3); the range of 7-21 is divided into three intervals as (7-11) is bad, (12-16) is moderate, and (17-21) is good.

3.5.4 Clean Product Indicator (CPI):

It includes five items that related to cleaner production principles application in ISWM at the factories, these items are:

V63: Does the factory adopt the integrated preventive environment strategy?

V64: Have you heard about the clean production practices to reduce SW, energy exploitation, and reduce pollutants?

V67: Are you ready to use solid waste as raw materials in your factory?

V69: Is SW produced in the factory reused in the factory itself (without recycling)?

V70: Is SW produced in the factory recycled?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 5 which is the minimum value (5*1) to 15 which is the maximum value (5*3); the range of 5-15 is divided into three intervals as (5-8) is bad, (9-11) is moderate, and (12-15) is good.

3.5.5 Safety and Security Indicator (SSI):

It includes five items that related to safety and security of labors in the factories, these items are:

V78: Are labors being aware about safety and mechanism of dealing with solid waste?

V79: Are labor trained in accordance with their work nature and their relation with solid waste?

V80: Are safety regulation and rules implemented?

V81: Do labor wear special uniform to protect them while collecting and transferring SW?

V83: Is there an accident guide manual how to react during and after accidents?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 5 which is the minimum value (5*1) to 15 which is the maximum value (5*3); the range of 5-15 is divided into three intervals as (5-8) is bad, (9-11) is moderate, and (12-15) is good.

3.5.6 Policy Obstacles for Cleaner Product Indicator (POCPI):

It includes five items that related to policy obstacles for cleaner product that exist in the state or market that impede the factories to apply cleaner production, these items are:

The sentence that comes before all these questions is “The main obstacle that prohibit factory from applying cleaner production and is related to state policy”?

V74a: Is weak application of environmental systems?

V74b: Is lack of economic motivations?

V74c: Is not following market demand?

V74d: Is inadequate self-regulation at the factory level?

V74e: Is poor public awareness and weak pressure from the community on the factories to improve their environmental performance?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 5 which is the minimum value (5*1) to 15 which is the maximum value (5*3); the range of 5-15 is divided into three intervals as (5-8) is weak, (9-11) is moderate, and (12-15) is strong.

3.5.7 Financial Obstacles for Cleaner Product Indicator (FOCPI):

It includes four items that related to financial obstacles for cleaner product impede the factories to apply cleaner production, these items are:

The sentence that comes before all these questions is “The main obstacle that prohibit factory from applying cleaner production and is related to financial issues”?

V75a: Is the high initial cost?

V75b: Is difficulty of attaining fund?

V75c: Is weak financial performance of the few returns are reluctant to invest in cleaner production projects?

V74d: Is the lack of financial evaluation of these projects?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 4 which is the minimum value (4*1) to 12 which is the maximum value (4*3); the range of 4-12 is divided into three intervals as (4-6) is weak, (7-9) is moderate, and (10-12) is strong.

3.5.8 Technical Obstacles for Cleaner Product Indicator (TOCPI):

It includes five items that related to technical obstacles for cleaner product that impede the factories to apply cleaner production, these items are:

The sentence that comes before all these questions is “The main obstacle that prohibit factory from applying cleaner production and is related to information and technical issues”?

V76a: Is limited capability and experience of the staff?

V76b: Is lack of external technical support?

V76c: Is difficulty of acquiring information about the clean?

V76d: Is difficulty of creation of additional infrastructure for cleaner production and integrated with existing production systems?

V76e: Is lack of practical training and workshops?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 5 which is the minimum value (5*1) to 15 which is the maximum value (5*3); the range of 5-15 is divided into three intervals as (5-8) is weak, (9-11) is moderate, and (12-15) is strong.

3.5.9 Administrative Obstacles for Cleaner Product Indicator (AOCPI):

It includes five items that related to administrative and regulatory obstacles for CP that impede the factories to apply CP, these items are:

The sentence that comes before all these questions is “The main obstacle that prohibit factory from applying CP and is related to administrative and regulatory issues”?

V77a: Is expansion of production is more important than the implementation of CP?

V77b: Is concentration on competition capability because the application of CP burden additional costs and undermine competitiveness?

V77c: Is concern the risk of changing the current production processes and technologies used?

V77d: Is lack of employees and managers awareness on the environmental and economical importance of CP?

V77e: Is lack of ability to manage CP in terms of administrative and technical?

Each respondent is asked to rate each item on a 1-3 response scale where:

1 = bad, 2 = moderate, and 3 = good

Depending on these values each item has the rate between 5 which is the minimum value (5*1) to 15 which is the maximum value (5*3); the range of 5-15 is divided into three intervals as (5-8) is weak, (9-11) is moderate, and (12-15) is strong.

3.6 Statistical analysis

The data from the returned questionnaires was analyzed using the Statistical Package for Social Science (SPSS version 12) program and Microsoft Office Excel. Descriptive statistics such as frequencies and percentages were computed.

4. Chapter Four: Results and Discussion

4.1 Responsibility of ISWM in the study area

Solid waste management services are usually the responsibility of the municipalities and local or village councils in Palestinian urban and rural areas. In the refugee camps, the United Nations Relief and Works Agency for the Palestinian Refugees in the Near East (UNRWA) is the body responsible for providing solid waste management services (Khatib et al, 2009). There are a number of communities, however, for which there is no municipal authority or village council; approximately 12 % of communities in Hebron District fall into this category (Southern West Bank Joint Service Council for Solid Waste Management, 2009). The next sections will illustrate the fact that ISW has been treated as MSW from sources to final disposal; so some of ISWM practices mentioned in the following sections are for ISW and MSW simultaneously.

Management of industrial solid waste is distinctly different from the approach used for municipal waste. There is a lot of similarity between the characteristics of the waste from one municipality or one region and another, but for industrial waste, however, only a few industrial sectors or plants have a high degree of similarity between products and waste generated. Nowadays industrial solid waste management is an important part of industry. The number of contaminated sites, which are polluted by industrial and hazardous waste, are increasing in developing countries (LaGrega et al. 2001). For proper management of industrial waste, it is necessary to obtain exact information and data about the waste characteristics, climatic conditions and the effects on human health and the environment (Mokhtarani et al, 2012).

Refer to the localities that included in this study and depending on localities classification; there are 17 municipalities and one local council which is Nuba council, one of the municipalities was excluded from analysis because it had no factories; this municipality is Kharas. So the total localities included in this study are 17.

4.2 ISWM practices on locality level

4.2.1 ISW collection and transferring

In Hebron Governorate the community container collection system is the main common practice used in the solid waste collection and storage, the percent of collecting solid wastes from the factories was 100%. Hebron, Beit Ula, Taffuh, and Bany Na'im municipalities answered the question:"Is industrial waste collected with domestic waste?" by yes partially which represent 23.5%, and the other 13 municipalities answered by yes totally, which represent 76.5%.

There were no special containers for ISW in the study area, excluding six factories in Hebron city. Although these factories have special containers for temporary storage of their wastes but 100% of municipality's laborers who are responsible for collecting and transferring waste from factory to Yatta dumpsite this result is completely different in Dar es Salaam City since 40% of ISW is collected by private SWM contractors, while the individual industries that collect and transport their own waste collect the remaining 60% (Mbuligwe et al, 2006).

Hebron, Surif, Beit Ula, Taffuh, Sa'ir, and Dura municipalities have a special vehicles devoted for transferring part of industrial solid waste that accounted for 37.5% of the respondent localities and 62.5% of them have not.

Vehicles used for collecting and transporting ISW are mainly in the range of 5–25 m^3. All the localities included in the survey have 12 special vehicles in the range of 7-25 m^3, and 28 compressor vehicles in the range of 5-18 m^3, nine of them in the Hebron city alone, these vehicles are used for long-range transport. They are generally self-tipping trucks, and are used because of their versatility with respect to unloading the waste at the final disposal site. Loading of the waste is normally done mechanically or mixed (manually and mechanically), according to the results: the percentages of solid wastes that are loaded inside the vehicles manually, mechanically, and mixed were 5.9%, 23.5%, and 70.6% respectively. It is worth noting that some of the ISW collection vehicles are not specially designed for that purpose. 70.6% of transferring vehicles have covers, while 17.6% most of transferring vehicles have covers, and 11.8% have no covers.

The results observed that 52.94% of localities have problems in collecting and transferring ISW from factories, these problems can be summarized as the absence of coordination with the locality, increase of ISW quantities, vehicles and containers are not enough, ISW discarded in different times and some of them are unsuitable to be loaded by trucks, far distance to dumpsite, and high transferring cost.

Table 4.1 represents the summary results of ISW collection and transferring on locality level

Table 4.1: Summary results of ISW collection and transferring on locality level

Question	Answer	Percent
V09: Is industrial waste collected with domestic waste?	Yes completely	76.5
	Yes partially	23.5
	No	0.0
	Total	100
V10: Who is responsible for collecting and transferring waste from factory to disposal site?	Factory labors	0.0
	local council labors	100
	Others	0.0
	Total	**100**
V14: Do the transferring vehicles have covers?	all of them	70.6
	most of them	17.6
	none of them	11.8
	Total	**100**
V15: The solid waste is loaded inside the vehicles?	manually	5.9
	mechanically	23.5
	mixed	70.6
	Total	**100**

4.2.2 ISW temporal storage

The result of locality questionnaire analysis revealed that there is no separation between industrial and domestic solid wastes at all. Beit Ula, Taffuh, Tarqumia, Dura, and Bany Na'im municipalities have a temporary storage of ISW before final disposal that accounted for 29.4%, while 70.6% of municipalities have no any temporary storage.

It was found that 15 out of 17 localities have no problem to find a specific location for containers beside factories, but these containers have no covers which accounted for 94%. Hebron, Surif, Halhoul, and Edh Dhahiriya seems to have no problems in adequate size of the containers that accounts for 25% of the respondents, while 75% of respondent have problems in the size of containers regarding adequacy to size of wastes produced by factories. One of the important issues that must be taken into consideration is the bad odors, insects, or rodents because of solid waste, almost 94% of the respondent localities said that there are the bad odors, insects, or rodents near to SW storage containers that can cause negative impacts on both the health and environment. Hebron and Tarqumia municipalities answered the question:" Is there industrial solid waste transfer stations before final disposal" by yes, the other localities answered by no.

4.2.3 ISW treatment, processing, and final disposal

Cleaning, separation and classification, separation of hazardous components, and recycling and others are the usual methods of ISW treatment. In this study there was no treatment at all.

Currently most of the solid waste from Hebron Governorate and from some villages in Bethlehem Governorate is dumped at the dumping site at Yatta. Solid waste from Israeli settlements in Hebron, from the UNRWA-managed refugee camps, and some industrial waste is also taken to the dumpsite (Southern West Bank Joint Service Council for Solid Waste

Management, 2009). Referring to the results of this study, all the collected wastes from the included localities have been dumped at Yatta dumpsite. Landfilling is still the cheapest and most common method of both industrial and municipal waste disposal in Poland. Incineration, composting, and neutralization are other utilization methods of wastes but in small scales (Jurczak, 2001), while the final disposal of ISW in Dar es Salaam City are in Vingunguti and Mbagala municipal disposal sites, the proportion of the industries that use these disposal sites are (56.9%), (37.9%) respectively, and (5.2 %) of industries use onsite disposal (Mbuligwe et al, 2006).

