

# BIO-ZMZM for biodegradable plastics



## Executive Summary

This report presents a detailed Environmental Impact Assessment (EIA) study for the proposed to be established facility under the name of "**Bio-Zmzm Company for Plastic Production**" which will be built in the premises of the already operating ZMZM company in Hebron, nearby its current factory.

This study was prepared upon the request from the owner/s to fulfill the requirements MIGA (Multilateral Investment Guarantee Agency) demands to support such developmental projects. It is aimed to help the client prepare EIA documents within the framework of the existing environmental Acts and Rules of the hosting country (here PNA). If any provision(s) and/or content(s) contradict(s) the provisions of the prevailing Acts and Rules, the provisions of the prevailing Acts and Rules shall be governing.

The study tackles in detail all the environmental aspects, elements, impacts and the mitigation, safeguards and risk elimination measures that should be followed and carried out in order to protect the people (workers, staff and others) and the environmental elements to keep them all safe and secure.

The owners of the project have already the long experience needed and the know-how essential in plastic production industry; they have been well-known in this field since more than the last two decades.

The main foreseen products will be only the biodegradable plastic items that proved to be more environmentally-sounded and safer for the human health.

## CHAPTER ONE : INTRODUCTION

### \*About Plastics:

One of the most ubiquitous and long-lasting recent changes to the surface of our planet is the accumulation and fragmentation of plastics,” The amount of plastic manufactured in the first ten years of this century (2000 on) will approach the total produced in the entire last century (1900-2000) wrote David Barnes. As all know plastics are very long-lived products that could potentially have service over decades, and yet the main use of these lightweight, inexpensive materials are as single-use items that will go to the garbage dump within a year, where they’ll persist for centuries. From hand watches and computers to household tools and hospital IV bags, plastic has molded our societies in many ways that make life both easier and safer. But this synthetic material also has left harmful impacts on the environment and human health. Evidence is mounting that the chemical building blocks that make plastics so versatile are the same components that might harm people and the environment. And its production and disposal contribute to an array of environmental problems, too. For example:

- Chemicals added to plastics are absorbed by human bodies. Some of these compounds have been found to alter hormones or have other potential human health effects.
- Plastic debris, laced with chemicals and often ingested by marine animals, can injure or poison wildlife.
- Floating plastic waste, which can survive for thousands of years in water, serves as mini transportation devices for invasive species, disrupting habitats.
- Plastic buried deep in landfills can leach harmful chemicals that spread into groundwater.
- Around 4 percent of world oil production is used as a feedstock to make plastics, and a similar amount is consumed as energy in the process.

People are exposed to chemicals from plastic multiple times per day through the air, dust, water, food and use of consumer products.

For example, phthalates [*are esters of phthalic acid and are mainly used as plasticizers (substances added to plastics to increase their flexibility,*

*transparency, durability, and longevity). They are used primarily to soften polyvinyl chloride (PVC). Phthalates are being phased out of many products in the United States, Canada, and European Union over health concerns]* are used as plasticizers in the manufacture of vinyl flooring and wall coverings, food packaging and medical devices. Eight out of every ten babies, and nearly all adults, have measurable levels of phthalates in their bodies.

In addition, bisphenol A (BPA) *[is an organic compound with the chemical formula  $(CH_3)_2C(C_6H_4OH)_2$ . It is a colorless solid that is soluble in organic solvents, but poorly soluble in water. Having two phenol functional groups, it is used to make polycarbonate polymers and epoxy resins, along with other materials used to make plastics. BPA is controversial because it exerts weak, but detectable, hormone-like properties, raising concerns about its presence in consumer products and foods contained in such products. Starting in 2008, several governments questioned its safety, prompting some retailers to withdraw polycarbonate products. A 2010 report from the United States Food and Drug Administration (FDA) raised further concerns regarding exposure of fetuses, infants, and young children. In September 2010, Canada became the first country to declare BPA a toxic substance. In the European Union and Canada, BPA use is banned in baby bottles],* found in polycarbonate bottles and the linings of food and beverage cans, can leach into food and drinks. The U.S. Centers for USA Disease Control and Prevention GO. reported that 93 percent of people had detectable levels of BPA in their urine. The report noted that the high exposure of premature infants in neonatal intensive care units to both BPA and phthalates is of “great concern.” Polybrominated diphenyl ethers or PBDEs, which are flame-retardants added to polyurethane foam furniture cushions, mattresses, carpet pads and automobile seats, also are widespread.

The plastics industry still claims that its products are safe after decades of testing.

“Every additive that we use is very carefully evaluated, not just by the industry, but also independently by government agencies to look at all the materials we use in plastics,” said Mike Neal, a consumer and environmental affairs specialist at PlasticsEurope, an industry trade association, and a co-author of the report.

But some of these chemicals have been shown to affect reproduction and development in animal studies, according to the report. Some studies also have linked these chemicals with adverse effects in people, including reproductive abnormalities.

“We have animal literature, which shows direct links between exposure and adverse health outcomes, the limited human studies, and the fact that 90 to 100 percent of the population has measurable levels of these compounds in their bodies,” said John Meeker, an assistant professor of environmental health sciences at the University of Michigan School of Public Health and a lead author. “You take the whole picture and it does raise concerns, but more research is needed.”

Shanna Swan, director of the University of Rochester's Center for Reproductive Epidemiology, conducted studies that found a linkage between pregnant women's exposure to phthalates and altered genital development in their baby boys.

Also, people with the highest exposure to BPA have an increased rate of heart disease and diabetes, according to one recent study. Animal tests studies of PBDEs have revealed the potential for damaging the developing brain and the reproductive system.

Deciding which chemicals to test and at what dose is also an issue. To date, most studies have addressed single chemicals, and there are limited data on the interactions between chemicals. Compounding the problem is the discovery that endocrine disrupting chemicals may have effects at doses lower than those used in the Environmental Protection Agency's standard toxicity tests.

Swan said the old model of testing should be thrown out and that the new goal should be tests that mimic real human exposure.

Plastic's problems extend beyond the human body, according to the report. More than one-third of all plastic is disposable packaging like bottles and bags, many of which end up littering the environment.

Although the image of a bird tangled in a plastic necklace is by now burned into the public's eye, ingestion of plastic fragments is much more common. Once inside, plastic can pack a one-two punch by both clogging an animal's stomach and poisoning it with chemicals that have

concentrated in the plastic. Some chemicals are then transferred to the food web when animals eat them.

Green solutions, however, are becoming available, the scientists say.

Table (1) below illustrates the most common types of plastics used, their applications and the symbol which is often used to identify them on forms of plastic packaging.

