

FEASIBILITY OF A MEDICAL WASTE TREATMENT PROJECT IN THE HOLY CITY OF NAJAF

Assist Prof. Ali Abdulhusein Khaleel Alfadhel. (MBA)

Banking & Financial Dept./ Economic & Administration Collage - Kufa University

alia.fadhil@uokufa.edu.iq

Orcid <https://orcid.org/0000-0002-3126-379x>

Noor Mohammed Kadhim (MFB)

Banking & Financial Dept. Economic & Administration Collage - Kufa University

marth6376@gmail.com

Orcid <https://orcid.org/0009-0001-7819-6336>

ABSTRACT

The current research focused on providing a clear view of a project about the reality of medical waste management in private health institutions and the methods of treating this kind of waste in the city of Najaf, in addition to estimating the amount of medical waste generated. In this research, a case study was conducted for establishing a comprehensive project of waste management for private health institutions. After estimating the investment and operational costs, making market study-based predictions, estimating the project revenues, and carrying out the field survey, it turned out that all of them were good. Therefore, we can establish a waste management project in the Holy city of Najaf. The current study recommends that the issue of disposal, management, and treatment of medical waste be linked to legal frameworks, so that health institutions, regardless of type and size, shall abide by these frameworks in order to ensure the seriousness of disposing of these hazardous waste in safe ways. The reason is attributed to the risks of such kind of waste, which could result in death due to mismanaging it, in addition to the fact that it pollutes water, air and soil.

Keywords: feasibility studies, medical waste.

INTRODUCTION

Medical waste is one of the most significant environmental and health issues that pose a threat to public health and the environment, as it is classified as more hazardous. What makes it more hazardous is that it widely prevails in the urban and residential areas of the city, and it directly affects them. There are certain factors contribute to increasing the medical waste, which are daily generated by patients and hospitalized persons in these institutions. This waste could generate effects that result from the inappropriate disposal of the medical waste, which typically causes significant harm to both the environment and people. Medical solid waste consists of two basic parts: one part is similar to household waste, which consists of waste paper, cartoon, packaging, glass, food waste, and other inert materials, and the other part is considered hazardous, which contains harmful, infectious, and cancer-causing toxic substances. As medical fields and technologies have developed, it has become increasingly important to find safe ways to dispose of medical waste. This is particularly ascribed to the risks and diseases associated with the waste, which requires special care, unlike other types of waste. Hence, the problem of

the study lies in the fact that there are some significant shortcomings in the process of disposing of medical waste. Additionally, workers lack the way of disposal and are not aware of its risks. The problem of the study and the main question can be defined as follows:

- Is medical waste completely and properly disposed of within private health institutions?
- Are there any available related companies that are specialized in treating this waste within private health institutions?

The study hypothesizes that there are many types of medical waste, and several treatment methods, in addition to the environmental impacts resulting from it in private institutions.

- Is it possible to establish an investment project to cope with this waste? Is this project certainly going to be economically feasible?

The importance of the research lies in providing a future view and explaining the general dimensions of medical waste issues, means of treatment, problems facing workers and stakeholders in the process of management, factors contributing to the exacerbation of the problem, and developing some important solutions and recommendations. This study can also be valuable for:

1. Providing those responsible for disposing of medical waste in private institutions with the most important problems and obstacles that affect the success of their effective management.
2. Providing preventive, guidance, and treatment solutions to alleviate the problems that stakeholders face in getting rid of them.
3. The research recommendations can be used to develop an integrated mechanism for medical waste disposal, as it is a profession that requires its own specifications.

The quantitative method was adopted by describing data, information and statistics related to the subject of the study, which depends on studying the phenomenon as it exists on the ground, in order to answer the questions raised in the research problem.

Medical Waste

The concept of medical waste

Many authors and organizations have worked hard to develop definitions for medical waste, including the World Health Organization, which defined health care waste as “the waste that covers all kinds of waste generated by health care institutions, research centers, or laboratories.” In addition, it includes waste arising from secondary or dispersed sources, such as home health care such as (dialysis operations, insulin injections...etc. (WHO Report, 2006: 2).

The United States Environmental Protection Agency defines healthcare waste as any waste generated by a medical treatment facility, including hospitals, medical laboratories, animal experimentation centers or units, and health clinics (Al-Harazin, 2023: 320).

The classifications of medical waste according to types.

Medical waste and its materials vary and are classified into several classifications. The classifications that are used to distinguish various wastes from health care activities usually vary from one country to another. Therefore, the World Health Organization has proposed several classifications of medical waste for developed countries, and also developed a special

classification for developing countries. The aim of these classifications is to facilitate the treatment and management of medical waste in terms of sorting and collecting it by hospital workers, then transporting and treating it. Furthermore, waste is usually classified into two categories as follows:

1- Non-hazardous medical waste (general)

It is generally defined as the kind of waste that does not pose a threat to the environment or public health and it represents all other non-hazardous waste generated from the health facility. This kind of waste covers administrative waste, paper, and food scraps from kitchens or cafeterias. The percentage of general non-hazardous medical waste in general ranges between (75-90%), which is resulted from sources of health care institutions that are treated as household waste (Habib, 2011).