Yatta dumpsite has been used to dump wastes since 1994 and has been managed by Higher Council for SWM for Hebron and Bethlehem Governorates. The dumpsite is located southeast of Hebron city, near the town of Yatta and has a total area of 150 dunums without fencing around. There are 9 employers working in the site and it has weighing bridge to weigh the loaded trucks entered the site. According to E.Majed Alsari': about 20 ton/ day of industrial wastes enter the site, and they get 16 NIS/ ton wherever the type of wastes. There were 17 dumpsites in Hebron governorate, 11 out of them were closed by Higher Council for Solid Waste Management for Hebron and Bethlehem Governorates and the others with Yatta dumpsite will be closed when Al-Menya landfill start operating in the middle of 2013, the landfill will be divided into 8 cells (None of them is specialized for ISW); one for every 2-3 years operation (Higher Council for SWM, 2012). Al-Menya landfill with a total area of 254 dunums is currently under construction and it is located to the east of Se'ir; it is financed by the World Bank and the European Union with 20 million dollar (Hebron Municipality, 2012).

Table 4.2 represents the summary results of ISW treatment and final disposal on locality level.

Table 4.2: Summary results of ISW treatment and final disposal on locality level

Question	Answer	Percent
V28: Is there any treatment for industrial solid waste before final disposal?	Yes always	0.0
	Sometimes	0.0
	No	100
	Total	**100**
V31: Is there documentation for the daily quantity of ISW?	Yes	0.0
	No	100
	Total	**100**
V33: Is there a guideline about dealing with ISW?	Yes	5.9
	No	94.1
	Total	**100**
V34: Is there coordination with other authorities related to management of ISW?	Yes	76.5
	No	23.5
	Total	**100**
V36: Is there monitoring for transfer and disposal of ISW?	Yes	81.3
	No	18.8
	Total	**100**
V37: Is there any special vehicles devoted for transferring industrial solid waste?	Part of it	37.5
	No	62.5
	Total	**100**

Continue Table 4.2: Summary results of ISW treatment and final disposal on locality level

V39: Are there special machines for ISW volume reduction?	**Yes**	**0.0**
	No	**100**
	Total	**100**

4.2.4 Coordination between localities and authorities

The results showed that there is a good coordination between the respondent localities and other authorities related to management of ISW, 76.5% of respondent localities said that there is coordination with health department and JSC.

Surif, Halhoul, and Yatta municipalities that accounted for 30% of respondent localities said that they impose regulations related to management of ISW to the factories; the other 70% said that such regulations are imposed by other authorities such as EQA and MNE; the results showed that almost 70% of regulations imposed by EQA and 30% by MNE. In the absence of regulation application some penalties are imposed, the result explained that 43% of penalties were financial, 21.4% were postpone or cancel factory licensing, 7% were closure of the factory, and 28.6% were all of them together. And in order to check the validity of these answers, the following question is asked" had any of these penalties been applied during your work performance?" the answers were 75% yes and 25% no.

4.2.5 Financial Aspects

It is well known that most localities in (oPT) have financial constraints regarding SW sector, in addition to political conditions that significantly affect providing the services, the lack of proper funds and infrastructure are making solid waste management services one of the most expensive services. Although municipalities and councils have assigned fees for the collection and transferring of wastes, few people have been able to pay for the services and hence the revenue actually collected from the fees has contributed to less than 20% of the money needed to run the services (UNEP, 2003; Khatib et al, 2009). The results of this study showed that the mechanisms of collecting fees of SW from factories were: 81.3% of respondent localities said there is monthly fees ranging from 10 – 100 NIS, 12.5% said the fees depend on SW quantities, and 6.3% said it depends on factory size. On the other hand the percentage of respondent localities that said the current solid waste management budget is enough was 25%, and also 25% of them said sometimes it is enough, while 50% of them said it is not enough.

4.2.6 Labors in SWM sector

As a result of the above facts about ISWM, the results of questions regarding labor specialized in working in ISWM section were as expected in terms of the following:

-There are no labors specialized in working in ISWM.

-Labors in SWM section is always wearing protective clothes by 43.8%, labors in SWM section is sometimes wearing protective clothes by 43.8%, labors in SWM section is never wearing protective clothes by 12.5%.

-Inoculating against diseases like tetanus and typhoid: 37.5% said yes there is inoculation, 18.8% said there is sometime inoculation, and 43.8% said no inoculation.

-Labor awareness about the safety principles and how to deal with solid waste: 82.4% said yes there is awareness and 17.6% said no.

-The required training that suit their work: 11.8% said yes the labors get the required training, and 52.9% said yes the labors get sometimes the required training, and 35.3% said no.

-Safety and health regulations application that imposed by specialized authorities: 47.1% said yes they applied, 41.2% said yes sometimes, and 11.8% don't know.

4.3 Characteristics of respondents and factories

4.3.1 Characteristics of localities respondents

The percentages of the respondent's positions of the localities are presented in Figure 4.1; it is clear that the most respondent's positions were head of health section which accounted for 59% of the respondents. 94% of them were male, and 6% was female (engineer). Results related to education level of respondents revealed that 14 out of 17 have high education, and the other 3 have secondary level.

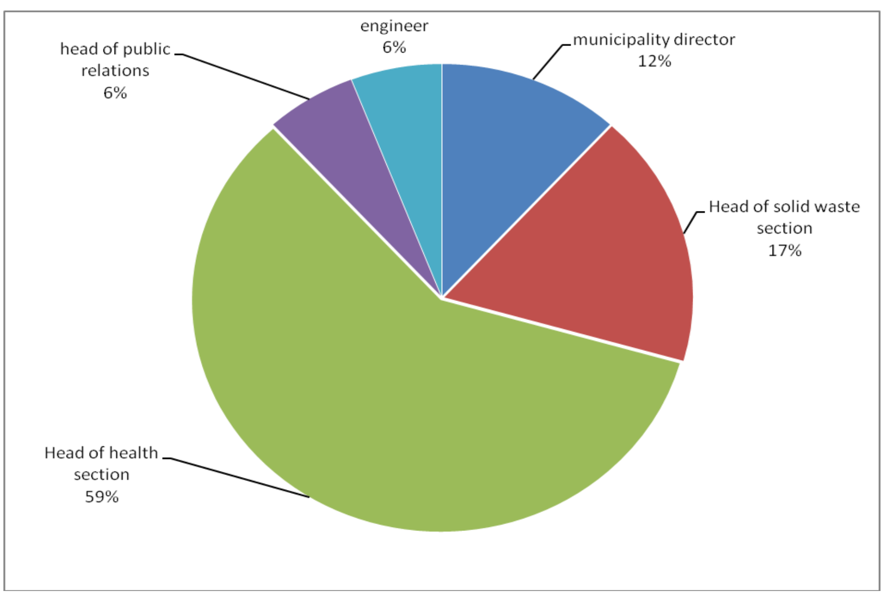


Figure 4.1: Respondent's positions of the localities

4.3.2 Characteristics of factories respondents

Among 91 respondents, 96.2% of respondents were male, and 3.8% were female. Most respondents reside in the city (93.7%) and 6.3% reside in villages. Results related to education level of respondents revealed that 53.2% have high education, 38% have secondary education, and the other 8.8% have elementary education. 73% of respondents were owner of the factory, 9.4% manager, 9.4% production manager, and 8.2% were (human resource, financial, and quality manager and labors).

4.3.3 Characteristics of factories

It is obvious from figure 4.2 that 49% of factories are modern since they had been established after 1999; this result is higher than 38.4% of the industries started their operations within the last ten years, and 8.2% have been in operation over 20 years as stated in the recent study by (Al-Khatib et al, 2012). The rest of other categories of establishment date results are presented in the same figure.

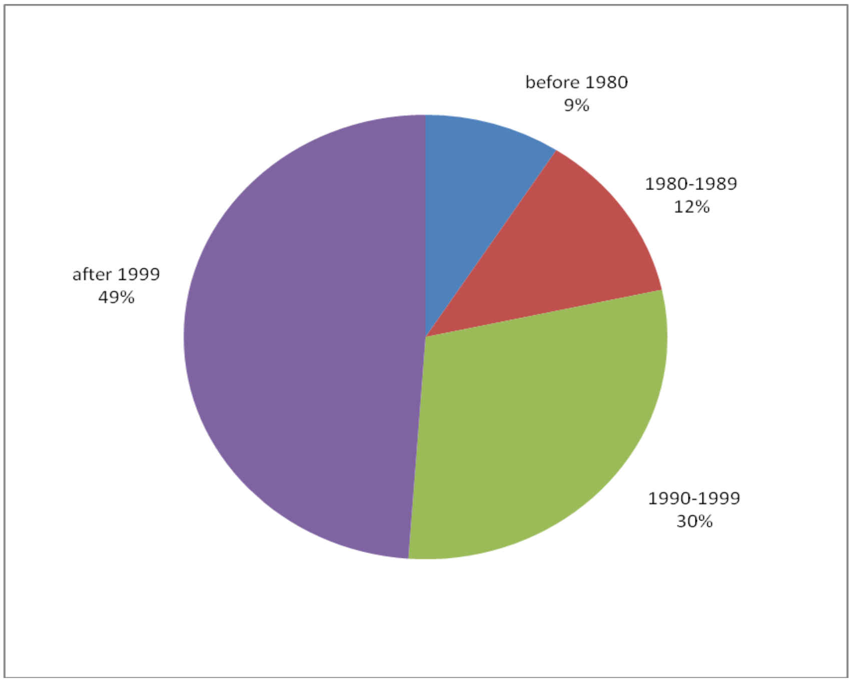


Figure 4.2: Establishment date categories of the factories

For the number of factories labors, 30.8% of factories have less than 10 labors, 41.8% have 10 to19 labors, 24.2% have 20 to 99 labors, and 3.3 have more than 99 labors; these results are slightly vary from results in the recent study by (Al-Khatib et al, 2012) that shows the highest percentage (40.1%) of industries have 3 to10 workers, while the lowest percentage (8.3%) have more than 25 workers.

The highest percentage (73.6%) of factories located in the city between houses, while 20.7% in the city in the industrial area, 4.6% in villages, and 1.1 in commercial area. While the status of factories locations seemed to be a slightly better in a similar study for Nablus and Ramallah &. Al-Bireh governorates by (Al-Khatib et al, 2012), the percentage of industries location in industrial areas was 57% and 43% of industries was in residential areas in the cities and villages. So it is clear that the choices of factories locations in Palestinian territories do not based on a structured master plan; so existing the highest percent of (73.6%) of factories within residential areas posing higher pollution and more public health risk for the people who living near factories.

43% of factories were individual ownership and 57% were private joint-stock company.

Food and beverages industries comprised the higher percent of industries that included in the survey sample, figure 4.3 shows the factories products distribution of the survey sample.