Polymer Types	Examples of applications	Symbol
PolyethyleneTerephthalate	Fizzy drink and water bottles. Salad trays.	 PET null
High DensityPolyethylene	Milk bottles, bleach, cleaners and mostshampoo bottles.	 HDPE null
PolyvinylChloride	Pipes, fittings, window and door frames(rigid PVC). Thermal insulation (PVC foam)and automotive parts.	 PVC null
Low DensityPolyethylene	Carrier bags, bin liners and packaging films.	 LDPE null
Polypropylene	Margarine tubs, microwaveable meal trays, also produced as fibres and filaments for carpets, wall coverings and vehicleupholstery.	 PP null
Polystyrene	Yoghurt pots, foam hamburger boxes and egg cartons, plastic cutlery, protective packaging for electronic goods and toys. Insulating material in the building and construction industry.	 PS null
Unallocated References	Any other plastics that do not fall into any of the	 null

	above categories - for example polycarbonate which is often used in glazing for the aircraft industry	
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Table (1): Types of known plastics and their uses.

**\*About the Project (Subject of this Study):**

**Zamzam Company** for Plastic Industries is one of the largest group Hassouna industrial business. It was founded in 2005 as a fruit of 32 years of experience and working in the field of plastics' consumptive industry. The company core work is based on the modernist global technology used in plastic production lines in aim that our products match the highest international plastic market standards in terms of quality and diversity. The company strives to open new foreign markets to its goods.

The company aims to provide the Palestinian market with the best sorts of plastic products of greater variety, as well as update its machinery credit with the newest technologies in its field of specialization and is committed to build the capacity of its cadres and personnel for the best.

The company also addressed its concerns to protect the environment from plastic waste by implying recycling practices at all its production lines and buying the most modern and sophisticated technologies, as well as obtaining the standards' licenses needed from the specialized international organizations in charge. The company looks forward to make a progressive turnover in its plastic field production by adopting the production of only biodegradable plastics, as they are the environmentally-sounded and friendly products, in all of its lines. Hence this is its strategic aim, the company administration is planning to establish the new firm "Bio-Zamzam Plastic Co." to which this study is prepared.

**\* EIA and its Importance:**

Environmental Impact Assessment (EIA) is one of the proven tools of facilitation to achieve the goal of environmentally and socially sound and sustainable development. The incorporation of EIA in developmental projects in PNA was initiated in the late nineties.

However, with the enforcement of the Environmental Strategy Plan (ESP) and the rules of the Environment Quality Authority (EQA) of Palestine in 1998, the integration of EIA in many developmental projects in Palestine has now become compulsory. The importance of conducting an EIA for any project is:

- To determine whether the proposed investment may result in environmental or social impacts.
- To identify these impacts; the negative as well as the positive
- To propose the suitable mitigation and monitoring measures to protect the environment and give details for administering and monitoring the potential environmental impacts and their mitigation measures.
- To propose applicable safeguard documentation to address potential impacts;
- To evaluate the existing institutional capacity of the company staff to manage the recommendations for implementing the proposed measures
- To provide recommendations to build capacity and strengthen environmental management and awareness;
- To develop procedures to identify and address potential environmental and social safeguard issues of the company.

The environmental matrices annexed at the end of this study provide means to be considered during the main phases of the company project; design, implementation, operation, control and monitoring.

The proposed factory might have some negative but small impacts on the environment that can be easily mitigated. Therefore, the project is classified as environmental category B, in accordance with World Bank Operational Policy 4.01. So, as a result, this Environmental Impact Assessment study was prepared for the company with the aim to provide a review, analysis and

#### **\*Plastic Industries in Palestine:**

Prior to 1963 only few small plastic fabrics existed in Palestine, nowadays the number exceeds > 165 (*100 in West Bank & 67 in Gaza*)

*Strip*). The man power now working in these plastic fabrics exceeds 3500 workers. The fabrics are able to manufacture most of the well-known plastic items and tools, from the household articles to the industrially needed ones, e.g. hoses of different sizes, jars, cups, bags, pipes, molds, casts, agricultural sheets, mattresses, pillows .... etc.

**\*Aims of this study:**

This study aims for the followings:

- To identify the type, nature and scale of the project;
  - To determine based on knowledge whether the proposed investment may result in environmental impacts;
  - Propose mitigation and monitoring measures in the form of applicable safeguard documentation to address potential impacts;
  - Evaluate the existing institutional capacity of the company cadre to manage the recommendations for implementing the measures outlined in the EMMP (discussed in the coming pages)
  - Provide recommendations to build capacity and strengthen environmental management and awareness;
  - Develop procedures to identify and address potential environmental and social safeguard issues of the projects;
- Whatever safeguards and measures to be carried out, the proposed factory might have some negative impacts on the workers and environment that should be mitigated. So, as a result, this Environmental Impact Assessment study was prepared for the company with the aim to provide a review, analysis and recommendations of the best mitigation measures that the company management team should consider during operation.

**\*Feasibility Study & Marketing Possibilities:**

Being a nation under occupation, Palestinians still don't have accessibility to their own resources (e.g. land, water, sea, natural resources and whatever physical or non-physical). Such developmental projects, like the one under study here, will help to minimize the growing rate of unemployment among the Palestinian labor power and contribute to build a self-dependent economy for the quested Palestinian state.

### ***Market for biodegradable plastics***

Because of the problems with plastic waste, it is important to stimulate environmental consciousness at companies and consumers in the Palestinian Authority and surrounding countries by expanding recycling activities of plastic and introducing eco-friendly plastics. The government of the Palestinian Authority welcomes these activities since it is developing plans to ban non-degradable plastics. It is expected that these legislation will be introduced within a few years.

A detailed feasibility study for the project and its elements is separately prepared by the project owners for the donors.

### **\*Licensing and Consultancy:**

The proposed project will comply with all needed licensing demands from all governmental institutions in concern; especially from the Ministries of Environment + Local Governance + National Economy + Health + Finance + Agriculture and the Municipality of Hebron. Zmzm Co. had already passed all these steps of licensing process and it has already the needed license.

Many revisions, consultations, market and disk studies and technical analysis of all subjects related to inaugurate such projects were made prior to reach the decision to adopt such project. In these studies, university professors, qualified engineers and persons with long experience in the field of plastic industry were involved. The end result all reached was that the proposed project is a promising one and will gain momentum with time.

The joint venture will be ISO-certified before the end of the project implementation period.

The owners will also liaise with the appropriate officials from the Department of Antiquities at the Ministry of Tourism and Antiquities where needed.

### **\*Alternative:**

None of the Palestinian companies produce biodegradable plastics. Further the local market for biodegradable plastic products has not been developed yet; these products are not imported nor available right now.

The project partners will start with the introduction of well-chosen biodegradable plastic products that will have a major beneficial impact on the environment and will not encourage littering nor interfere with local recycling activities. It is proven, by EPI among others, that agricultural

sheets and garbage bags are very suitable to be made of biodegradable plastic. Parts of the agricultural sheets that are left behind will decompose within a few months. Biodegradable garbage bags are disposed anyway and will start degrading within a few months on a landfill or dumpsite. Positive side effect is that it will speed up decomposing of the garbage in it. Therefore these biodegradable products will contribute to an improved environment.