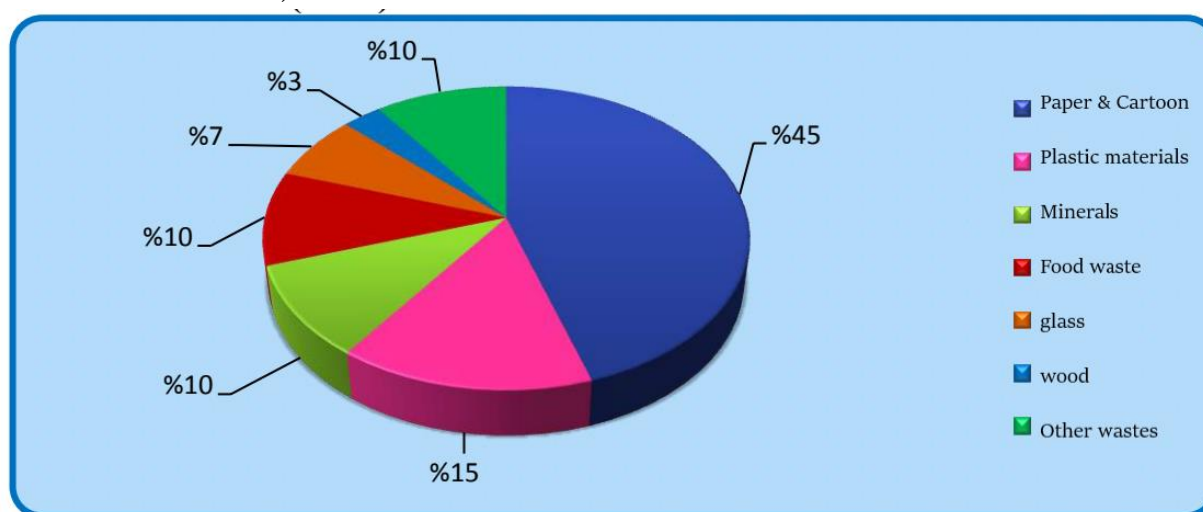


Figure (1) Percentage of components of normal (general) medical waste

Source: Meylud Toumi, Adila Al-Alwani, The Impact of Medical Waste on the Costs of Health Institutions. Journal of Human Sciences. Issue 10, University of Biskra, 2006, 5.

2- Hazardous medical waste

It is called special waste, which represents the remaining percentage of 20-30% of the total medical waste, and includes waste generated from disease diagnosis, treatment, and vaccination. It causes multiple health risks if it is not drained or properly disposed of. (Abdel-Bari, 2015).

Hazardous medical waste covers several types that vary according to their types. It is classified into:

(1) Infectious waste

This kind of waste may possibly include pathogens or toxins, such as bacteria, viruses, parasites, or fungi in sufficient concentration or quantity causing illness for those exposed to. This waste is found in the equipment and tools used in treating and diagnosing diseases, which have come into contact with the patient's bodily fluids and secretions, such as gauze, gloves, swabs, tongue depressors, needles, blood, feces, urine, lung secretions and phlegm. (Al-Harazin, 2023: 321).

(2) Sharp materials waste

These include sharp objects with sharp ends and edges that can cause skin irritation and are meant to be disposed of after patient care. Examples of such objects include broken glass that may or may not be contaminated with blood, patient fluids, and glass containers used for vaccinations. (Grimmed, 2013).

(3) Chemical waste

They are toxic and flammable materials that cause corrosion of other materials. They include all the remains of liquid chemical materials used in the health center, such as disinfectants and sterilization materials used to clean patients' wounds, disinfectants used to clean surgical devices or to clean surfaces, solvents and dyes used in chemical pathology laboratories, and expired or poorly stored solutions at laboratories and pharmacies.

(4) Pathological waste

It is an extremely hazardous waste which covers tissue waste and human remains, such as placental waste in the maternity ward, surgical waste from removed body organs, waste associated with operations such as blood and other fluids, and human samples in the pathology laboratory.

(5) Radioactive materials waste

It includes every material that is contaminated with radioactive materials during examination or treatment, such as some radioactive materials used to treat cancerous diseases or tools used to detect such diseases, the remains of operation rooms and specialized labs, and X-rays such as radioactive iodine and so on.

(6) Pharmaceutical waste

It covers all expired pharmaceutical products that are unused, lying on the floor, or contaminated, such as unwanted tools and serums, empty bottles, or cardboard boxes containing the remains of those tools, gloves, masks, and plastic tubes used to deliver these medications.

(7) Toxic waste with environmental genetic damage

It includes all highly hazardous toxic substances that have a genetic impact on the surrounding environment in terms of causing mutations or forming cancer cells, such as the remains of some substances and medications used to treat tumors found in the stool, urine, or vomit of the treated patient. These substances have the ability to stop the growth and kill certain types of human cancer cells, which are also given to patients receiving a new organ transplant to reduce their immunity.