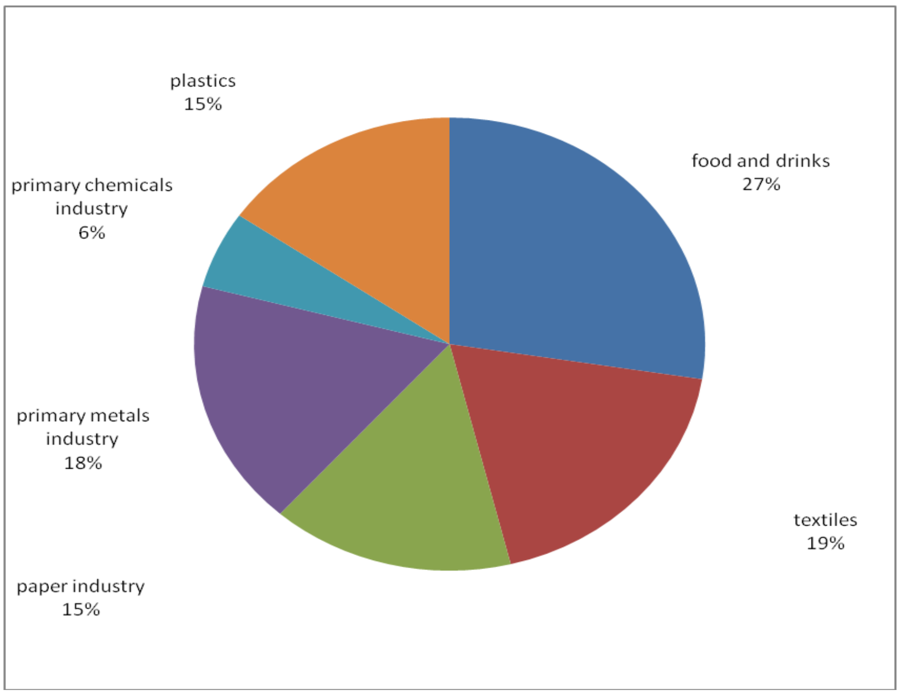


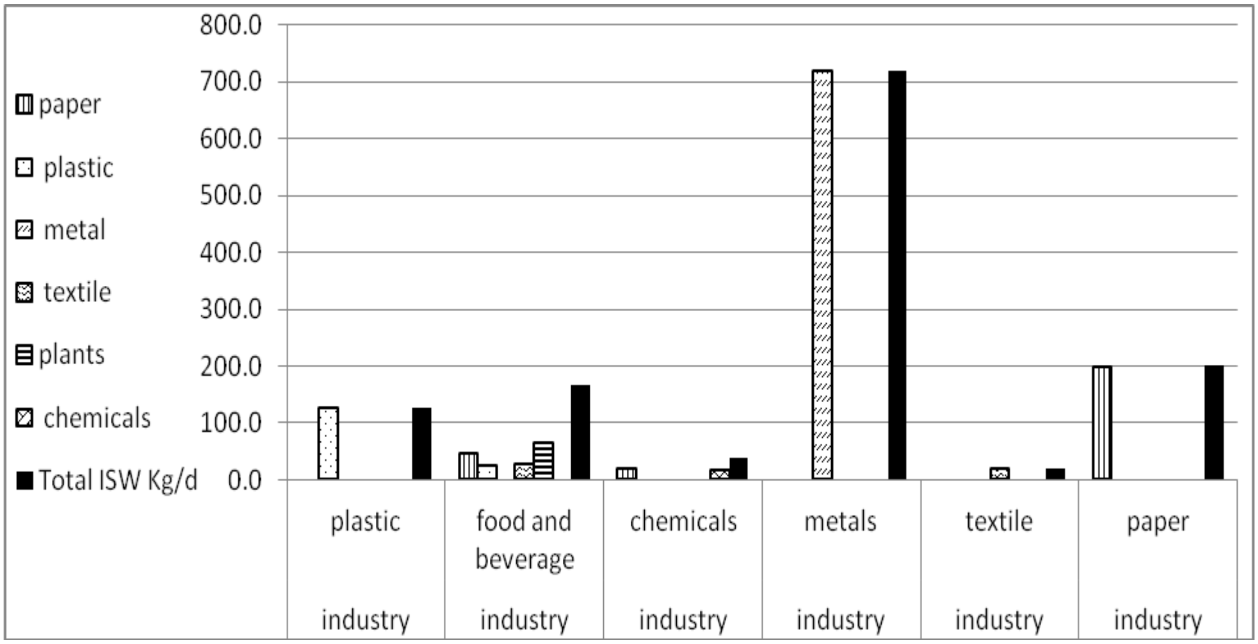
Figure 4.3: Factories products distribution of the survey sample

4.4 ISWM practices on factory level

4.4.1 ISW generation

Development of proper industrial waste management system needs to know the mean generation rate of ISW expressed as kg/day and m^3/day; both of them are necessary in order to determine the proper way of handling, for example wastes such as paper and cardboard, plastic, and wood, have a high volume, so special collection technology is necessary. This could take the form of mechanical volume reduction or another processing technique. According to the results of this study there were no machines to reduce volume of solid wastes.

Mean generation rates in this study were calculated depending on quantities of ISW produced by factories. The results were estimations since they depend on the estimates of the respondent from factories. The mean generation rates of ISW produced from factories is presented in figure 4.3.The ordered from highest to lowest rate is: 719.38 kg/day (262.6 tonne/year) from metals industries, 200 kg/day (73 tonne/year) from paper and printing industries, 166.64 kg/day (60.8 tonne/year) from food and beverage industries, 127.14 kg/day (46.4tonne/year) from plastic industries, 39.4 kg/day (14.4 tonne/year) from chemicals industries, and 20 kg/day (7.3 tonne/year) from textile industries.



Factories number	14	25	5	16	17	14
% industries	15.38	27.47	5.49	17.58	18.68	15.38

Figure 4.4: Number and percentages of industries generating each type of wastes.

In terms of quantities of ISW, table 4.3 shows that metals, papers, plastic, plants are the most common wastes resulted in the survey, these wastes are generated at 16, 14, 14, 25 factories, respectively.

Table 4.3: Mean and total generation rates of ISW

Category	**Average Industrial Solid Waste Kg/day**						**Total ISW (Kg/d)**
	paper	**plastic**	**metal**	**textile**	**plants**	**chemicals**	
Plastic	0.00	127.14	0.00	0.00	0.00	0.00	127.14
food and beverage	47.40	24.64	0.00	29.80	64.80	0.00	166.64
Chemicals	20.00	0.00	0.00	0.00	0.00	18.40	39.40
Metals	0.00	0.00	719.38	0.00	0.00	0.00	719.38
Textile	0.00	0.00	0.00	20.00	0.00	0.00	20.00
Paper	200.00	0.00	0.00	0.00	0.00	0.00	200.00
Total	267.40	151.78	719.38	49.80	64.80	18.40	1272.56

4.4.2 ISW temporal storage

Steel and plastic containers, which account for 36% for each of all temporal storage facilities, are the commonest method of ISW storage, apercentage of 14.6% represents steel and plastic containers together. Other storage facilities are plastic sacks (7.9%), steel containers and sacks (3.4%) and open to air (1.1%). Metallic containers of the same size as the plastic ones are used for ISW that has a relatively high bulk density. Also, containers whose handling subjects them to impact loads are made of metallic materials. 66.3% of the containers do not have covers, but 33.7% do. A study by (Mbuligwe et al, 2006) in Dar es Salaam City showed that solid waste storage was open-air piles account for 43% of all storage facilities, other storage facilities are metal and plastic bins (34%), open masonry enclosures (11%), 200 l used oil drums (6%), covered masonry enclosures (4%), and concrete silos (2%).

Only 17% of the ownership of the containers is for factories and the other 83% is for localities. The temporary storage of ISW in the factory vicinity is accounted for 96.6%, and 3.4% is out the factory vicinity.

4.4.3 ISW collection and transferring

Of respondents, 94.4% answered the question:" who is responsible for collecting solid waste and transferring it to temporary storage locations?" By factory labors, and 5.6% by factory labors devoted to this purpose.

Of respondents, 85.2% answered the question:" how many labors is response to collect ISW inside the factory?" By 1-2 labors, and 9.1% by 3-4 labors, and 3.4% by 5-6 labors, and 2.3% by more than 6 labors.

ISW collection frequencies differ depending on generation rates, nature of the waste, especially with respect to its biodegradability, and the transportation means used. Of factories respondents, 66.7% said that the collection of ISW inside the factory is once a day, 14.9% said it is twice a day, 14.9% said it is three times a day or more, 3.4% said it is once a week.

Of factories respondents, 57.5% answered the question:" How is the collected waste loaded into transferring vehicles?" by mechanically, and 42.5% by manually. Table 4.4 presents summary results of ISW collection and transferring on factory level.

Manual handling is the most common way to transfer ISW from inside factory to collection places. Figure 4.5: shows the percentages of means of transferring solid waste from inside factory to collection places.

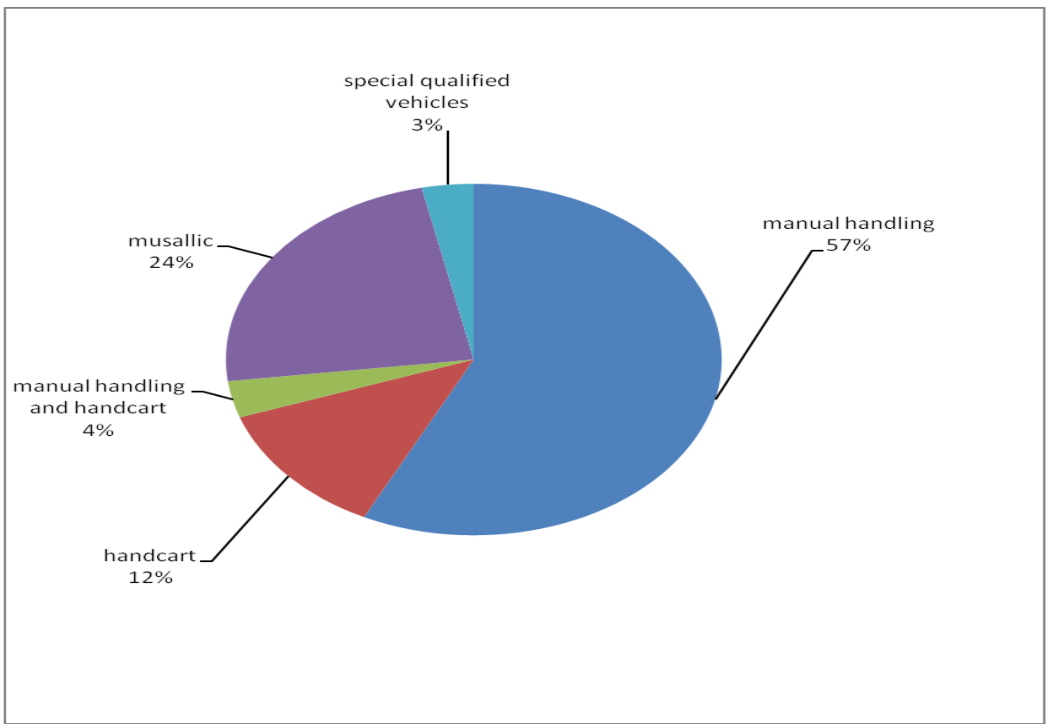


Figure 4.5: Means of transferring solid waste from inside factory to collection places

Local council vehicles and trucks that account for 52% as shown in figure 4.6 is the highest percentages of the means of transferring solid waste to the final disposal. The other means and their percentages are also shown in the same figure.