Currently traditional agricultural sheets (large sized plastic foils) are not being produced at the Palestinian Authority and are imported. Traditional drawstring garbage bags are only produced by ZMZM. The drawstring offers an easy gripping handle with a tight closing top which provides an effective way to collect and dispose trash.

The average distributors price for garbage bags on the Palestinian market is 1,500 €/mton, drawstring garbage bags is priced at 2,200 €/mton and agricultural sheet of traditional plastics are sold at a price level of 2,400 €/mton.

Based on a small scale experiment ZMZM has made some samples of biodegradable plastic products. A substantial number of its current customers are very enthusiastic and want to buy larger amounts. They have signed a preliminary buying contract for a substantial amount of biodegradable plastics per year if the required quality is satisfying.

## CHAPTER TWO: PROJECT DESCRIPTION

\* **Locality:** The factory to produce biodegradable plastics will be established on the premises of since years functioning ZMZM plastic factory but separated from it with the needed fences; the new facility will run all its operations unrelated to the main Zamzam Co. The new building will be 1,600 m<sup>2</sup> and consists of a production facility including warehouse for raw material and end products and offices. Outside, an entrance and exit road will be constructed and a parking place. The premises will be marked out with fences and a security system will be installed. Below are some photos for the Zmzm Co. from different perspectives:





**\*Production process:**

The technology used for producing thin plastic sheets is called blown extrusion technology (see figure 2 for a flow chart).

The blown extrusion process starts with computerized mixing of virgin resin/granule, recycled material and additives. The mixture is heated and conveyed



through the extruder. The melted material is pumped, under continuous pressure, through a circular, rotating die (1) that creates a tube of thin polymer. As the warm, extruded material is drawn up several stories by nip rollers (2), the tube is expanded by filling it with air, creating a "bubble" (3). As the bubble enters the nip rollers it is collapsed into a flat tube and then cools further while it travels back down the outside of the tower to an additional set of rollers. The film next enters the slitter station where one or both sides of the flat tubular film can be slit. After slitting the agricultural sheets are finished and wound on rolls. Garbage bags need further processing like printing and welding. Welding is performed with ultra-son or heating technology and is purposed to close the bottom of the bag. Subsequently a perforation line will be applied that enables the end-user to tear off a bag from the roll. Final steps is to apply the cord or drawstring and then the end products can be packed. Further, peripheral equipment is needed like compressors and equipment for gravimetric dosing, pre-treatment and measuring the quality and thickness of the film. Pre-treatment equipment is used for cleaning and shredding used plastic for recycling.

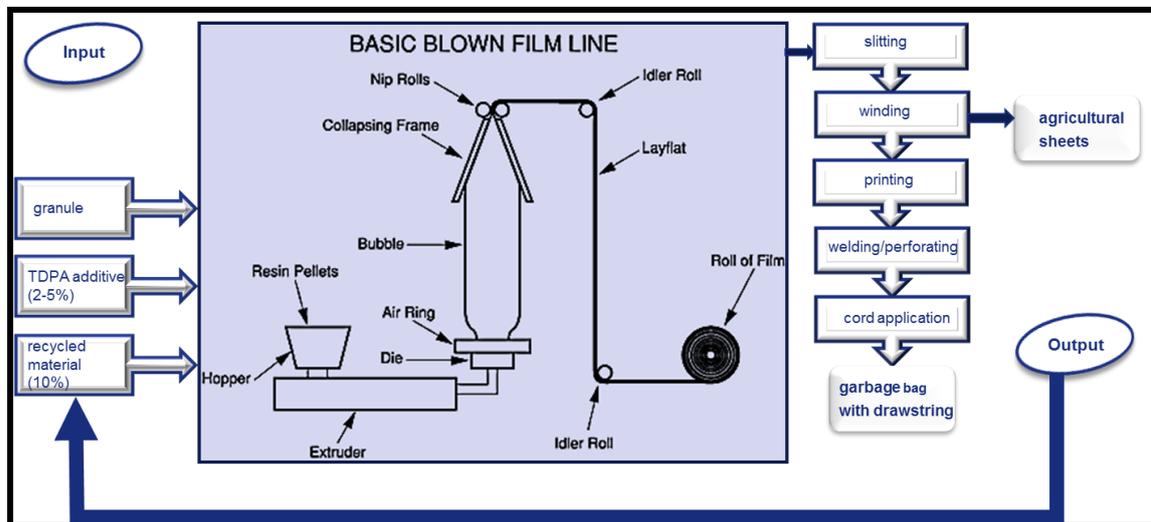


Fig. (1): Flow chart within the Bio-Zmzm facility.

**\*Production Capacity:**

Table (2) below shows the expected annual production of each type of product:

#	Type of Product	Annual Production
1	Garbage bags with or without drawstrings	750 mton/year
2	Agricultural Sheets	850 mton/year

Table (2): Type and quantity of plastic production in the new facility.

**\*Infrastructure Services and Accessories:**

- **Roads:** Zamzam factory is reachable via the Hebron – Beit Kahil main road; the average width of which exceeds 12m (8m are well-paved).

- **Water:** The company is provided with fresh water from the municipality of Hebron water public network. Anyhow, any shortage in water can easily be covered by fresh water tankers. Hence such projects don't need that much of water, only limited water quantities for household purposes are needed. The proposed project will be provided by many water stores fixed on its roof. One big underground store of 1000m<sup>3</sup> fresh water storage capacity is going to be constructed within the proposed building complex.

- **Electricity:** The whole facility of Zamzam is provided with phase electricity 3 from the main electric public company. The new project will become a fully automated production facility and electricity is the main power to be used at all of its operational phases.

There should be a generator of suitable capacity to operate automatically during public EC cut-off times. It will be housed in a special store where nearby another store for a stainless steel fuel container, double layered. Both stores are isolated, well-ventilated and equipped with an efficient fire extinguishing system.

**- Sanitary Unit & Sewerage Services:**

The factory building is not connected to the public sewage network; therefore a sealed underground cesspool will be constructed at the lowest part of the construction. The cesspool is composed of three major chambers, the first one is the sedimentation chamber, the middle one is the rotting and the last one is the fermentation chamber. The sum capacity of the three

chambers will be not less than 300m<sup>3</sup>, 100m<sup>3</sup> each. The cesspool will be professionally emptied by special sewage tanks once filled and disposed according to the acting municipality regulations. Within the utility of the building there will be 2 WC utilities for men and other 2 for women, each is served with cold and warm water as well as soap for flushing and cleaning and toilet paper for drying. Cleaning all the utilities of the (offices, ground, working places, glasses, walls, ceilings, roofs, corners, stores .... etc) by professional cleaners is a must that will be checked and monitored by the house keeping officer all the time around.