(8) Heavy metals waste

This kind of waste is a chemical waste, which is highly toxic. It includes residues of waste containing very toxic substances, such as mercury when deposited from the breakdown of some

medical devices, chromium in discarded batteries after use, and some tools containing lead in diagnostic and radiology departments.

(9) Waste of compressed gas cylinders

There are several types of gases used in health care. Some of these gases are stored in cylinders that can be recycled, whereas other gases are stored in a pressurized container that is thrown away after they are run out, such as anesthesia gas, oxygen, some sterilization gases in the operating room, compressed air in laboratories, and some treatment devices and the maintenance department (Ali, 2023).

The second section: The economic feasibility of the medical waste treatment project

The economic feasibility study is defined as a scientific method used to estimate the probability of success regarding an investment idea before actual implementation in light of the ability of the project or investment idea to achieve certain goals for the investor. Therefore, the economic feasibility is a practical tool that protects the project from risks and losses, as the study precedes any investment decision, and operations. Therefore, the economic feasibility is the means whereby the appropriate investment decision is made that achieves the desired goals. The feasibility study is a group of studies that seek to determine the viability of an investment project or group of investment projects from several market, technical, financial, economic and social aspects, in preparation for selecting those projects that achieve the highest possible net benefit, in addition to a number of others goals. Thus, the feasibility study seeks to determine the viability of an investment project or group of proposed investment projects in preparation for making a decision on accepting or rejecting investment in it.

Market study of medical waste

It is a study of the needs for the services that the project will provide in order to obtain the best estimated information about the expected demand in the target market, whereby the activities that the medical waste project will undertake and the services that it will provide will be determined.

Table (1) shows the potential beneficiaries of the project

Potential beneficiaries of the project	
Total number of workers in the project/person	202
Number of beneficiaries of the project in the community/person	200,000
Number of cities benefiting from the project/city	15
Age groups (1-16)	Indirect benefit
Age groups (16-36)	Direct benefit
Age groups (36-56)	Direct benefit
Age groups (56-76)	Indirect benefit
Unemployed	Direct benefit
Workers in the private sector	Direct benefit
Employees in government departments	Direct benefit
Workers in the mixed sector	Direct benefit
Number of beneficiary categories	6

Source: The table was prepared by the researchers

Table (2) shows the project beneficiaries according to sector

The project beneficiaries by sector				
Universities and educational institutions.	Benefited	Insurance sector.	Benefited	
Travel, tourism, hotel and restaurants.	Not benefiting	Job opportunities and jobs.	Benefited	
State departments, institutions and unions.	Not benefiting	Banks and banks.	Not benefiting	
Wholesale and retail trade sector	Not benefiting	Clothes and accessories	Not benefiting	
Industrial institutions and factories.	Benefited	Medical sector	Benefited	
Machinery, machinery and equipment sector.	Benefited	Toys and flowers.	Not benefiting	
Agriculture and livestock.	Not benefiting	Sports and clubs.	Not benefiting	
Electronic services and the Internet.	Benefited	Real estate and property.	Not benefiting	
Construction and building materials.	Not benefiting	Transport and communications.	Benefited	
No of benefited sectors				8

Source: The table was prepared by the researchers

Table (3) shows the forecast of demand for collecting and treating medical waste from 2010 to 2023 for private institutions, by adopting a linear regression function.

Table (3) Demand Forecasting / Waste Collection and Treatment

Demand Forecasting / Waste Collection and Treatment						
Year		Private Hospital	Private Medical Center	Clinic	Dressing clinic	Total/ Tons per year
2010	Forecasting demand using a linear regression function	438	146	36.5	109.5	730
2011		438	146	36.5	109.5	730
2012		438	146	36.5	109.5	730
2013		438	175.2	45.6	127.8	786.6
2014		700.8	175.2	45.6	127.8	1,049.40
2015		700.8	175.2	45.6	127.8	1,049.40
2016		700.8	189.8	54.8	146	1,091.40
2017		700.8	189.8	54.8	146	1,091.40
2018		876	189.8	54.8	146	1,266.60
2019		876	219	63.9	164.3	1,323.10
2020		876	219	63.9	164.3	1,323.10
2021		1,226.40	219	63.9	164.3	1,673.50
2022		1,226.40	262.8	73	182.5	1,744.70
2023		1,206.20	247.6	69.6	180.2	1,703.70
2024		1,305.10	257.6	72.2	186.2	1,821.10
2025		1,363.40	266.7	74.7	191.6	1,896.30
2026		1,457.90	274.2	77.3	195.6	2,004.90

2027		1,550.50	285.1	79.1	200.7	2,115.40
2028		1,635.50	295.6	81.4	206.5	2,219.00
2029		1,705.00	305	83.2	211.7	2,304.90
2030		1,790.30	315.5	84.5	217.2	2,407.50

Annual quantity of medical waste/ton for a governorate with an average of two million people

Source: The table was prepared by the researchers

The following table (4) shows the mechanism and division of the market in the holy city of Najaf.