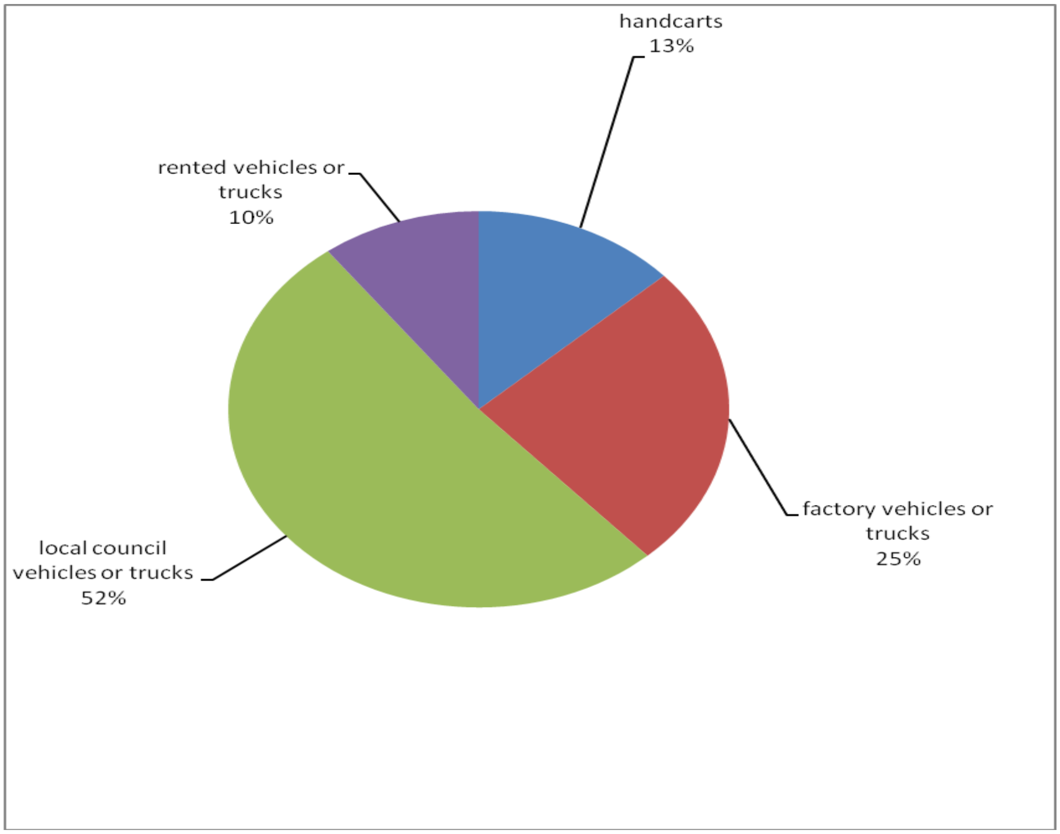


Figure 4.6: Means of transferring solid waste to the final disposal sites

Table 4.4: Summary results of ISW collection and transferring on factory level

Question No.	Question	Answer	Percent
V30	Who is responsible for collecting solid waste and transferring it to temporary storage locations?	factory labors	94.4
		factory labors devoted to this purpose	5.6
V31	How many labors is response to collect ISW inside the factory?	1-2 labors	85.2
		3-4 labors	9.1
		5-6 labors	3.4
		More than 6 labors	2.3
V32	How many times is solid waste collected inside the factory	once a day	66.7
		Twice a day	14.9
		Three times a day or more	14.9
		Once a week	3.4
V40	How is the collected waste loaded into transferring vehicles	mechanically	57.5
		Manually	42.5

4.4.4 Treatment, processing, and final disposal

Cleaning, separation, volume reduction, reuse, and others are the treatment methods of ISW. Most of ISW is not treated prior of final disposal, 61 factories which accounts for 69.3% don't treat SW after collection and before final disposal, 21 of factories which account for 23.9% always treat, and 6.8% sometimes treat. 83.33% of 21 factories treat their waste by recycle and 16.67% by separation. It is observed that 51.65% of factories produce a mixture of process and non-process ISW but in small amounts, the average rate of non-process ISW was 23.22 kg/day, while 48.35% of factories produce process ISW only. A study by (Mbuligwe et al, 2006) in Dar es Salaam City showed that 11% of the industries in Dar es Salaam city produce significant quantities of non-process ISW, the other 89% of the industries produce process ISW. Only 8.4% of factories in this study always separate process ISW from non-process ISW, 14.5% sometimes separate ISW, and 77.1% don't separate ISW.

85.7% of factories don't separate their ISW into specific components, while 9.9% sometimes do the separation, and 4.4% always separate ISW into specific components. In the case of providing the required containers, the respondent had been asked if they were ready to separate ISW, the results were: 5% of respondent said they want to separate ISW against paying, 75% said yes without paying, and 20% said no. The hazardous classification of SW produced by the factory according to the respondents was: 12.2% classify SW as low threat on human and environment and 87.8% classify it as no threat at all.

It is good to realize that the SW can be treated as resource, it can be sold for example, but unfortunately 88.4% of respondents said that they don't sell ISW or part of it, but 11.6% said they sell it to individuals. 29.2 % of factories are paying for disposing SW, while 70.8 % don't pay. 94.4% of factories do not record the daily SW produced. 93.3% of factories do not have written instructions (guide manual) about dealing with ISW, and 6.7% have like this manual. There is a lack in monitoring of ISWM at the factory level, 5.7% of respondent factories said that there are governmental authorities that follow up the issue of ISWM, but 93.1% of them said there aren't. 80.8% of respondents said these authorities do not impose regulations regarding handling of SW produced, even though 90.7% said there is a need to impose such regulations. The same percent of 26.3% of both yes and sometimes that these authorities impose penalties when regulations do not apply, while 47.4% said no. 75.9% of respondents were satisfied with the service of transferring ISW to the final disposal.

Table 4.5 represents the summary results of ISW treatment and final disposal on factory level.

Table 4.5: Summary results of ISW treatment and final disposal on factory level

Question	Answer	Percent
V47: Are ISW treated after collection and before final disposal?	Yes always	23.9
	Sometimes	6.8
	No	69.3
	Total	100
V48: What are the methods of treatment of ISW?	Cleaning	8.3
	Separation and classification	12.5
	Separation of hazardous components	4.2
	Recycling	75.0
	Total	100
V50: Do you sell ISW or part of it?	Yes	11.6
	No	88.4
	Total	100

Continue Table 4.5: Summary results of ISW treatment and final disposal on factory level

V52: Do you pay for disposing ISW?	Yes	29.2
	No	70.8
	Total	100
V54: Is there a record for the daily quantity of ISW?	Yes	5.6
	No	94.4
	Total	100
V55: Do you have written instructions about dealing with ISW?	Yes	6.7
	No	93.3
	Total	100
V56: Are there governmental authorities that follow up the issue of ISWM?	Yes	5.7
	No	93.1
	Total	100
V58: Do the governmental authorities that follow up the issue ISWM impose regulations?	Yes	19.2
	No	80.8
	Total	100
V59: Do the governmental authorities that follow up the issue of ISWM impose penalties or punishments?	Yes always	26.3
	Sometimes	26.3
	No	47.4
	Total	100

Continue Table 4.5: Summary results of ISW treatment and final disposal on factory level

V60: Is there a need for presence of laws and regulations concerning ISWM?	Yes	90.7
	No	9.3
	Total	100
V61: Are you satisfied with the service of transferring ISW from factor to disposal site?	Yes	75.9
	Sometimes	17.2
	No	6.9
	Total	100

The main methods for final disposal of ISW are as shown in table 4.6

Table 4.6: Results of final disposal methods of ISW in factory survey

Methods of final disposal	Percent
on-site treatment	1.1
backfilling in special dumping sites	1.1
backfilling in local council landfill	54.5
random disposal	1.1
burning outside factory	1.1
burning inside factory	1.1
reuse	4.5
Recycle	27.3
transferring to unknown site	1.1
I do not know	6.8
Total	100.0

It is clear from table 4.6 that the percentage of backfilling ISW in local council landfill is accounted for 54.5%, 27.3 is accounted for recycling, and the other methods of the final disposal are accounted for very small percentages.

4.5 Safety and security of factory labors

The results of survey regarding safety and security of factory labors can be summarized as:

86.4% of factories aware labors of safety and mechanism of dealing with SW.

74.2% of factories trained labors in accordance with their work nature and their relation with SW. 79.8% of factories apply safety regulations and rules.

46% of factories said that labors wear special uniform to protect them while collecting and transferring SW. 75.6% of factories do not have an accident guide manual to react during and after accidents.

4.6 Cleaner production principles application

The survey shows that 60 factories that accounted for 66.3% of factories adopt an integrated preventive environment strategy, while 33.7% don’t; this result is considered high compared with only 4 industries out of 170 of had plans to implement an Environmental Management System in Asegra in Spain (Casares et al, 2005).

Outcomes of social survey conducted in eight West Bank districts made by (Khatib et al, 2009) showed that the level of knowledge concerning reuse and recycle is poor; referring to outcomes of this study 23.1% of respondent heard about CPP, while 76.9% don't hear about them. 31.6% heard about CPP from T.V, 26.3% from internet, 10.5% for each from radio and workshops, and

5.3% for each from (T.V and radio), bulletins, (workshops and bulletins), and (radio and bulletins).

The results of using raw materials were: 95.6% of factories use the raw materials in their production process, while 4.4% of them use either reused or recyclable materials. The respondents had been asked if they were ready to use SW as raw materials in their factories (if possible), 38.2% of them replied by yes, and 61.8% replied by no; most those reply by no attributed the answer to the type of industry (food and beverages industries) the majority, and the cost of raw materials is cheaper (metals industries) the majority. 16.3% of respondent can replace raw materials by others with lower SW production, while 83.7% can't because the category of industry (food and beverages industries) for example, lower prices of raw materials used, and sometimes no substitute for raw materials.

Low percentages of industries reuse or recycle SW for use as raw materials in their production processes; both intra and inter industry reuse and recycling are practiced. It is found that 13.6% of factories reuse and 16.5% recycle ISW as intra-industry reuse and recycle; which means SW are collected from generation points and reused directly in industrial processes or recycled for eventual use within the same industry. 77.3% of the recyclable materials used as raw materials, and 22.7% of them used as an initial materials help in production.

Nevertheless, inter- industry reuse which means SW discarded by one industry are reused directly or processed for use as raw materials in another industry; is practiced in recycling paper plant in Hadera (Al-Hudayrah) (occupied Palestinian city in 1948) as mentioned by Eng. Abdulrahman Abu Ras, he said that there is no economic feasibility to recycle papers at small scales; it depends on economies of scale (Al-Qasrawi Industrial & Trading Co. L.T.D, 2012).

4.7 Industrial solid waste management performance indicators

Nine indicators were conducted in order to evaluate the performance of the factories in ISWM sector, and they also represent the main obstacles of the application of CPP. The results of the nine indicators that aforementioned in section 3.4 were displayed in the tables (4.7.1-6).

Table 4.7.1: Results of temporary storage indicator (TSI)

TSI Results			Important survey results
Good %	Moderate%	Bad%	
17.6	80.2	2.2	1. 66.3% of the containers do not have covers. 2. 77.1% don't separate process from non-process ISW 3. 95.3 % said that number of containers is enough. 4. 94.4 % of industries have no problem in storing inside factory. 5. 80.7% said there are no dogs or cats near SW containers. 6. 85.7% of factories don't separate their ISW into specific components

The outcomes of TSI in table 4.7.1 indicate that the situation of temporary storage inside the factories is moderate (80.2%) since the internal management of the factories regarding that issue had high percentages in terms of 95.3 % said that number of containers is enough, 94.4 % of industries have no problem in storing inside factory, 80.7% said there are no dogs or cats near SW containers; while 66.3% of the containers do not have covers; the reason may be attributable to the nature of the waste produced by the factories which means waste produced are not attractive to animals. Also 77.1% don't separate process from non-process ISW and 85.7% of factories don't separate their ISW into specific components; these percentages can be reduced significantly if there are programs that encourage the application of CPP.

Table 4.7.2: Results of collection and transfer indicator (CTI)

CTI Results			**Important survey results**
Good %	Moderate%	Bad%	
90.1	9.9	0.0	1. 77.5% of factories do not have bad odors, insects, or rodents because of the collected SW before its transfer. 2. 91.1% of respondent factories said there are no complaints from neighbors because of SW produced by the factory. 3. 95.6% of factories have not problems in collecting SW inside the factory 4. 58.1% of respondents said that the vehicles transferring SW from factory specialized for SW 5. 72.7% said that there is no monitoring for transferring and disposing of SW. 6. 100% of factories have no problems in transferring SW outside the factory.