- **Solid Wastes' Management:** Most of the solid wastes that will be generated thru the daily work can be divided into 3 main categories:

1. The ordinary household wastes that the workers and the staff generate all-day around; e.g. kitchen and food residues, papers je sort<sup>1</sup>, personal unneeded articles, ....
2. Municipal residues; e.g. cardboard, strings, scraps je sort, .....
3. Plastic residues and trimmings.

The first two waste sorts (1+2) are going to be dumped in the containers (no., capacity and type will be defined after the finishing of the construction) which will be emptied by the municipality trash collection cars. Most of the third (the plastics) will be recycled and the unrecyclable will be kept in special containers and dumped according to the acting regulations under the supervision of the concerned authorities. Collecting the trash/garbage will be followed on daily basis.

- **Telecommunication and Internet Services:**

The company will be provided by a network of telephone and internet services of high quality and capacity. There will be a special web-page for the Bio-Zmzm company where its activities, contacts, personnel, products, events and more are accessible for the public to see.

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<sup>1</sup> Papers je sort means all types of papers and card boards as well as newspapers, disposed labels and carton. Scraps je sort means all unneeded accessories [excluding plastic remains, metal, pesticides, hazardous materials, domestic residues ...], e.g. wood, strings, neutral household residues like degradable organics [=agricultural] if any...etc.

## CHAPTER THREE: THE ENVIRONMENTAL STATUS QUO

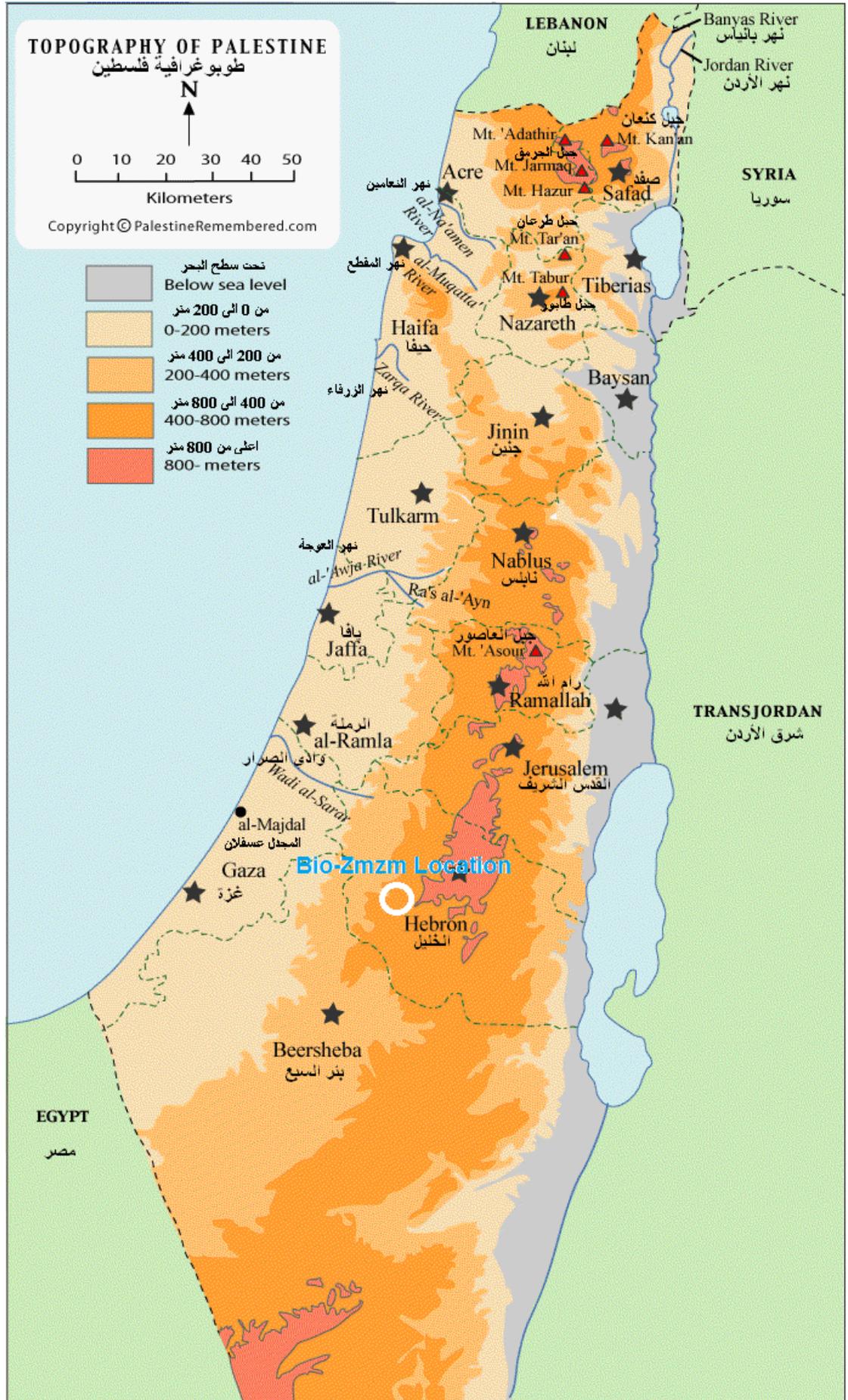
### A) The Physical Environment:

#### A-1: Topography of the Project Area:

Zmzm complex is located at the southern hillside of Hebron-Beit Kahil main road, some meters before the crossing to Haska (*see Fig.2 below*). The area slopes approx.  $3^{\circ} - 5^{\circ}$  towards south.



Figure (2): Location of Zmzm industrial complex between Hebron and Beit Kahil (*google maps*).



Fig(3):Topographic map of Palestine showing the location of Hebron City.

### **A-2: Geology of the Project Area:**

The soil cover within the project area and around is composed mainly of calcareous rich terra rosa where different erosion residues of hard stones ranging in size from gravel/cobble to boulder/blocky dissipated randomly here and there in the area and around. Patches confined in between these blocks are filled with soil cover which thickness ranges between mostly few centimeters to rarely  $>1.5\text{m}$ , depending on the spot location.

This soil cover rests on a true bed rock composed extensively and substantially of hard limestone rocks of Late Cenomanian Age. This yellowish beige bed attains a thickness of approx. 20m and is characterized from a hydrological point of view by being a good aquifer, therefore special mitigation measures and restriction should be imposed to prevent any whatever seepage from the plastic facility to percolate down to the groundwater reservoirs.

Geologically, and from the tectonic point of view, Zmzm complex is located on the western flank of the geologically well-known Hebron anticline where all rock successions show remarkable dipping towards the west, the dip magnitude varies from being gentle within the Hebron city to very sharp (even thrusting) going down westwards. Geological features like karst or sinkholes or subsidence due to permafrost or quick sand are excluded. Other features that are considered geo- hazards like land sliding, mud flow, land creep, mass wasting and avalanche are not likely to occur within the vicinity of the factory land or even some kilometers away from it; the project is by guarantee is located in a geologically stable area.

A geological map of Palestine is to see in fig. (4 )below where the location of the project is marked on.