Table (4) Foundations and rules for dividing the market

Foundations and rules of market division	
Support sector	Demographically
<p>Health and physical safety</p> <ul style="list-style-type: none"> 2658 Primary health care centers 4391 Health institutions 1821 Premature incubators 400 Governmental & Private hospitals 44527 beds in government hospitals 127 Private Hospitals 273 Governmental Hospitals 37143 Beds 	<p>69.8% urban residents</p> <p>4696265 The total of Iraqi Families</p> <p>6 persons the average size of the Iraqi famil</p> <p>30.2% of people living countryside</p> <p>6.5.persons living in countryside.</p> <p>5.9 persons in urban areas</p> <p>10.5% of families are run by a woman</p> <p>40.5% of people are less than 15 years</p> <p>54.4% of people are between 15-60 years</p> <p>5% of people are more than 60 years</p>
Main Sector	Geographically
<p>17000</p> <p>Tons of medical waste annually</p>	<p>Public Hospitals in Iraq</p>

Source: This chart was prepared by the researchers

The following table (5) shows the requirements that the project needs in order to be completely met. It also explains the movements with which the project begins and with which the project ends.

Table (5): Time dimension of the project

Activity	The time dimension of the project		
	Starting activity	Duration of activity/day	End of activity
Establishment of the project	December 20, 2023	7	December 27, 2023
Land works	December 28, 2023	14	January 11, 2024
Building works, facilities and services	January 15, 2024	90	April 14, 2024
Other service facility works	January 20, 2024	30	February 19, 2024
Water, electricity, and support services	January 15, 2024	21	February 5, 2024
Preparing cars and diesel/heavy engines	February 15, 2024	15	March 1, 2024
Preparing cars and engines / light	February 20, 2024	15	March 6, 2024
Preparing furniture and office equipment	March 20, 2024	21	April 10, 2024
Preparing basic machines and equipment	January 20, 2024	60	March 20, 2024
Preparing secondary equipment and supplies	January 20, 2024	21	February 10, 2024
Cleaning and preparation work	March 20, 2024	7	April 14, 2024
Trial operation	April 14, 2024	7	April 21, 2024
Duration of completion/working day	180		

Source: The table was prepared by the researchers

Table (6) shows the amount of supplies needed by the project and also shows the amounts for all the supplies shown in the table.

Table (6) Estimation of investment costs

Estimating investment costs			
Estimating fixed capital			
Establishment expenses	Quantity	Amount	Total amount
Engineering and technical plans	1	8,000,000	8,000,000
	64,200,000		
Land	Area	Price	Amount
Purchase or cash exchange	0	0	0
	114,500,000		
Buildings, facilities and services	Area	The cost of 1 square meter	Amount
Civil engineering works	1,000	500,000	500,000,000
	500,000,000		
Other service facilities	Area	Price	Amount
	27,700,000		
Water, electricity and support services	Quantity	Estimate value	Amount

Diesel cars and engines/heavy	Quantity	Price	Amount
	3,122,000,000		
Cars and engines/light weight	Quantity	Price	Amount
Saloon cars	4	22,000,000	88,000,000
	224,000,000		
Office furniture and equipment	Quantity	Price	Amount
Office furniture	18	3,000,000	54,000,000
	68,000,000		
Basic machines and equipment	Quantity	Estimate value	Amount
Waste processing line Turkish origin			
	3,650,000,000		
Secondary equipment and supplies	Quantity	Price	Amount
Security cameras	50	250,000	12,500,000
	122,500,000		
	8,088,700,000		

Source: The table was made by the researchers

Table (7) shows the estimate of working capital as a measure of the efficiency of business operations and activities, and it can be found by calculating the difference between the company's current assets on the one hand and current liabilities on the other hand, and it can be found by evaluating the institution's performance and financial health.

Table (7) Estimation of working capital

Estimating working capital			
Estimating working capital for an operating cycle			
Fixed annual costs	Course duration/working day	Annual amount	The amount required
The services, fuel, and spare parts of management	30	11,962,500	983,219
Administrative expenses	30	23,006,250	1,890,925
Marketing expenses	30	31,300,000	2,572,603
Interests and fees	30	92,000,000	7,561,644
Depreciation	30	417,794,000	34,339,233
Technological obsolescence	30	121,676,500	10,000,808
Amortization of establishment expenses	30	12,840,000	1,055,342
Amortization of trial operating expenses	30	39,023	3,207
Salaries and wages for administrators	30	108,600,000	8,926,027
	67,333,009		
Annual variable costs	Course duration/working day	Annual amount	The amount required
Cost matrix	30	91,052,747	7,804,521
Production services, fuel and spare parts	30	24,150,000	2,070,000
General production expenses	30	218,620,000	18,738,857
Salaries and wages/production	30	1,290,000,000	110,571,429
	139,184,807		

Source: The table was prepared by the researchers

Table (8) shows a summary of working capital

Summary of working capital		
Cash	Amount	
Bank deposits	174,867,699	
Cash in hand	19,871,329	
194,739,029		
Inventory	Amount	
Raw materials	7,804,521	
Fuel and spare parts activity	3,974,266	
11,778,787		
Total working capital		206,517,816
Total investment costs		8,295,217,816

Source: The table was prepared by the researchers

Table (9) (10) shows an estimate of the operational costs that are spent to operate the project, which include fixed costs and variable costs shown in the table.