The outcomes of CTI in table 4.7.2 indicate that the situation of collection and transfer ISW inside the factories is good (90.1%), except 72.7% said that there is no monitoring for transferring and disposing of SW. The monitoring is responsibility of ministries and institutions related to waste management that is supposed to impose instructions in this regard and follow their implementation on the ground, and impose real penalties when regulations not applied.

Table 4.7.3: Results of treatment and final disposal indicator (TFDI)

TFDI Results			**Important survey results**
Good %	Moderate%	Bad%	
81.3	18.7	0.0	1. 69.3% of factories don't treat SW after collection and before final disposal. 2. 94.4% of factories do not record the daily SW produced. 3. 93.3% of factories do not have written instructions (guide manual) about dealing with ISW. 4. 93.1% of respondents said that there aren't governmental authorities that follow up the issue of ISWM. 5. 80.8% of respondents said these authorities do not impose regulations. 6. 47.4% of respondents said that these authorities not impose penalties when regulations do not apply. 7. 75.9% of respondents were satisfied with the service of transferring ISW to the final disposal.

The outcomes of TFDI in table 4.7.3 indicate that the situation of treatment and final disposal of ISW is good (81.3%), however the existence of some negative practices such that 69.3% of factories don't treat SW after collection and before final disposal; but this high ratio not belong to the factories internal management alone, it belong significantly to governmental authorities and localities policies that do not support or encourage treatment of SW; suppose all factories treat their wastes which means more efforts and costs and in the end the segregated wastes will come to the same final disposal. (Survey results no. 2, 3, 4, 5, and 6) emphasize this notion.

Table 4.7.4: Results of cleaner product indicator (CPI)

CPI Results			Important survey results
Good %	Moderate%	Bad%	
97.8	2.2	0.0	1. 66.3% of factories respondents said that they adopt an integrated preventive environment strategy. 2. 23.1% of respondent heard about CPP. 3. 61.8% replied by no when asked if they were ready to use SW as raw materials in their factories. 4. 13.6% of factories reuse and 16.5% recycle ISW as intra-industry reuse and recycle. 5. 77.3% of the recyclable materials used as raw materials, and 22.7% of them used as an initial materials help in production.

The outcomes of CPI in table 4.7.4 indicate that the situation of cleaner product of ISW in general is good (97.8%); as it is obvious from result number one in the table. For 23.1% of respondent heard about CPP result is considered low and it is lower than the result of 31.8% which resulted from a survey conducted in Nablus and Ramallah & Al-bireh governorates by (Al-Khatib et al, 2012). This issue can be overcome by dissemination of CP concepts through multi media and campaigns in all Palestinian Territories to increase awareness of all relevant industrial and SWM sectors. For 61.8% replied by no when asked if they were ready to use SW as raw materials in their factories; the comment on this can be attributable to the industrial category; for example if all food and beverage respondents replied by no to this question, this percent will be reasonable and it is worth mention that food and beverage industries in this study had the highest number of questionnaire, they were 25 out of 91 questionnaires. The last two results in table 4.7.4 were good in spite the absence of integrated SWM system adopt recycle and reuse.

Table 4.7.5: Results of safety and security indicator (SSI)

SSI Results			Important survey results
Good %	Moderate%	Bad%	
39.6	40.7	19.8	1. 86.4% of factories aware labors of safety and mechanism of dealing with ISW. 2. 74.2% of factories trained labors in accordance with their work nature and their relation with SW. 3. 79.8% of factories apply safety regulations and rules. 4. 46% of factories said that labors wear special uniform to protect them while collecting and transferring SW and 54% don't. 5. 75.6% of factories do not have an accident guide manual to react during and after accidents.

The outcomes of SSI in table 4.7.5 indicate that the situation of safety and security of factories labors is good with percent of (39.6%), moderate with up close to it is (40.7%), and bad with low percent of (19.8). High percent of factories have good concern of labors in terms of safety and mechanism awareness of dealing with ISW and trained labors in accordance with their work nature. And also high percent of 79.8% of factories apply safety regulations and rules. On the other hand, 75.6% of factories do not have an accident guide manual to react during and after accidents.

Table 4.7.6: Results of cleaner production obstacles indicators

<table>
<tr><th rowspan="2">No.</th><th rowspan="2">Indicator</th><th colspan="3">Results</th></tr>
<tr><th>Strong %</th><th>Moderate%</th><th>Weak%</th></tr>
<tr><td>6</td><td>Policy obstacles for cleaner product indicator (POCPI)</td><td>86.8</td><td>12.1</td><td>1.1</td></tr>
<tr><td colspan="5">Important survey results
The main obstacles that prohibit factory from applying cleaner production and is related to state policy are:
❖ 94.5% weak application of environmental regulations.
❖ 94.3% lack of economic motivations.
❖ 96.6% lack of demand.
❖ 83.5% inadequate self-regulation at the factory level.
❖ 87.9% weak public awareness and weak of pressure from the community on the factories to improve their environmental performance.</td></tr>
<tr><td>7</td><td>Financial obstacles for cleaner product indicator (FOCPI)</td><td>89.0</td><td>7.7</td><td>3.3</td></tr>
<tr><td colspan="5">The main obstacles that prohibit factory from applying cleaner production and is related to financial issues are:
❖ 97.7 high initial costs.
❖ 93% difficulty of attaining fund.
❖ 87.9% weak of financial performance of the few returns are reluctant to invest in cleaner production projects
❖ 93.2% lack of financial evaluation of these projects.</td></tr>
<tr><td>8</td><td>Technical obstacles for cleaner product indicator (TOCPI)</td><td>85.7</td><td>14.3</td><td>0.0</td></tr>
<tr><td colspan="5">The main obstacles that prohibit factory from applying cleaner production and is related to information and technical issues are:
❖ 89.7%limited capability and experience of the staff.
❖ 97.7% lack of external technical support.
❖ 96.6% difficulty of acquiring information about the clean production.
❖ 95.4% difficulty in finding additional infrastructure for CP and integrate it with existing production systems.
❖ 85.7% Lack of practical training and workshops.</td></tr>
<tr><td>9</td><td>Administrative obstacles for cleaner product indicator (AOCPI)</td><td>83.5</td><td>15.4</td><td>1.1</td></tr>
<tr><td colspan="5">The main obstacles that prohibit factory from applying cleaner production and is related to administrative issues are:
❖ 85.7% expansion of production is more important than the implementation of CP.
❖ 90.6% concentration on competition capability.
❖ 89% concern of changing the current production processes and technologies used.
❖ 94.1 lack of employees and managers awareness on the importance of this issue.
❖ 83.5% lack of ability to cleaner production in terms of administrative and technical.</td></tr>
</table>

The outcomes from table 4.7.6 indicate that all cleaner production obstacles indicators are strong; all of them over 80%; which means significant weak in cleaner production aspects on policy, financial, technical, and administrative levels. This situation can be improved by application of localities and institutions visions that concerning with ISWM and CP through the adoption of the governmental authorities to these visions and impose supportive policies to them.

5. Chapter Five: Conclusions and Recommendations

This thesis presents the final results of the two localities and factories surveys respect to current ISWM in Hebron governorate and opportunities for the application of cleaner production principles in the governorate factories. The status of solid waste management in general in Hebron governorate is good in terms of the localities perform their duties regarding collection, transferring, and final disposal, and due to good coordination between these localities and higher council for SWM for Hebron and Bethlehem governorates, health department, EQA, and MNE. The most notable deficiency of the existing ISW management practices in Hebron governorate is that the hazardous component of the ISW is not segregated from the rest of the waste for appropriate treatment separately and also the final disposal is done at dumpsites until recent days; but this situation of dumping will improved when Al-Menya sanitary landfill start operating in the middle of 2013.

ISWM on factories level is good in some aspects and need improvements in other aspects; for example the status of collection and transferring of ISW inside the factories and also labors safe and security is good and has not pressing problems. The reuse and recycle aspects on factory level are low ; the results showed that only 21 out of 91 factories treat their wastes and this can be attributable to the absence of supported policies from concerned authorities. Monitoring and treatment of ISW are good examples on the aspects that need more and more improvements. Detailed results are shown in section 5.2. Finally, some recommendations have been suggested to make windows for improvement in ISWM sector, and enhance CP concepts.

5.1 ISWM practices on locality level

The results revealed the fact that ISW has been treated as MSW from sources to final disposal in the study area. Community container collection system is the main common practice used in the solid waste collection and storage, the percent of collecting solid wastes from the factories was 100%. There were no special containers for ISW in the study area, excluding six factories in Hebron city; but 100% of municipality's laborers who are responsible for collecting and transferring waste from containers to Yatta dumpsite. 52.94% of localities have problems in collecting and transferring ISW from factories. There is no separation between industrial and domestic solid wastes at all. All the collected wastes from the included localities have been dumped at Yatta dumpsite. 30% of respondent localities said that they impose regulations related to management of ISW to the factories; the other 70% said that such regulations are imposed by other authorities such as (Environment Quality Authority) EQA and (Ministry of National Economy) MNE.

5.2 ISWM practices on factory level

The mean generation rates of ISW produced from factories was ordered from highest to lowest rate as: 719.38 kg/day from metals industries, 200 kg/day from paper and printing industries, 166.64 kg/day from food and beverage industries, 127.14 kg/day from plastic industries, 39.4 kg/day from chemicals industries, and 20 kg/day from textile industries. In terms of quantities of ISW metals, papers, plastic, plants are the most common wastes resulted in the survey. Steel and plastic containers, which account for 36% for each of all temporal storage facilities, are the commonest method of ISW storage.

Local council vehicles and trucks account for 52% of the means of transferring solid waste to the final disposal.

It was found that just 21 of factories always treat SW after collection and before final disposal, 83.33% of them treat their waste by recycle and 16.67% by separation. 51.65% of factories produce a mixture of process and non-process ISW, the average rate of non-process ISW was 23.22 kg/day. Only 8.4% of factories always separate process ISW from non-process ISW. 85.7% of factories don't separate their ISW into specific components.

The absence of authorities clear and continuous monitoring on factories, the lack of coordination between authorities concerned and factories, conflicts in responsibilities and duties between concerned institutions create bad situation of ISWM options. The survey results revealed that 5.7% of factories respondents said that there are governmental authorities that follow up the issue of ISWM, but 93.1% of them said there aren't. 80.8% of respondents said these authorities do not impose regulations regarding handling of SW produced, even though 90.7% said there is a need to impose such regulations. The same percent of 26.3% of both yes and sometimes that these authorities impose penalties when regulations do not apply, while 47.4% said no. 75.9% of respondents were satisfied with the service of transferring ISW to the final disposal.

It is found that 66.3% of factories adopt an integrated preventive environment strategy. 23.1% of respondent heard about CPP. It is found that 13.6% of factories reuse and 16.5% recycle ISW as intra-industry reuse and recycle. 77.3% of the recyclable materials used as raw materials, and 22.7% of them use as an initial materials help in production. Inter-industry reuse of paper recycling is practiced in recycling plant in Hadera.

5.3 Industrial solid waste management performance indicators

The outcomes of ISWM indicators are: TSI is moderate (80.2%) which implies good situation of temporary storage inside the factories; except some points such that 77.1% don't separate process from non-process ISW and 85.7% of factories don't separate their ISW into specific components; these percentages can be reduced significantly if there are programs that encourage the application of CPP.