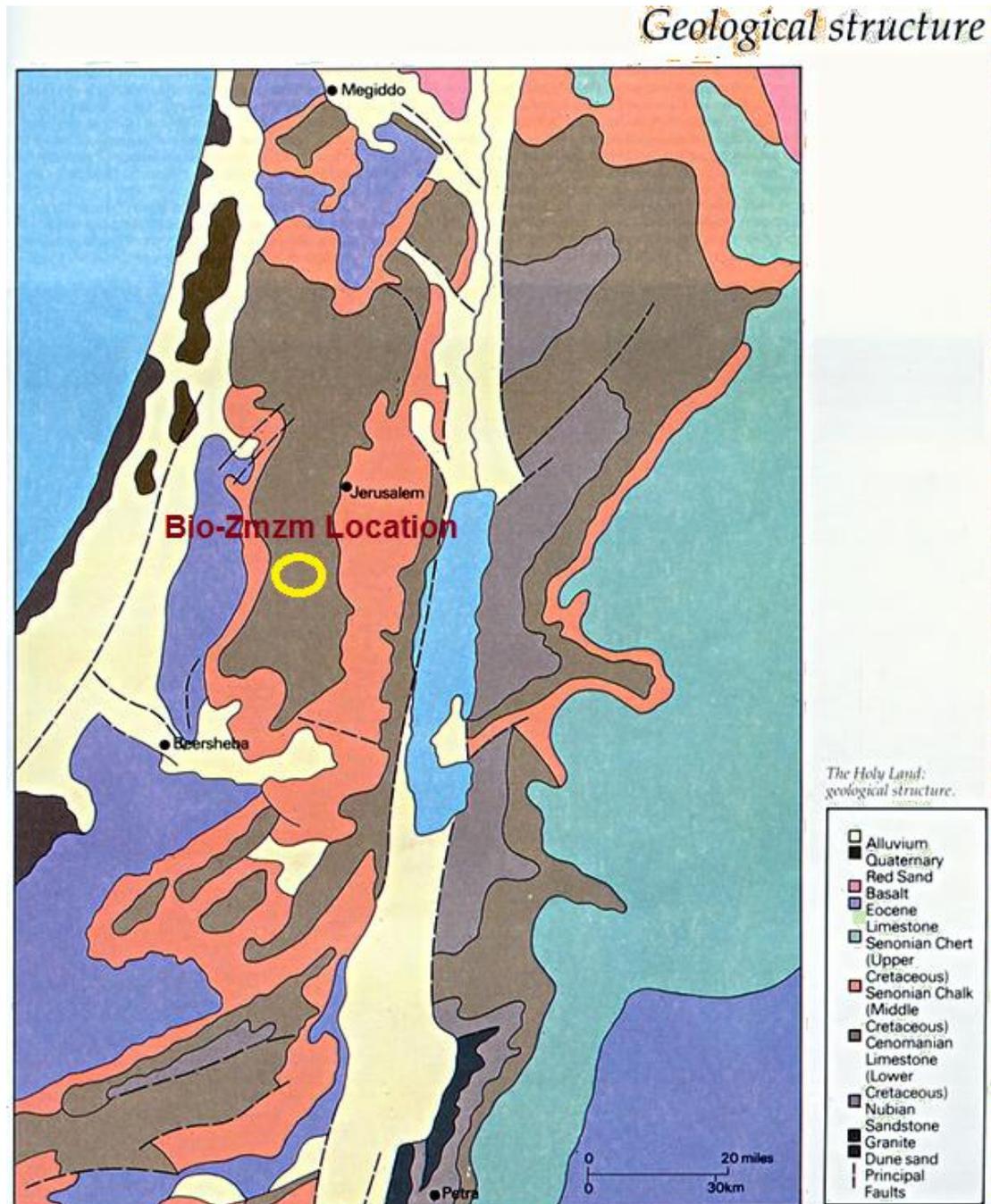


Fig. (4): Geological map of Palestine showing Zmzm industrial complex.

### A-3: Climate and Weather:

To know the climatic conditions well of the site might contribute positively too much in putting the suitable mitigation measures for any negative impact. The climatic conditions prevailing in the area of the proposed project and around are those of the Mediterranean; warm dry weather in summer and rainy cool in winter. Normally, the wind blows

mainly from west to east except the what is locally called Khamaseen winds that blow in spring from east to west. The distinction between the four seasons in the near past times was clearly defined, nowadays the photo shows some disturbances; this may be ascribed to the global warming effect.

#### **A-4: Hydrological and Hydro-geological Status:**

Hydrologically, the average annual rainfall within the vicinity of the studied area is 300-350mm in dry years to 500-550mm in rainy ones; 700mm or more are looked as exceptional. Surface water bodies of any sort do not exist in the area or around.

From the hydro-geological point of view, the site is located within the vicinity of the western aquifer system which by far is considered the most fertile groundwater producing reservoir in Palestine (see the map in fig.5 below). Because all used waters in the facility are going to be totally collected in a sealed septic underground store and emptied periodically away, then seepage of any sort to percolate to the underground strata is completely excluded. Moreover, no spring will be affected by whatever activity running in the facility which will operate by far as per close system.

## Mountain and Coastal Aquifers



Fig.(5): Groundwater aquifer system in Palestine.

### **B: Biological Environment:**

#### **B-1: Agriculture, Vegetation Cover & the Wild Life:**

The area where the factory is located was considered by far an arable/pasture land where diversified species of wild plants and grasses are randomly growing. Seasonal crops like forages growing in some land lots and grapes in others were normal. Nowadays, most of the area is

undergoing urbanization process and many industries had already their facilities built in and around.

Being always a country side land, wild life of both fauna and flora were flourishing in harmony in the area and around all time, but due to the urbanization (in fact the on-going industrialization in the area) the prevailing indigenous species of both are negatively affected in number of species and population density.

### **B-2: Socio-Economic Aspects:**

Hebron is located in the southern West Bank, 30 km (19 mi) south of Jerusalem. Nestled in the Eastern Mountains, it lies 930 meters (3,050 ft) above sea level. It is the largest city in the West Bank and home to an estimated 230,000 Palestinians. The city is most notable for containing the traditional burial site of the biblical Patriarchs. The city is also venerated by Muslims for its association with Abraham and was traditionally viewed as one of the "four holy cities of Islam.