Table (9) Estimation of operational costs (fixed)

Estimating operational costs			
Estimating annual fixed costs			
The services, fuel, and spare parts of the management	Quantity	Price	Amount
Fuel consumption per administration/litre	5,250	450	2,362,500
11,962,500			
Administrative expenses	Quantity	Amount	Total Amount
Electrical capacity required for management/KW annually	600,000	6	3,600,000
23,006,250			
Marketing expenses	Quantity	Amount	Total Amount
Advertisements	12	2,000,000	24,000,000
31,300,000			
Interests and fees	Rate of benefit	Amount	The amount of benefit
Delayed benefits	0.02	100,000,000	2,000,000
92,000,000			
(Depreciation)	Rate of depreciation	Amount	The Amount of annual depreciation
Buildings, facilities and services	0.02	500,000,000	10,000,000
417,794,000			
(Obsolescence)	Obsolescence percentage	Amount	The amount of annual obsolescence
Buildings, facilities and services	0.01	500,000,000	5,000,000

	121,676,500		
Amortization of establishment expenses	Annual percentage	Amount	Total
	0.2	64,200,000	12,840,000
	12,840,000		
Amortization of trial operating expenses	Annual salaries	Amount	Total
	39,023		
Salaries and wages for administrators	Monthly Salary	Annual Salary	Total salaries
project manager	2,000,000	24,000,000	24,000,000
	108,600,000		
Total annual fixed costs	819,218,273		

Source: The table was prepared by the researchers

Table (10) Estimation of operational costs (fluctuating)

Estimating annual variable costs				
Cost matrix	Unit of measure	Cost of ton	Annual sales	Total Amount
Recycled waste	Ton	50,000	1,821	91,052,747
	91,052,747			
Production services, fuel and spare parts		Amount	Quantity	Total Amount
Fuel consumption for the production process/litre		450	35,000	15,750,000
	24,150,000			
General production expenses		Amount	Quantity	Total Amount
Training and development		1,250,000	20	25,000,000
	218,620,000			
Salaries and wages/production	No. of employees	Monthly salary	Annual salaries	Total salaries
Engineer	2	1,200,000	14,400,000	28,800,000
	191	1,290,000,000		
Total annual variable costs			1,623,822,747	
Total operational costs			2,443,041,020	

Source: The table was prepared by the researchers

Table (11) shows the return, which is the total income that the investor achieves through investment each year and is expressed as a percentage of the value of the original investment.

Table (11) Estimation of returns

Estimation of returns				
Services and products	Total amount	Annual sales	Selling price of one ton	Measuring unit
Recycled waste	3,642,109,879	1,821	2,000,000	Ton
	0			
	0			
	0			

	3,642,109,879			
Other incomes	The amount of benefit	Amount	Level of operation	Benefit
Bank benefits	1,748,677	174,867,699	0.25	0.04
	1,748,677			
Total of annual revenues	3,643,858,556			

Source: The table was prepared by the researchers

Table (12), (13), (14), and (15) show the statement of income and cash flows, which companies are required to prepare as an integral part of their financial statements for each period for the financial statements are submitted. The cash flow statement is considered one of the most important financial statements that helps users of these lists identify the financial conditions of the organization. The significance of cash flows is found in their ability to display both the total cash effect of all business operations throughout the financial period and the kind of impact, such as internal or external cash flow. Moreover, the ability of the company to create cash flows may also be used to assess strengths and shortcomings..