The outcomes of CTI indicate that the situation of collection and transfer ISW inside the factories is good (90.1%), except 72.7% said that there is no monitoring for transferring and disposing of SW. The monitoring is responsibility of ministries and institutions related to waste management that is supposed to impose instructions in this regard and follow their implementation on the ground, and impose real penalties when regulations not applied.

The outcomes of TFDI indicate that the situation of treatment and final disposal of ISW is good (81.3%), however the existence of some negative practices such that 69.3% of factories don't treat SW after collection and before final disposal; but this high ratio not belong to the factories internal management alone, it belong significantly to governmental authorities and localities policies that do not support or encourage treatment of SW; suppose all factories treat their wastes which means more efforts and costs and in the end the segregated wastes will come to the same final disposal.

The outcomes of CPI in indicate that the situation of cleaner product of ISW in general is good (97.8%). For 23.1% of respondent heard about CPP result is considered low, this issue can be overcome by dissemination of CP concepts through multi media and campaigns in all Palestinian Territories to increase awareness of all relevant industrial and SWM sectors.

The outcomes of SSI indicate that the situation of safety and security of factories labors is good with percent of (39.6%), moderate with up close to it (40.7%), and bad with low percent of (19.8). High percent of factories have good concern of labors in terms of safety and mechanism awareness of dealing with ISW and trained labors in accordance with their work nature. And also high percent of 79.8% of factories apply safety regulations and rules. On the other hand, 75.6% of factories do not have an accident guide manual to react during and after accidents.

The outcomes of all cleaner production obstacles indicators are strong; all of them over 80% which means significant weak in cleaner production aspects on policy, financial, technical, and administrative levels. This situation can be improved by application of localities and institutions visions that concerning with ISWM and CP through the adoption of the governmental authorities to these visions and impose supportive policies to them.

5.4 Recommendations

- Concerned authorities in SWM sector must develop and update the legislative framework that supporting integrated SWM.
- Concerned authorities can encourage the reduction of SW quantities destined for landfilling by develop an incentives system for factories and projects that aim at reducing and/or recycling ISW.
- It is recommended to make good coordination between authorities concerned and factories, define responsibilities, and enforcing clear and viable policies and following their implemented on the ground and not just drafted on papers only.
- It is recommended to perform a cost-benefit analysis to assess the feasibility of recyclable SW in existing landfills versus separating and recycling SW items in new recycling

plants that can be erected in the West Bank areas to serve northern, middle, and southern districts in order to mitigate accessibility problems and reduce transferring costs.

- Concerned authorities in environmental issues must prepare and publish a list of categories of hazardous waste, and implement a system to document, track, and update the data of hazardous waste including (types, quantities, sources, and impacts).
- Management of industrial solid waste is distinctly different from the approach used for municipal waste; so it is highly recommended to customize some of the cells in AL-Menya landfill which consists of eight cells to deal with special wastes (industrial and medical wastes) since none of these cells customized for that purpose.
- Future investigation studies of industries nature (hazardous, non hazardous) should be conducted not only for ISW produced but also for raw substances, processes, and industries to determine those industries are hazardous or not.

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6. Annex 01: Localities questionnaire

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معهد الدراسات البيئية والمائية

يهدف هذا الإستبيان إلى جمع المعلومات اللازمة لعمل رسالة ماجستير بعنوان (إدارة النفايات الصلبة الصناعية في محافظة الخليل والفرص المتاحة لتطبيق مبادئ الإنتاج الأنظف) والتي أقوم بإعدادها أنا الطالبة عايدة عمر البطنيج لإستكمال درجة الماجستير في تخصص هندسة المياه والبيئة من معهد الدراسات البيئية والمائية في جامعة بير زيت. أرجو تعبئة الإستبيان كاملا علما بان المعلومات الواردة فيه سوف تستخدم لأغراض البحث العلمي والأكاديمي فقط.

اليوم:	**التاريخ:**	**رقم الاستبانة:**

معلومات عامة عن المؤسسة:

V01	☐	اسم التجمع السكاني:...........
V02	☐	تصنيف المؤسسة: ١. بلدية ٢.مجلس قروي ٣. مخيم ٤. غير ذلك حدد.............
V03	☐	العنوان:
V04	☐	التلفون/ فاكس:
V0٥	☐	المجيب عن الأسئلة: ١) رئيس البلدية أو المجلس القروي ٢) مسؤول إدارة النفايات ٣) غير ذلك حدد ....
V0٦	☐	الجنس: ١. ذكر ٢. أنثى
V0٧	☐	مكان سكن المجيب عن الأسئلة: ١) مدينة ٢) قرية ٣) مخيم
V0٨	☐	المستوى التعليمي للمجيب عن الأسئلة: ١) أمي ٢) ابتدائي ٣) إعدادي ٤) ثانوي ٥) تعليم عالي
		التجميع و النقل (Collection and Transportation)
V09	☐	هل يتم جمع النفايات الصلبة من المصانع مع النفايات البلدية؟ ١. نعم بشكل كامل ٢. نعم بشكل جزئي ٣. لا

V10	☐	من المسئول عن تجميع النفايات الصلبة من خارج المصنع ونقلها إلى محطات النقل أو أماكن التخلص النهائي؟ ١. عمال المصنع ٢.عمال البلدية ٣.شركة خاصة ٤.غير ذلك، حدد---------------------
V11	☐	ضمن نطاق مؤسستكم، كم شخص مسئول عن تجميع النفايات الصلبة من المصانع. ١. لا يوجد ٢. ١-٢ ٣. ٣ - ٤ ٤ . ٥- ٦ ٥ . أكثر من ٦
V12	☐	كم مرة يتم تجميع النفايات الصلبة من المصانع في اليوم؟ ١.مرة ٢. مرتين ٣. ثلاث مرات ٤.مرة بالأسبوع ٥. حسب نوع النفايات ومعدل انتاجها
V13	☐	ما الوسيلة المستخدمة لنقل النفايات الصلبة من المصانع إلى أماكن التخلص النهائي منها.

نوع المركبات	عدد	السعة($م^3$)	الحالة: (١)جيدة (٢) متوسطة (٣) سيئة
١. عربات يدوية			
٢. عربات تجر بواسطة حيوانات			
٣. تراكتور			
٤. شاحنات كبيرة			
٥. شاحنات مخصصة لنقل النفايات			
٦. سيارات ضاغطة			
٧. غير ذلك حدد			
٨. المجموع			

V14	☐	هل المركبات التي تنقل النفايات الصلبة من المصانع لها أغطيه: ١. كلها ٢. معظمها ٣. لا يوجد
V15	☐	يتم تحميل النفايات الصلبة في وسيلة النقل؟ ١. يدويا ٢. آليا ٣. مختلط
V16	☐	هل لديكم مشاكل في تجميع ونقل النفايات الصلبة من المصانع؟ ١. نعم ٢. لا

V17	☐	إذا كان الجواب نعم، ما هي هذه المشاكل؟
التخزين المؤقت (Temporal Storage)		
V18	☐	هل يتم فصل النفايات الصلبة من المصانع عن النفايات البلدية؟ ٢. نعم ٢. لا
V19	☐	هل يتم تخزين النفايات الصلبة من المصانع مؤقتا قبل إرسالها إلى أماكن التخلص النهائي؟ ١. نعم بشكل كامل ٢. نعم بشكل جزئي ٣. لا
V20	☐	إذا كان الجواب نعم، ما نوع الحاويات التي يتم فيها التخزين؟

نوع الحاويات التي تستخدم للتخزين المؤقت للنفايات الصلبة :	العدد	١.معدني ٢. بلاستيكي
١. أكوام مفتوحة للهواء		
٢. حاويات سعة ١م³		
٣. حاويات سعة ٣م³		
٤. حاويات سعة ٥م³		
٥. حاويات سعة ٨م³		
٦. حاويات سعة ٣٠م³		
٧. حاويات باطون		
٨. براميل		
٩. غير ذلك، حدد ----------------------		

V21	☐	إذا كان الجواب نعم، هل العدد المتوفر للحاويات كافي ويفي بالغرض: ١. نعم دائما ٢. أحيانا ٣. لا

V22	☐	يوجد هناك مكان مخصص لوضع الحاويات بالقرب من المصانع: ١. نعم ٢. لا
V23	☐	يوجد للحاويات أغطية: ١. كلها ٢. معظمها ٣. لا يوجد
V24	☐	حجم الحاويات الموجودة مناسب لحجم النفايات المنتجة من المصانع: ١. نعم دائما ٢. أحيانا ٣. لا
V25	☐	هل يوجد محطات ترحيل لنقل النفايات الصناعية الصلبة اليها قبل التخلص النهائي منها ١. نعم ٢. لا
V26	☐	هل تلاحظ وجود روائح كريهة أو حشرات أو قوارض بسبب النفايات الصلبة المجمعة قبل نقلها إلى أماكن التخلص النهائي منها؟ ١) نعم دائما ٢) أحيانا ٣) لا ٤) لا ادري
V27	☐	هل صدرت شكاوى من المجاورين للمصنع بسبب النفايات الصلبة الناتجة من المصنع؟ ١) نعم دائما ٢) أحيانا ٣) لا
المعالجة و المعاملة والتخلص النهائي (Treatment, Processing, and final disposal)		
V28	☐	هل يتم معالجة النفايات الصناعية الصلبة بعد جمعها و قبل التخلص النهائي منها؟ ١. نعم دائما ٢ . أحيانا ٣. لا
V29	☐	إذا كان الجواب نعم، ما هي طرق المعالجة المستخدمة ١. التنظيف ٢. الفصل و الفرز ٣. فصل المركبات الخطرة فقط ٤. تقليل الحجم ٥. التدوير ٢. غير ذلك، حدد -----------------------------
V30	☐	كيف وأين يتم التخلص النهائي من النفايات الصناعية ١. طمرها في مكبات خاصة ٢. طمرها في مكبات البلدية ٣. رميها بصورة عشوائية ٤. إعادة استخدام (Reuse) ٥. التدوير (Recycle) ٦. نقلها الى جهة غير معروفة ٧. بيعها أو بيع جزء منها ٨.لا أدري ٩. غير ذلك، حدد ------------------------
V31	☐	هل يتم تدوين كميات النفايات المجمعة من المصانع باليوم؟ ١. نعم ٢. لا

V32	☐	إذا كان الجواب نعم، كم تبلغ هذه الكميات---------------------------كغم/يوم.
V33	☐	هل يتوفر لديكم معلومات مكتوبة (دليل إرشادي) عن كيفية التعامل مع النفايات الصلبة الناتجة من المصانع ؟ ١) نعم ٢) لا
V34	☐	هل يوجد تنسيق مع جهات أخرى لها علاقة بموضوع إدارة المخلفات الصلبة الصناعية ؟ ١) نعم ٢) لا
V3	☐	إذا كان الجواب نعم، من هي هذه الجهات--.
V36	☐	هل يتم مراقبة آلية النقل و التخلص النهائي من النفايات الصناعية الصلبة؟ ١. نعم ٢. لا
V37	☐	هل يوجد للنفايات الصناعية الصلبة مركبات خاصة لنقلها: ١. نعم لجميعها ٢. نعم لجزء منها ٣. لا
V38	☐	إذا كان هناك مصانع لا يتم جمع النفايات منها فكم تبلغ نسبتها..................%
V39	☐	هل يوجد لديكم آليات خاصة لضغط النفايات الصناعية الصلبة لتقليل حجمها: ١. نعم ٢. لا
معلومات تتعلق بالأنظمة والقوانين:		
V40	☐	هل هنالك قوانين واضحة للأصحاب المصانع والمنشآت تتعلق بإدارة النفايات الصلبة الصناعية في المحافظة: ١. نعم ٢. لا ٣.لا أدري
V41	☐	إذا كان الجواب نعم، هل أنتم من يفرض مثل هذه القوانين الخاصة بالتعامل مع النفايات الصلبة الصناعية الناتجة من المصانع؟ ١) نعم ٢) لا
V42	☐	إذا كان الجواب لا، من الجهة التي تفرض مثل هذه القوانين؟ ١) سلطة جودة البيئة ٢) وزارة الإقتصاد الوطني ٣) غرفة تجارة وصناعة الخليل ٤) غير ذلك، حدد---