Hebron is a busy hub of West Bank trade, responsible for roughly a third of the area's gross domestic product, largely due to the sale of marble from quarries. It hosts many big businesses of most known industries (plastic industry is among the larger) and is locally well known for its grapes, figs, limestone, pottery workshops and glassblowing factories, and is the location of the major dairy product manufacturers. The city is home to Hebron University and the Palestine Polytechnic University. Plastic industries in Hebron are flourishing more than elsewhere in Palestine and Hebron hosts many plastic firms (see table 3 below):

<b>Name of the company</b>	<b>City</b>	<b>Type of products</b>
ZMZM for plastic industries	Hebron	T-shirt bags, shopping bags, bags for food, garbage bags
Al Zeir company	Hebron	T-shirt bags, shopping bags, bags for food
Shawar company	Hebron	T-shirt bags, shopping bags, bags for food

Abko company	Hebron	T-shirt bags of traditional plastics
Al Ferdous Co.	Hebron	Nylon bags
Al Bayan company	Hebron	Plastic industries, traditional plastic
Al Herbawy Co.	Hebron	Bags and nylon sheets
Al RAHA company	Hebron	Shopping bags of traditional plastics
Al Sa'afeen company	Hebron	T-shirt bags of traditional plastics

Table (3): Plastic producing firms in Hebron and the type they produce.

## **CHAPTER FOUR: ENVIRONMENTAL MANAGEMENT & MONITORING PLAN (EMMP).**

**\*Forward:** MMDP gives details for administering and monitoring the potential environmental impacts and their mitigation measures. The environmental matrices shown herein are to provide means to be considered during the main phases of the projects; design, implementation, operation, control and monitoring.

MMDP discusses all the input elements as well as those output in detail and the activities proposed to be carried out step by step in the production process from A to Z. Its aim is to perform the transformation process in an environmentally-sounded way that won't generate any negative impact neither on the personnel involved nor on the environment. For this goal it to be optimally achieved, it states all suitable mitigation measures and safeguards committed to be followed by the company administration and those working with in all stages of the production/working process. Monitoring these measurements is the responsibility of the co. staff in the first line and the concerned official authorities.

Filing and documentation of all the events happened and activities carried on including the procedures followed, new inputs, outputs, personnel affairs, accidents, emergency cases, catalogues, visits conducted, marketing and financial registrars .... etc should be kept in the co. office for revision and reference at any time.

### **\*Inputs:**

**Stationary Inputs:** Those are kept within the vicinity of the fabric all the time including those moving here and there to provide services like lifting articles, displacing things, carrying, facilitating the production process in situ ... etc. The fabric will host an Extruder [type Kung Hsing, single head type high speed, KS-FE80B, dimensions are: (L X W X H) in meter 7.5 X 4 X 8)], Hudson Sharp bag making machine M840, Fork lift, Air compressor, Generator, General tools like tables, chairs, hand tools (variables), ...

**Kinetic Inputs:** The raw materials (plastic grains and recyclable cuttings), paints, the products, the trucks/cars, stationeries (variable), packaging articles ... etc.

**\*Employment/Personnel and Working Conditions:**

It is proposed that this project will create 45-48 direct new jobs at the end of the implementation phase (see table 4 below). Two years after the project implementation an additional 30 direct jobs are expected to be created.

#	Profession	No.	Responsibility
1	General Manager	1	Head of the Co. and responsible for all the co. activities and personnel; represents the co. in front of external institutions.
2	Production Manager	1	In charge for the production process, the inputs as well the outputs, the workers' commitment to the regulations and rules.
3	Sales' Manager	1	Specialist in marketing
4	Sales' Representative	2	Advertising and exploring new marketing possibilities
5	Accountant	4	Financial affairs
6	Administrator	2	Controlling the work and the working conditions
7	Secretary	2	Paper and office work
8	Technical Services & Supervisors	5	Maintenance, repair and technical works
9	Janitor	1	Check in & out
10	Guard	1-3	One at night & 1 at day
11	Warehouse Keeper	2	Checking and keeping the good
12	Workers	20	For the 3 shifts
13	Drivers	2	To drive the trucks/cars
14	Sanitary/Canteen	1-2	Cleaning and services
<b>Total No. of employees = 45-48</b>			

Table (4): No. of Co. employees and their assigned responsibilities.

Training Programs will focus on introducing the raw materials [their nature, chemistry, degradability, safe handling, storage, .... etc], the machinery [specifications, safe running, mechanics, electronics, functions, how to deal with ....etc.], the products [specifications, handling, storage, loading, transport, ....etc.], utilities in the facility and how to deal with e.g. the lab., the kitchen, sanitation, waste, safety

measures, emergency plan/s....etc. Also, everyone involved in the production-marketing-administration process should have to attend these training programs which are going to be prepared by professionals.

Guards will not be armed as it is strictly forbidden for Palestinians to be armed without Israeli permit which is not possible. But there will be an efficient alarm electronic system connected directly with the nearest police station in case of emergency. Extra to these, there will be a wired fence up to 2m height and a heavy duty gate.

**\*Environmental Impacts and the proposed Mitigation Measures:**

Table (5) below shows the environmental and safety component and its impact sign.

No.	Environmental and Safety Component	Impact		
		Positive	No Impact	Negative
1.	Air Quality			X
2.	Groundwater Quality			X
3.	Heat Flow			
4.	Community Water Supply		X	
5.	Public Health and Services	X		
6.	Workers Health and Safety			X
7.	Dust and Noise Reduction			X
8.	Cultural and Heritage	X		
9.	Socio-economic	X		
10.	Water Courses and Wadis		X	
11.	Forests and Biodiversity Areas		X	
12.	Aesthetic		X	
13.	Waste Reduction			X
14.	Work Accidents			X

15.	Recycling Applications	X		
16.	Poverty Alleviation	X		
17.	Used Machinery Oils			X

Table (5): Environmental and safety component and its impact.

While table (6) below shows the environmental impacts and the related mitigation measure/s to be carried out in order to minimize its negativity to the minimum, taking in consideration that no whatever developmental project is to operate it should have at least one negative impact on at least one the environmental elements (the 4 well-known elements are soil cover + air + water + human being). It is a matter of innovation to find a mechanism how to balance between implementing developmental projects with the least loss to any of the environmental elements.

#	Environmental Impact	Source/s	Place to occur in	Mitigation Measures to be carried out
1	Air Quality gets worse [odors, dust...]	Plastic granules warming/melting + additives, e.g. coloring pigments + paints + oil vapors + odors	Inside doors + Outside	1) Installation of efficient ventilation system 2) Workers wear suitable masks when needed 3) Sustainable maintenance for all machinery 4) Continuous surveillance
2	Groundwater quality	Because the aquifer is too deep [>100m deep], the possibility to be negatively influenced is rather nil. As well as, most of the runoff will be harvested in a 1000 m <sup>3</sup> sealed underground store.		
3	Public Health and Services	Some of the profit will go to improve the local clinical utilities, municipal cleaning facilities, environmental awareness activities ...etc. Also, all employees [& their families] of the new Co. will be medically insured.		
4	Socio-economic parameters/ poverty alleviation	Saving new employment places will improve the socio-economic life of the community residents. As well as all the Co. employees [& their families] will be socially secured.		
5	Aesthetic/	New construction	All the plot	1) Planting >>>>ever green