Table 14: Income and cash flow statement

Income and cash flow statement					
Growth rate %	Year 1	Year 2	Year 3	Year 4	Year 5
Sales	0.8	0.85	0.9	0.95	1
Sales returns	2,913,687,903	3,095,793,397	3,277,898,891	3,460,004,385	3,642,109,879
Net sales	0	0	0	0	0
Cost of sales	2,913,687,903	3,095,793,397	3,277,898,891	3,460,004,385	3,642,109,879
Total operating income	1,299,058,198	1,380,249,335	1,461,440,472	1,542,631,610	1,623,822,747
Fixed costs	1,614,629,705	1,715,544,062	1,816,458,418	1,917,372,775	2,018,287,132
Net operating income	279,747,773	279,747,773	279,747,773	279,747,773	279,747,773
All other revenues	1,334,881,933	1,435,796,289	1,536,710,646	1,637,625,002	1,738,539,359
Net income before tax	1,398,942	1,486,375	1,573,809	1,661,243	1,748,677
Tax	1,336,280,874	1,437,282,665	1,538,284,455	1,639,286,246	1,740,288,036
Net income after tax	0	0	0	0	0
	1,336,280,874	1,437,282,665	1,538,284,455	1,639,286,246	1,740,288,036
Sales					
Cost of sales	2,913,687,903	3,095,793,397	3,277,898,891	3,460,004,385	3,642,109,879
Total operating income	1,299,058,198	1,380,249,335	1,461,440,472	1,542,631,610	1,623,822,747
Distinctions and technical obsolescence	1,614,629,705	1,715,544,062	1,816,458,418	1,917,372,775	2,018,287,132
Earnings before interest and taxes	819,218,273	819,218,273	819,218,273	819,218,273	819,218,273
Benefits	795,411,433	896,325,789	997,240,146	1,098,154,502	1,199,068,859
Taxable profit	92,000,000	82,800,000	74,520,000	67,068,000	60,361,200
Tax	703,411,433	813,525,789	922,720,146	1,031,086,502	1,138,707,659
Profit after tax	0	0	0	0	0
Net cash flow	703,411,433	813,525,789	922,720,146	1,031,086,502	1,138,707,659
	1,614,629,705	1,715,544,062	1,816,458,418	1,917,372,775	2,018,287,132

Source: The table was prepared by the researchers

Table 14: Income and cash flow statement

Statement of income and cash flows					
Growth rate %	Year 6	Year 7	Year 8	Year 9	Year 10
Sales	1	1	1	1	1
Sales returns	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879
Net sales	0	0	0	0	0
Cost of sales	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879
Total operating income	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747
Fixed costs	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132
Net operating income	279,747,773	279,747,773	279,747,773	279,747,773	279,747,773
All other revenues	1,738,539,359	1,738,539,359	1,738,539,359	1,738,539,359	1,738,539,359
Net income before tax	1,748,677	1,748,677	1,748,677	1,748,677	1,748,677
Tax	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036
Net income after tax	0	0	0	0	0
	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036
Sales					
Cost of sales	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879
Total operating income	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747
Depreciations	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132
Earnings before interest and taxes	819,218,273	819,218,273	819,218,273	819,218,273	819,218,273
Benefits	1,199,068,859	1,199,068,859	1,199,068,859	1,199,068,859	1,199,068,859
Taxable profit	54,325,080	48,892,572	44,003,315	39,602,983	35,642,685
Tax	1,144,743,779	1,150,176,287	1,155,065,544	1,159,465,876	1,163,426,174
Profit after tax	0	0	0	0	0
Net cash flow	1,144,743,779	1,150,176,287	1,155,065,544	1,159,465,876	1,163,426,174
	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132

Source: The table was prepared by the researchers

Table 14: Income and cash flow statement

Statement of income and cash flows					
	Year 11	Year 12	Year 13	Year 14	Year 15
Growth rate %	1	1	1	1	1
Sales	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879
Sales returns	0	0	0	0	0
Net sales	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879
Cost of sales	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747
Total operating income	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132
Fixed costs	279,747,773	279,747,773	279,747,773	279,747,773	279,747,773
Net operating income	1,738,539,359	1,738,539,359	1,738,539,359	1,738,539,359	1,738,539,359
All other revenues	1,748,677	1,748,677	1,748,677	1,748,677	1,748,677

Net income before tax	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036
Tax	0	0	0	0	0
Net income after tax	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036	1,740,288,036
Sales	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879	3,642,109,879
Cost of sales	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747	1,623,822,747
Total operating income	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132
Depreciations	819,218,273	819,218,273	819,218,273	819,218,273	819,218,273
Earnings before interest and taxes	1,199,068,859	1,199,068,859	1,199,068,859	1,199,068,859	1,199,068,859
Benefits	32,078,416	28,870,575	25,983,517	23,385,166	21,046,649
Taxable profit	1,166,990,443	1,170,198,284	1,173,085,342	1,175,683,693	1,178,022,210
Tax	0	0	0	0	0
Profit after tax	1,166,990,443	1,170,198,284	1,173,085,342	1,175,683,693	1,178,022,210
Net cash flow	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132	2,018,287,132

Source: The table was prepared by the researchers

Table (15) shows the net present value (NPV), which is the amount of money invested currently when it flows in the future in five or more years. It refers to the difference between the present value of cash inflows and the present value of cash outflows. The alternative that achieves the greatest net present value compared to other alternatives is the best alternative. The alternative is considered economically acceptable when it achieves a positive net present value.