V43	☐	في حال وجود مثل هذه القوانين هل هناك عقوبات معينة في حالة عدم التقيد بها؟ ١) نعم دائما ٢) أحيانا ٣) لا
V44	☐	في حالة وجود عقوبات، ما نوع هذه العقوبات؟ ١) غرامات مالية ٢) تأجيل أو عدم تجديد الترخيص ٣) إغلاق المصنع أو المنشأة ٤) غير ذلك، حدد---
V45	☐	هل تم فعلا خلال عملك تطبيق واحدة أو أكثر من العقوبات المذكورة؟ ١) نعم ٢) لا
معلومات تتعلق بالأمور المالية:		
V46	☐	كم تشكل النسبة المئوية للميزانية المخصصة لقطاع إدارة النفايات الصلبة من الموازنة العامة السنوية للبلدية أو المجلس القروي....................%
V47	☐	ما هي آلية تحصيل رسوم جمع النفايات من المصانع: ١. دفع مبلغ محدد كل شهر ٢. يعتمد المبلغ على كمية النفايات الصلبة ٣. يعتمد المبلغ على طبيعة النفايات الناتجة ٤. يعتمد المبلغ على حجم المصنع ٥.غير ذلك، حدد--- -
V48	☐	هل تشعر بأن الموازنة المخصصة لإدارة النفايات الصلبة مناسبة؟ ١. نعم ٢. أحيانا ٣. لا
العاملين في مجال إدارة النفايات:		
V49	☐	هل يوجد عمال مخصصين للعمل في قسم إدارة النفايات الصناعية الصلبة: ١. نعم ٢. لا
V50	☐	يلبس العمال ملابس واقيه: ١. نعم دائما ٢. أحيانا ٣. لا
V51	☐	يتم تلقيح العمال ضد الأمراض مثل التيفوئيد والكزاز وغيرها: ١. نعم دائما ٢. أحيانا ٣. لا
V52	☐	يتم توعية العمال بمبادئ السلامة المهنية و آلية التعامل مع النفايات. ١. نعم ٢. لا
V53	☐	يتم توفير التدريب المناسب للعمال بما يتناسب مع طبيعة عملهم وعلاقتهم بالنفايات و الأخطار الناشئة ؟ ١. نعم دائما ٢. أحيانا ٣. لا
V54	☐	يتم تطبيق قوانين السلامة المهنية والصحية الموضوعة من قبل الجهات المختصة؟ ١. نعم دائما ٢. أحيانا ٣. لا ٤. لا أدري

7. Annex 02: Factories questionnaire

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اسم المصنع:
العنوان:
المسئول:
التلفون/ فاكس:
تاريخ إنشاء المصنع:
عدد أيام العمل السنوية:

عدد العاملين:
التاريخ:

يهدف هذا الإستبيان إلى جمع المعلومات اللازمة لعمل رسالة ماجستير بعنوان (إدارة النفايات الصلبة الصناعية في محافظة الخليل والفرص المتاحة لتطبيق مبادئ الإنتاج الأنظف) والتي أقوم بإعدادها أنا الطالبة عايدة عمر البطنيج لإستكمال درجة الماجستير في تخصص هندسة المياه والبيئة من معهد الدراسات البيئية والمائية في جامعة بير زيت. أرجو تعبئة الإستبيان كاملا علما بان المعلومات الواردة فيه سوف تستخدم لأغراض البحث العلمي والأكاديمي فقط.

V0١	☐	رقم الاستبانة
V0٢	☐	المجيب عن الأسئلة: ١) صاحب المصنع ٢) مدير المصنع ٣) غير ذلك حدد ....
V0٣	☐	الجنس: ١. ذكر ٢. أنثى
V0٤	☐	مكان سكن المجيب عن الأسئلة: ١) مدينة ٢) قرية ٣) مخيم
V0٥	☐	المستوى التعليمي لمجيب عن الأسئلة: ١) أمي ٢) ابتدائي ٣) إعدادي ٤) ثانوي ٥) تعليم عالي

معلومات عامة عن المصنع		
V06	☐	أين يوجد موقع المصنع؟ ١) في المدينة بين المنازل ٢) في المدينة في المنطقة الصناعية ٣) في قرية ٤) غير ذلك حدد ....
V07	☐	عدد الموظفين في المصنع ١) أقل من ٥ ٢) ٥ - ١٠ ٣) ١١-١٥ ٤) ١٦-٢٠ ٥) أكثر من ٢٠ ٦) أكثر من ٣٠ ٧) أكثر من ٤٠
V08	☐	ملكية المصنع ١.فردية ٢. مساهمة خاصة ٣. مساهمة عامة ٤. حكومية ٥. حكومية و مساهمة خاصة

		٦.حكومية و مساهمة عامة ٧. غير ذلك، حدد --------------------------------------
V09	☐	منتجات المصنع: ١. الأغذية و المشروبات ٢ . الأنسجة ٣. الصناعات الورقية ٤. صناعة المعادن الأساسية ٥. صناعة الكيماويات الأساسية
V10	☐	(see table below)

النفايات الصلبة الناتجة	كمياتها (كغم/اليوم)	النسبة المئوية لها (%)
١. الورق أو الكرتون		
٢. الزجاج		
٣. البلاستيك		
٤. المعادن		
٥. أنسجة		
٦. مخلفات نباتية (قشور،بذور ،أوراق وغيرها)		
٧. مواد كيماوية صلبة (على شكل بودرة أو رغوة)		
٨. غير ذلك، حدد		
المجموع		

V11	☐	كم يبلغ الاستهلاك اليومي من المواد الخام (طن/ يوم)؟
V12	☐	أيام عمل المصنع في الأسبوع ١. ٧ أيام ٢. ٦ أيام ٣. ٥ أيام ٤. ٣-٤ أيام ٥. غير ذلك، حدد -------------------------------
V13	☐	عدد ساعات العمل في المصنع: ١. ٨ ساعات أو أقل ٢. من ٩ – ١٦ ساعة ٣. أكثر من ١٧ ساعة
V14	☐	هل إنتاج المصنع ١. دائم ٢. موسمي ٣. فصلي
V15	☐	ما نوع النفايات الناتجة من المصنع. ١. صلبة ٢ . سائلة ٣ . غازية ٤. صلبة و سائلة ٥. صلبة و غازية ٦. سائلة و غازية ٧. صلبة وسائلة وغازية

V16	☐	ما هو تصنيف النفايات الصلبة الناتجة من المصنع من حيث الخطورة ١) تهديد خطير جدا للبيئة والإنسان ٢) خطرة للبيئة والإنسان ٣) قليلة الخطورة ٤) لا يوجد خطر
مصدر النفايات (Source)		
V17	☐	كم تقدر كمية النفايات الصلبة الناتجة من مصادر أخرى مثل المكاتب، الكافتيريات، التعبئة، التغليف وما إلى ذلك يوميا (كغم/ يوم) (Non-Process ISW)
V18	☐	هل يوجد فصل للنفايات الصلبة الناتجة عن التصنيع (التشغيل والصيانة....الخ) عن النفايات العادية التي تنتج عن عمليات التغليف و من المكاتب، و بقايا الطعام وغيرها(داخل المصنع)؟ ١) نعم دائما ٢) أحيانا ٣) لا
التخزين المؤقت (Temporary Storage)		

V19	☐	ما نوع الحاويات التي تستخدم للتخزين المؤقت للنفايات الصناعية الصلبة:	الحجم	العدد
		١٠. أكوام مفتوحة للهواء		
		١١. حاويات معدنية		
		١٢. حاويات بلاستيكية		
		١٣. أكياس بلاستيكية		
		١٤. حاويات باطون		
		١٥. براميل (oil drums)		
		١٦. صوامع (Silos)		
		١٧. غرفة خاصة مرفقة بالمصنع مفتوحة للهواء الطلق		
		١٨. غرفة خاصة مرفقة بالمصنع مغلقة		
		١٩. غير ذلك، حدد ---------------------		
V20	☐	هل يوجد للحاويات أغطية؟		

		١) نعم ٢) لا
V21	☐	إلى من تعود ملكية الحاويات المستخدمة في تخزين النفايات مؤقتا إلى حين جمعها (في حال توفرها)؟ ١) للمصنع نفسه ٢) للبلدية أو المجلس المحلي 3) غير ذلك حدد........................
V22	☐	هل عدد الحاويات المتوفرة كافي. ١. نعم ٢. لا
V23	☐	إذا كان الجواب لا، كيف وأين يتم تجميع النفايات الزائدة ؟
V24	☐	أين يوجد مكان تخزين النفايات المؤقتة؟ ١) في إطار المصنع ٢) خارج إطار المصنع 3) غير ذلك حدد
V25	☐	هل لدى المصنع مشاكل في التخزين داخل المصنع؟ ١. نعم ٢. لا
V26	☐	إذا كان الجواب نعم، ما هي هذه المشاكل؟
V27	☐	هل تلاحظ وجود بعض الحيوانات الضالة كالكلاب والقطط في أماكن تجميع النفايات المؤقتة أو بالقرب منها؟ ١) نعم دائما ٢) أحيانا ٣) لا
V28	☐	هل يتم فرز النفايات الصلبة الناتجة عن المصنع إلى مكوناتها الرئيسية المختلفة(بلاستيك ،أوراق،زجاج..........الخ)؟ ١) نعم دائما ٢) أحيانا ٣)لا
V29	☐	إذا كانت الإجابة لا ،في حال توفير الحاويات اللازمة هل لديكم استعداد للفرز؟ ١) نعم مقابل اجر ٢) نعم بدون مقابل ٣)لا
التجميع و النقل (Collection and Transportation)		
V30	☐	من المسئول عن تجميع النفايات داخل المصنع ونقلها إلى أماكن التخزين المؤقت؟ ١. عمال المصنع ٢.عمال المصنع (مختصين للتجميع) ٣.عمال مؤقتين ٤.عمال البلدية ٥.شركة خاصة ٦.غير ذلك، حدد--------------------
V31	☐	كم شخص مسئول عن تجميع النفايات داخل المصنع.