	Forests and Biodiversity Areas influenced	itself Construction activities+ operation + urbanization	topography is changed	plants around 2) Keeping the surroundings always clean 3) Movement restrictions at the realm of the plantation 4) Rehabilitation/preservation of as much as could be rehabilitated/preserved. 5) No use of pesticides in the realm of the plantation
6	Noise level gets higher/	Machinery + cars + tools	Inside doors + Outside	1) Sustainable maintenance for all machinery. 2) Workers wear ears' anti-noise devices
7	Solid wastes increase (quantitative & qualitative)	Personnel + operations + visitors	Inside + outside	1) Solid waste separation and implying recycling when possible 2) Introducing suitable and sufficient containers and keep them always closed 3) Emptying daily 4) Cleaning around and spraying anti-insects 5) Awareness training for all personnel
8	Wastewater quantity increases	Personnel daily life needs + flushing + cleaning	Inside mainly	1) Collection of all wastewater from all utilities in the underground sealed cesspool. 2) The cesspool will be professionally emptied by special sewage tanks once filled and disposed according to the acting municipality regulations.
9	Fresh water quantity need increases	Personnel daily life needs + flushing + cleaning + irrigation	Inside & outside	1) Rational use of water. 2) Application of dripping system in irrigation 3) Application of water saving devices 4) Awareness programs for the workers

10	Fire risk possibility increases	Electric contact + over warming of the plastics + oils' mishandling	Inside & outside	<ol style="list-style-type: none"> <li>1) Sustainable maintenance for all machinery</li> <li>2) Oils and all other combustibles kept isolated</li> <li>3) Efficient fire alarm system introduced</li> <li>4) Awareness programs for the workers</li> </ol>
11	Human health/ Workers Health and Safety/ Work Accidents	All	Everywhere	<ol style="list-style-type: none"> <li>1) Medical periodic checking for all personnel</li> <li>2) No use of whatever hazardous material</li> <li>3) Awareness programs for the workers to follow the labor safety regulations</li> </ol>
12	Green cover decrease	Urbanization + industrialization	Outside	<ol style="list-style-type: none"> <li>1) Planting new &gt;&gt; plants</li> <li>2) Irrigation and caring</li> <li>3) Awareness</li> </ol>
13	Heat Flow increase	Operations	Inside mainly	<ol style="list-style-type: none"> <li>1) Air conditioning installation</li> <li>2) Good ventilation</li> </ol>
14	Runoff increase	Roofs + paved yards	Outside	<ol style="list-style-type: none"> <li>1) Building an efficient drainage system (engineering issue)</li> <li>2) Construction of a water harvesting utility</li> </ol>
15	Public Roads' status Gets worse	➤ Traffic	Outdoors	<ol style="list-style-type: none"> <li>1) Contribution for street rehabilitation.</li> <li>2) Complying with the permitted loads.</li> </ol>
16	Recycling possibilities	Import + operation	Inside + outside	<ol style="list-style-type: none"> <li>1) Recycling all plastic trimmings/remains</li> <li>2) Plastic trash from outside to buy and recycle</li> </ol>
17	Used Machinery Oils	All types of machines + cars	Inside + outside	<ol style="list-style-type: none"> <li>1) Collection of each drop of the oil in sealed containers.</li> <li>2) Disposal due to the instructions of the official authorities</li> </ol>

Table (6): Environmental Impacts and the related Mitigation Measures.

### \* Positive Impacts:

The facility will save work for approx. 50 families in the first phase, this is very important for a nation under occupation suffering unexpected harsh conditions like curfews, siege, road-cuts, embargos, military invasions where experience shows that such irresponsible and irrational invasions led to great damage and wrecking of the infra- as well as ultra structures. Also a good opportunity for recycling plastic trash from elsewhere will support other families' economy.

### \*Recycling:

The new facility will use 10% used material besides virgin granule. To guarantee this input it will initiate and stimulate recycling of plastics by:

- 1) all plastic waste at the production (for example after slitting the sides) will be re-used in the production;
- 2) establishing a reception desk at the new facility where customers, individuals and companies can turn in used plastics. This desk will be equipped with a scale and individuals/companies will receive a direct payment per kilo used plastic.
- 3) establishing a new recycling project with commercial or governmental organizations or joining an existing one. The project partners believe this initiative should be supported by the government to create more impact at the consumers.

This project will positively influence the environment as biodegradable plastics will accelerate decomposing of plastics. The new project will become a fully automated production facility for biodegradable plastic garbage bags (with or without a drawstring) and agricultural sheets. Its main activities will be production and sales of biodegradable plastic products. Further activities will be research and product development at the laboratory and receiving used plastics for recycling.

Like all factories, the new facility will use energy resources for production. Further, the project partners commit themselves to limit the negative environmental impacts of their economic activity as much as possible. At the factory no hazardous material is used. The proposed recycling activities reduce the required amount of original input material and energy as well as reduce waste on the street, on dumpsites and on agricultural land with **at least 160 mton** each year. The factory will also re-use plastic waste from its own production. The limited amount of

waste produced by the factory will be disposed responsibly and in compliance to all local environmental laws and regulations. The facility will be equipped with second hand machinery requiring 80% less energy compared to manufacturing new ones. Establishing a social project to promote environmental awareness will eventually change buying and littering behavior of consumers and companies sustainably. It will change the mind-setting and enforce the development of eco-friendly acting of companies and consumers.

**\*Negative Impacts:**

As an axiom, no whatever economic activity is without negative impact, especially on the environment.

An estimated 30% of plastic waste in the Palestinian Authority is being recycled and reused for the production of plastic pipes for electricity and irrigation. However, the majority of the plastic waste, over 450 mton/month, is dumped at landfills, dumpsites or ends up in the streets. A huge amount of plastic is left behind on agricultural land (about 700 ton/year). Farmers use plastic sheets to increase soil temperature, reduce the use of herbicides and water or to prevent fruits and vegetables from direct contact with soil. After harvesting the plastic sheets are removed from the land, a very time spending activity for farmers, but parts of it are ripped off and stay behind. It takes decennia, if not centuries before these larger pieces of plastic are decomposed. Also farmers burn the plastic sheets on their lands, leading to an unhealthy emission of smoke and CO<sub>2</sub>. The Palestinian market for agricultural sheets is about 1,200 mton/year. These large, thin sheets are produced by Palestinian companies or imported from Israel.

This environmental impact assessment is conducted, not only because it is required by law, but also to measure the exact impact of the activity on the environment and to investigate what mitigation measures can be implemented to decrease these impacts.