Table (15) Financial indexes

Financial indicators				
Discounted standards under certainty conditions				
The condition of providing sufficient information necessary for the evaluation and comparison process, taking into account the time factor				
Discounted standards				
Minimum discount rate used				3%
The highest discount rate used				6%
The value of the amount invested in the project				-8295217816
	Year	Cash inflow	Current value	
Cash outflows	0	-8295217816	-8295217816	
Cash inflows	1	1,614,629,705	1,614,629,705	
	2	1,715,544,062	1,715,544,062	
	3	1,816,458,418	1,816,458,418	
	4	1,917,372,775	1,917,372,775	
	5	2,018,287,132	2,018,287,132	
	6	2,018,287,132	2,018,287,132	
	7	2,018,287,132	2,018,287,132	
	8	2,018,287,132	2,018,287,132	
	9	2,018,287,132	2,018,287,132	
	10	2,018,287,132	2,018,287,132	
	11	2,018,287,132	2,018,287,132	
	12	2,018,287,132	2,018,287,132	

	13	2,018,287,132	2,018,287,132	
	14	2,018,287,132	2,018,287,132	
	15	2,018,287,132	2,018,287,132	
	20	10,091,435,658	10,091,435,658	
	31,061,381,251			

Source: The table was prepared by the researchers

Table (16) shows the sensitivity analysis for the economic feasibility study, as the sensitivity analysis must be conducted before implementing the project on the ground in view of the benefits that may accrue to the project, as it measures the extent to which the project proposed for study responds to the variables, whether positive or negative.

Table (16) Sensitivity analysis

Sensitivity Analysis					
	Decrease	Increase	Revenues	Operational costs	Change
The first case	0.9		3,279,472,700	2,443,041,020	836,431,680
The second case		1.1	3,643,858,556	2,687,345,122	956,513,434
Current revenues and costs			3,643,858,556	2,443,041,020	1,200,817,536
The project is not sensitive to changes in revenues while operating costs remain constant					
The project is not sensitive to changes in operational costs while revenues remain constant					

Source: The table was prepared by the researchers

Table (17) Social benefits and national economic benefits of the project

Social benefits and national economic benefits of the project		
Percentage of cash savings achieved	%	2.50%
Monetary savings achieved	Iraqi Dinar	202,217,500
These are the savings achieved as a result of the rational management of the project during the implementation period		
Total added value	Iraqi Dinar	2,030,070,500
Interest and fees, plus depreciations, salaries and wages		
Net added value	Iraqi Dinar	1,490,600,000
It is a standard of value added minus depreciations		
Distribution coefficient for wages	%	94%
The result of dividing wages by the net value added		
Coefficient of cash savings to the project investment cost	%	2.44%
Comparing project costs with the cash savings achieved		
The project's contribution to providing job opportunities	%	8.10%
Achieving industrial interconnection with existing projects, which depends on them to obtain raw materials		
Capital productivity of the project	%	18.40%

Source: The table was prepared by the researchers

Table (18) Degree of endemism

Degree of endemism	0.51	Smaller than 1 high endemism
Total number of workers on the project	202	
Job opportunities in the region	2,500	
The total number of workers in the same activity in the region	400	
Job opportunities in the region	2,500	
The project area is considered an attractive and encouraging area to establish the project in		
Standard of opportunity cost		
Opportunity cost		
The opportunity cost in the event of entering into another project	663,617,425	Iraqi Dinar
Opportunity cost in the case of indirect investment	165,904,356	Iraqi Dinar
Opportunity cost in the case of a bank deposit bearing interest (4%)	331,808,713	Iraqi Dinar

Source: The table was prepared by the researchers

Analysis of the results

After estimating the investment and operational costs, making market study-based predictions, estimating the project revenues, and carrying out the field survey, and drawing the results, it was found that the project's payback period amounted to approximately five years. It was also found that the ability of the project to pay its short-term obligations was approximately 12% of what was required. As for the liquidity, it is (11%), in addition to the fact that the ability of the project to exploit the available resources was within (36%) of what was required. The project management was characterized by high efficiency of using working capital, which is estimated at approximately (14.1) times greater than required. The criterion for using revenues to cover operational costs reached a good result, estimated at approximately (149%) of what is required. The profitability in comparison to the total investments amounted to approximately 20%, as the project is not sensitive to increases in costs and decreases in revenues.

The project offers new job opportunities and can provide them with sufficient skills and experience easily and without additional costs. It serves many groups and segments of society and cities. The project includes all production elements, as the degree of localization is (0.51). Thus, the project area is considered an attractive and encouraging area for establishing the project there. The Cost Saving standard was excellent in all its sub-criteria. At the level of descriptive standards, we mention the most important of them, as the project evaluation was

encouraging regarding the per capita rate and human development indexes, the development of technical knowledge and the increase in the experience curve. The Profitability Index (PI) was excellent because it exceeded (18.23).