		١. ١-٢ ٢. ٣ - ٤ ٣. ٥- ٦ ٤. أكثر من ٦
V32	☐	كم مرة يتم التجميع للنفايات داخل المصنع في اليوم ١. مرة ٢. مرتين ٣. ثلاث مرات ٤. من مرتين إلى ثلاث مرات ٥. أكثر من ثلاث مرات ٦.مرة بالأسبوع ٧.مرة بالشهر ٨.غير ذلك، حدد---------------------------
V33	☐	هل تلاحظ وجود روائح كريهة أو حشرات أو قوارض بسبب النفايات الصلبة المجمعة قبل نقلها؟ ١) نعم دائما ٢) أحيانا ٣) لا ٤) لا ادري
V34	☐	هل صدرت شكاوى من المجاورين للمصنع بسبب النفايات الصلبة الناتجة من المصنع؟ ١) نعم دائما ٢) أحيانا ٣) لا
V35	☐	هل لدى المصنع مشاكل في التجميع داخل المصنع؟ ١. نعم ٢. لا
V36	☐	إذا كان الجواب نعم، ما هي هذه المشاكل؟
V37	☐	ما الوسيلة المستخدمة لنقل النفايات من داخل المصنع إلى أماكن التجميع. ١. الحمل بالأيدي ٢. النقل بواسطة عربات يد ٣. سيارات أو تراكتورات صغيرة ٤. النقل باستخدام المازليق ٥. النقل باستخدام سيارات مؤهلة ٦. غير ذلك، حدد---------------------------------
V38	☐	ما الوسيلة المستخدمة لنقل النفايات إلى أماكن التخلص النهائي منها ١. عربات اليد ٢. شاحنات أو مركبات خاصة بالمصنع ٣. شاحنات أو مركبات خاصة بالبلدية ٤. شاحنات أو مركبات مستأجرة ٥. غير ذلك، حدد ----------------------------

هل السيارات التي تقوم بنقل النفايات الصلبة من المصنع مخصصة للنفايات الصلبة الصناعية؟ ١) نعم ٢) أحيانا ٣) لا ٤) لا ادري	☐	V39
كيف يتم تحميل النفايات المجمعة في أماكن التجميع إلى سيارات النقل؟ ١) آليا ٢) يدويا	☐	V40
كم تبلغ المسافة من نقطة التجميع النهائية (داخل حدود المصنع) إلى أماكن التخلص النهائية ١. ٥٠ م أو أقل ٢. ٥١ – ١٠٠ م ٣. ١٠١ – ٢٠٠ م ٤. أكثر من ٢٠٠ م	☐	V41
هل يتم نقل النفايات خارج المصنع ١. حسب كمياتها ٢. بشكل دوري ٣. تتكدس وتشكل مشكلة ٤. غير ذلك، حدد --	☐	V42
هل يتم مراقبة آلية النقل و التخلص النهائي من النفايات؟ ١. نعم ٢. لا	☐	V43
إذا كان الجواب نعم. من هي الجهة التي تراقب؟ ١. جهة خاصة بالمصنع ٢. جهة من البلدية أو المجلس القروي ٣. غير ذلك، حدد---------- ------------	☐	V44
هل لدى المصنع مشاكل في نقل النفايات خارج المصنع؟ ١. نعم ٢. لا	☐	V45
إذا كان الجواب نعم، ما هي هذه المشاكل؟	☐	V46

المعالجة و المعاملة والتخلص النهائي (Treatment, Processing, and final disposal)		
هل يتم معالجة النفايات بعد جمعها و قبل التخلص النهائي منها ١. نعم دائما ٢ . أحيانا ٣. لا	☐	V47
إذا كان الجواب نعم، ما هي طرق المعالجة المستخدمة ٣. التنظيف ٤. الفصل و الفرز ٥. فصل المركبات الخطرة فقط ٦. تقليل الحجم ٧. التدوير ٨. غير ذلك، حدد ----------------------------	☐	V48
كيف وأين يتم التخلص النهائي من النفايات الصناعية ٢. معالجة في الموقع(On-site) ٣. طمرها في مكبات خاصة ٤. طمرها في مكبات البلدية ٥. رميها بصورة عشوائية ٦. حرقها خارج إطار المصنع (Burning) ٧. حرقها في إطار المصنع (On-site burning) ٨. إعادة استخدام (Reuse) ٩. التدوير (Recycle) ١٠. نقلها الى جهة غير معروفة ١١. لا أدري ١١. غير ذلك، حدد -------------------------------	☐	V49
هل يتم بيع النفايات أو جزء منها؟ ١. نعم ٢. لا	☐	V50
إذا كان الجواب نعم، من يشتري هذه النفايات ١. أفراد مستقلين ٢. شركات أو مؤسسات خاصة ٣. شركات أو مؤسسات حكومية ٢. غير ذلك،حدد----------------------	☐	V51

هل تدفع مقابل التخلص من النفايات؟ ١. نعم ٢. لا	☐	V52
إذا كان الجواب نعم. كم تدفع سنويا (شيكل) ؟	☐	V53
هل يتم تدوين كميات النفايات الناتجة من المصنع باليوم؟ ١. نعم ٢. لا	☐	V54
هل يتوفر لديكم معلومات مكتوبة (دليل إرشادي) عن كيفية التعامل مع النفايات الصلبة الناتجة من المصانع ؟ ١) نعم ٢) لا	☐	V55
هل توجد جهة رسمية تتابع موضوع إدارة المخلفات الصلبة الصناعية معكم؟ ١) نعم ٢) لا	☐	V56
إذا كان الجواب نعم. من هي هذه الجهة أو الجهات ؟	☐	V57
في حال وجود هذه الجهات، هل تفرض هذه الجهات قوانين أو تعليمات خاصة بالتعامل مع النفايات الصلبة الناتجة ؟ ١) نعم ٢) لا	☐	V58
في حال وجود هذه الجهات، هل هناك عقوبات معينة في حالة عدم التقيد بالقوانين والتعليمات؟ ١) نعم دائما ٢) أحيانا ٣) لا	☐	V59
هل ترى ضرورة وجود قوانين خاصة بإدارة النفايات الصلبة الصناعية؟ ١) نعم ٢) لا	☐	V60
هل أنت راض عن خدمة نقل النفايات الصلبة الى أماكن التخلص النهائي منها؟ ١) راضي ٢) راضي نوعا ما ٣) غير راضي	☐	V61
إذا كان الجواب غير راضي وضح السبب .	☐	V62

تطبيق مبادئ الإنتاج الأنظف (Cleaner Production principles application)		
هل يوجد لدى المصنع استراتيجية بيئية وقائية متكاملة (Integrated preventive environmental strategy) ، ١. نعم ٢. لا	☐	V63
هل سمعت عن (ممارسات الإنتاج النظيف) للتقليل من النفايات واستغلال الطاقة بالشكل الأفضل والتقليل من الملوثات البيئية؟ ١) نعم ٢) لا	☐	V64
في حالة الإجابة بنعم من هو مصدر هذه المعلومات؟ ١. التلفاز ٢. الراديو ٣. الجريدة ٤. الانترنت ٥. ورشات عمل ٦. نشرات ٩. غير ذلك، حدد ---------------------------------------	☐	V65
هل المواد الخام المستخدمة في الإنتاج هي ١. مواد خام غير مستخدمة من قبل (virgin materials) ٢. مواد معاد تدويرها (Recyclable materials) ٣. مواد معاد استعمالها (Reused materials) ٤. ٢+٣ ٥. جميع ما ذكر	☐	V66
هل لديك استعداد لاستخدام النفايات الصلبة المدورة كمواد خام في مصنعك؟ ١) نعم ٢) لا	☐	V67
إذا كانت الإجابة لا وضح السبب..............................	☐	V68
هل يتم إعادة استخدام النفايات الصلبة الناتجة عن المصنع في المصنع نفسه (استخدامها بدون عملية تدوير)؟ ١) نعم دائما ٢) أحيانا ٣) لا	☐	V69
هل يتم إعادة تدوير النفايات الصلبة الناتجة عن المصنع؟ ١) نعم دائما ٢) أحيانا ٣) لا	☐	V70
إذا كانت الإجابة نعم، ماذا تفعلون بالنفايات الصلبة المعاد تدويرها؟ ١) كمواد خام ٢) كمواد أولية مساعدة للإنتاج ٣) يتم بيعها ٤) غير ذلك حدد..............	☐	V71

V72	☐	هل يمكن للمصنع استبدال المواد الخام بمواد خام أخرى تنتج نفايات صلبة أقل؟ ١) نعم ٢) لا		
V73	☐	إذا كان الجواب لا، أرجو توضيح السبب ؟		
V74		ما هي أهم المعوقات المتعلقة بسياسة الدولة والسوق التي تمنع أو تعيق المصنع من تطبيق مبادئ الإنتاج الأنظف:	١. نعم	٢.لا
V74a	☐	ضعف تطبيق الأنظمة البيئية		
V74b	☐	عدم وجود سياسات الحوافز الاقتصادية		
V74c	☐	عدم وجود تفضيل السوق / الطلب (Demand)		
V74d	☐	عدم كفاية التنظيم الذاتي على مستوى المصنع		
V74e	☐	ضعف الوعي العام، وضعف الضغط من المجتمع على المصانع لتحسين الأداء البيئي لديها		
V75		ما هي أهم المعوقات المتعلقة بالنواحي المالية والاقتصادية التي تمنع أو تعيق المصنع من تطبيق مبادئ الإنتاج الأنظف:	١.نعم	٢.لا
V75a	☐	ارتفاع تكلفة رأس المال الأولي للتكنولوجيا النظيفة بالمقارنة مع التقليدية		
V75b	☐	صعوبة الحصول على تمويل لمشاريع الإنتاج الأنظف الصغيرة والمتوسطة		
V75c	☐	ضعف الأداء المالي للعوائد القليلة تحجم الاستثمار في مشاريع الإنتاج الأنظف		
V75d	☐	عدم وجود تدابير فعالة لتقييم الأداء المالي لمشاريع الإنتاج الأنظف		
V76		ما هي أهم المعوقات المتعلقة بالنواحي التقنية والمعلومات التي تمنع أو تعيق المصنع من تطبيق مبادئ الإنتاج الأنظف:	١.نعم	٢.لا
V76a	☐	خبرة وقدرة العمال محدودة في مجال الإنتاج الأنظف		

V76 b	☐	عدم الحصول على الدعم التقني الخارجي		
V76c	☐	صعوبة الحصول على معلومات عن الإنتاج الأنظف		
V76 d	☐	وجود مشاكل لإيجاد بنية تحتية إضافية للإنتاج الأنظف ودمجها مع أنظمة الإنتاج الموجودة.		
V76e	☐	نقص التدريب العملي وورش العمل		
V77	ما هي أهم المعوقات المتعلقة بالنواحي الإدارية والتنظيمية التي تمنع أو تعيق المصنع من تطبيق مبادئ الإنتاج الأنظف:		١. نعم	٢.لا
V77a	☐	التوسع في الإنتاج يعد أهم من تنفيذ الإنتاج الأنظف		
V77b	☐	التركيز على القدرة التنافسية أكثر لان تطبيق الإنتاج الأنظف يحمل المؤسسة تكاليف إضافية ويقوض القدرة التنافسية لها		
V77c	☐	القلق من مخاطر تغيير عمليات الإنتاج الحالية و التكنولوجيات المستخدمة		
V77d	☐	عدم وجود وعي من المدراء والموظفين لأهمية الإنتاج الأنظف الاقتصادية والبيئية		
V77e	☐	عدم وجود القدرة على إدارة الإنتاج الأنظف من ناحية إدارية وتقنية		

الأمن والسلامة

V78	☐	هل يتم توعية العمال بمبادئ السلامة المهنية و آلية التعامل مع النفايات. ١. نعم ٢. لا
V79	☐	هل يتم توفير التدريب المناسب للعمال بما يتناسب مع طبيعة عملهم وعلاقتهم بالنفايات و الأخطار الناشئة ؟ ١. نعم ٢. لا
V80	☐	هل يتم تطبيق قوانين السلامة المهنية والصحية الموضوعة من قبل الجهات المختصة؟ ١. نعم ٢. لا
V81	☐	هل يتم ارتداء زي خاص لحماية العمال أثناء جمع أو معالجة أو نقل النفايات ؟ ١. نعم ٢. لا

V82	☐	إذا كان الجواب لا. أرجو توضيح السبب ؟
V83	☐	هل يتوفر كتيب يشمل إرشادات وتعليمات للعاملين للوقاية و المعالجة في حالة حدوث حادث؟ ١. نعم ٢. لا