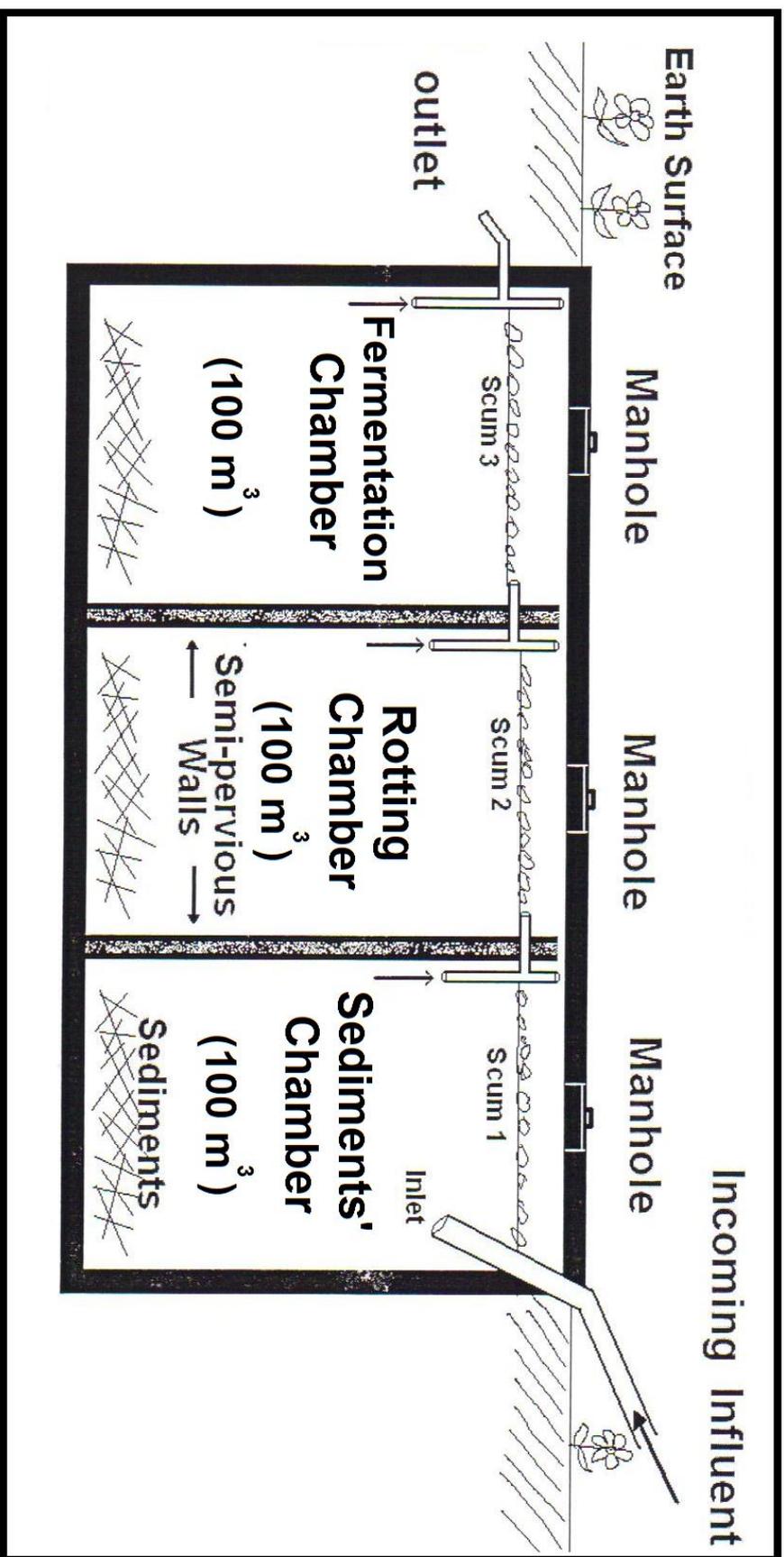
## Annexes

(1)↓Specifications one of the machines to be operated:

<b>MODEL</b>	<b>KS-FE65B</b>	<b>KS-FE80B</b>
<b>MATERIAL TO BE USED</b>	HDPE	
<b>MAX.FILM WIDTH</b>	1200mm	1600mm
<b>THICKNESS OF FILM</b>	0.008~0.08 m/m	
<b>MAX.EXTRUSION OUTPUT</b>	165 kg/hr	250 kg/hr
<b>SCREW DIA.</b>	65 mm	80 mm
<b>SCREW L/D</b>	30:1	30:1
<b>SCREW/CYLINDER MATERIAL</b>	SACM-645 STEEL WITH HARD WITH NITROGEN TREATMENT	
<b>CYLINDER COOLING</b>	1/2 HPx3	1/2 HPx4
<b>DRIVING MOTOR</b>	75 HP	100 HP
<b>HEATER CAPACITY</b>	30 kw	40 kw
<b>DIES (mm)</b>	150~175Ø	200~230Ø
<b>TEMPERATURE CONTROL</b>	7 points	8 points

	COOLING EQUIP	7 1/2 HP	10 HP
<b>TAKE-UP UNIT</b>	TYPE	FIXED TYPE	
	PINCH ROLLER (mm)	165Øx1300L	215Øx1700L
	TAKE-UP MOTOR	2 HP	3 HP
	TAKE-UP SPEED (m/min)	12~120	12~120
	SUB-PINCH ROLLER (mm)	140Øx1300L	165Øx1700L
	GUIDE MOTOR	30 kg/cm <sup>x2</sup>	50 kg/cm <sup>x2</sup>
<b>WINDING UNIT</b>	FW TYPE	ONE STATION AUTOMATIC SURFACE TYPE WINDER	
	EFFECTIVE WIDTH	1200 mm	1600 mm
	DIA. OF FILM WOUND-UP ROLL	1000 mm	1000 mm
	WINDER MOTOR	2 HP	3 HP
	DIMENSION (LxWxH)(M)	6.3x3.2x6.5	7.5x4X8
<b>OPTIONAL DEVICE</b>	AUTOMATIC HOPPER LOADER, FILM SURFACE TREATER, PRESSURE GAUGE, EMBOSSING DIVEICE, TWO-STATION SURFACE WINDER, ELECTRONIC TENSION CONTROL, EDGE POSITION CONTROL, ROTARY DIE, OSCILLATING TAKE-UP UNIT, AUTO UNLOADING DEVICE IN-LINE PRINTING MACHINE, HEAT SLITTING DEVICE,		

CHILLER, GRAVIMETRIC DOSING UNIT, THICKNESS  
MEASUREMENT, WIDTH CONTROLLER, MASTER  
BATCH DOSING UNIT, LD/LLDPE DIE & AIR-RING



**Figure (6) : Proposed sealed cesspool for Bio-Zmzm Facility.**

## **LIST OF ABBREVIATIONS & WORDS**

- **EIA = Environmental Impact Assessment.**
- **The Company = The Factory.**
- **ZMZM = Zamzam.**
- **PNA = Palestinian National Authority.**
- **MIGA = Multilateral Investment Guarantee Agency.**
- **EQA = Environmental Quality Authority.**
- **PVC = Poly-Venel- Chloride**
- **FDA = Food & Drug Administration.**
- **ESP = Environmental Strategic Plan.**
- **mton = metric ton = 1000.0Kg.**
- **ISO = International Standards Organization.**
- **€ = Euro**
- **EMMP = Environmental Management & Monitoring Plan.**