Table (19) Analysis of investment costs

Investment cost analysis		
Statement	Percentage	Amount
Establishment expenses	0.04	64,200,000
Land	0.071	114,500,000
Buildings, facilities and services	0.308	500,000,000
Other service facilities	0.017	27,700,000
Water, electricity and support services	0.121	195,800,000
Diesel cars and engines/ heavy	1.923	3,122,000,000
Cars and engines/light	0.138	224,000,000
Office furniture and equipment	0.042	68,000,000
Basic machines and equipment	2.248	3,650,000,000
Secondary equipment and supplies	0.075	122,500,000
Working capital	0.127	206,517,816
Investment costs		8,295,217,816

Source: The table was prepared by the researchers

Table (20) Analysis of fixed costs

Fixed cost analysis		
Statement	Percentage	Amount
The services, fuel, and spare parts of the Management	0.015	11,962,500
Administrative expenses	0.028	23,006,250
Marketing expenses	0.038	31,300,000
Interests and fees	0.112	92,000,000
Depreciation	0.51	417,794,000
Technological obsolescence	0.149	121,676,500
Amortization of establishment expenses	0.016	12,840,000
Amortization of trial operating expenses	0	39,023
Salaries and wages for administrators	0.133	108,600,000
Total fixed costs		819,218,273

Source: The table was prepared by the researchers

Table 21: Analysis of variable costs

Variable cost analysis		
Statement	Percentage	Amount
Cost matrix	0.0561	91,052,747
Production services, fuel and spare parts	0.0149	24,150,000
General production expenses	0.1346	218,620,000
Salaries and wages/production	0.7944	1,290,000,000
Total variable costs		1,623,822,747

Source: The table was prepared by the researchers

Table (21) Cumulative net profits for the first five years of the project's life

Cumulative net profits for the first five years of the project's life				
Year 1	Cumulative			
1,336,280,874	1,336,280,874			
Year 1	Year 2	Cumulative		
1,336,280,874	1,437,282,665	2,773,563,539		
Year 1	Year 2	Year 3	Cumulative	
1,336,280,874	1,437,282,665	1,538,284,455	4,311,847,994	
Year 1	Year 2	Year 3	Year 4	Cumulative
1,336,280,874	1,437,282,665	1,538,284,455	1,639,286,246	5,951,134,240
Year 1	Year 2	Year 3	Year 4	Year 5
1,336,280,874	1,437,282,665	1,538,284,455	1,639,286,246	1,740,288,036
Cumulative				
7,691,422,276				

Source: The table was prepared by the researchers

First: Conclusions

1- One of the important problems that health institutions and hospitals in Najaf suffer from is the mismanagement of medical waste as a result of a lack of material and human capabilities, a deficiency in the field of its management, and a lack of systems for its management and disposal.

2- Workers in this field lack awareness and training on the correct method in the process of collection, transportation and storage.

3- There is a clear lack of an appropriate strategy to dispose of medical waste in a complete and advanced manner. Moreover, there is an urgent need to implement the relevant laws and set implementation plans for them. A condition for this to be successful is to make education and awareness an important element during the implementation of the laws. This education should be available for all topics in the field of waste disposal.

4- When examining the study, it turned out that the results were all good, and the ability of the project to pay its short-term obligations was about 12% of what was required, the liquidity was 11%, and the ability to exploit the available resources was about 36%. Thus, this project

creates new job opportunities and provides sufficient skills and experience with ease and without additional costs.

Second: Recommendations

1- When examining the expected results shown and the market study, cash flows, and income statement of the project, we decided to grant an investment opportunity to establish a medical waste recycling plant in Al-Najaf, because all the results presented were good for opening such a project.

2- It is recommended that the issue of medical waste disposal, management and treatment be linked to legal frameworks, so that health institutions of all types and sizes shall abide by these frameworks, in order to ensure the seriousness of disposing of these hazardous wastes in safe ways. The reason for this is the danger of this waste and the loss of life resulting from its mismanagement, in addition to the fact that it pollutes water, air and soil.

3- Conduct training and awareness courses for workers in the field of collecting and transporting medical and solid waste inside and outside the hospital.

4- Assigning a scientifically qualified and trained person, at the level of each department, in coordination with the Quality Improvement and Infection Control Department, to monitor and follow up on the people who are directly related to the sorting and collection of medical waste, starting with medical personnel and ending with sanitation workers.

REFERENCES

1. Abdel-Bari, R, A. (2015) Legal Responsibility for Medical Waste. 3rd edition, Dar Al-Nahda Al-Arabiya, Cairo.
2. Al-Harazin, H, R. (2023) Spatial analysis of medical waste and methods of disposal in Al-Shifa Medical Complex in the Gaza Strip. A study in Environmental Geography.
3. Ali, N, H. (2023) Analysis of the reality of medical waste in health institutions in Muthanna Governorate and ways of managing it. Uruk Journal for the Humanities.
4. Habib, Z, M. (2011) Environmental Dictionary. 1st edition. Osama Publishing and Distribution House, Amman, Jordan.
5. Jrimad, B, H. (2013) Medical Waste Management in the Hospitals of Kut City. Engineering Journal, Volume (19), Issue (7), University of Baghdad, Cairo.
6. World Health Organization report. (2006) Safe management of waste from healthcare activities. Regional Office for the Eastern Mediterranean, Amman, Jordan.