Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6, 2726-2737
2024
Publisher: Learning Gate
DOI: 10.55214/25768484.v8i6.2543

Feasibility of establishing a waste recycling plant in the north of Najaf city and supporting the sustainable environment

Ali Abdulhussein Khaleel Alfadhel[1*], Maher Naji Ali[2], Fadhal A. Alfadhal[3], Usamah AAlkarim AAlmunam Alshimaysawe[4]
[1,2]Banking & Financial Department – Economic & Administration Collage - Kufa University, Iraq; alia.fadhil@uokufa.edu.iq (A.A.K.A.) mahen.ali@uokufa.edu.iq (M.N.A.)
[3,4]Faculty of Agriculture, Plant protection Dept., Kufa University, Iraq; fadhl.alfadhl@uokufa.edu.iq (F.A.A.) osama.alshmesawi@uokufa.edu.iq (U.A.A.A.)

Abstract: The increase in population growth, industrial progress in various fields, rising income, and improved living standards have led to societal development, and consequently, an increase in consumer needs and demands. This has resulted in irrational resource consumption and a significant increase in waste quantities, posing a major threat to the environment and human health, this research came as an attempt to enhance sustainability, create investment opportunities, solve the problem of resource shortages, and eliminate waste in an emerging country like Iraq. A feasibility study was prepared based on the technical study and conducting meetings with officials in Najaf Governorate. A set of conclusions and recommendations were reached, the most important of which were the following. By reviewing the extracted financial ratios, it became clear that the project has a high economic feasibility that is beyond comparison, and the reason can be justified by the huge amount of waste present in the targeted area, in addition to the fact that Iraq is a new experience in such industries related to sustainable development and an industry that provides resources and raw materials for other industries that are considered of great importance and are in demand in Iraq and other neighboring countries, The most important recommendations were Starting to refer the project to an investment company according to the government conditions of the Najaf Governorate Investment Authority and generalizing the successful experience to the governorates of Iraq, and giving this project the utmost importance when compared to other projects as it provides the basic and important resources for local industries, and this is consistent with Iraq's strategy of focusing on industry and establishing industrial cities.

Keywords: *Cash flow statement, Feasibility studies, Financial accounting, Project evaluation, Sustainable environment.*

1. Introduction

Recycling is one of the advanced methods in addressing environmental pollution problems, involving the disposal of waste in an environmentally and economically friendly manner that allows for investment opportunities amidst the irrational depletion of resources. Recycling has become one of the important projects in the economy of developed countries [1].

The increase in population growth, industrial progress in various fields, rising income, and improved living standards have led to societal development, and consequently, an increase in consumer needs and demands. This has resulted in irrational resource consumption and a significant increase in waste quantities, posing a major threat to the environment and human health.

The phenomenon of increasing waste and the random spread of landfill sites has highlighted this issue, necessitating the search for solutions. One of the most important solutions is waste recycling, which represents an economic approach that contributes to increasing the national output. It is one of the key

* Correspondence: alia.fadhil@uokufa.edu.iq

solutions for maintaining environmental safety and achieving sustainable development goals, which aim to improve the health and service reality of society by using resources optimally with modern technologies that align with current and future capabilities to meet the needs of the population [2].

2. Related Literature

2.1. The Environmental and Economic Importance of Waste Recycling

The process of recycling waste from harmful materials into real added value for utilization significantly contributes to various environmental, economic, and social aspects as follows:

2.2. Environmental Importance of Waste Recycling [3]:

Reducing Pollution: Recycling waste helps reduce pollution (such as air, water, and soil pollution). The recycling process reduces gas emissions that cause environmental climate changes, prevents the spread of rodents and insects that cause diseases, and reduces fires caused by waste accumulation.

Reducing Waste in Landfills: The accumulation of waste in landfills distorts the aesthetic appearance of areas, especially since most landfills are located near urban cities. Therefore, recycling waste reduces pressure and waste accumulation, improving the environmental appearance.

Energy Conservation: Recycling waste requires less energy than the energy used in various production processes. The energy savings from recycling certain materials are estimated as follows:

- Recycling and manufacturing aluminum: 95%
- Recycling and manufacturing iron: 74%
- Recycling and manufacturing paper: 60%
- Recycling and manufacturing glass: 40%
- Recycling and manufacturing plastic: 70%

2.3. Economic Importance of Waste Recycling [4]:

- Reducing Natural Resource Depletion: Recycling waste produces low-cost raw materials used in the industries of paper, iron, glass, and plastic, reducing the import of raw materials from abroad.
- Reducing Disposal Costs: Recycling waste reduces the financial costs spent on disposing of solid waste by extending the lifespan of sanitary landfills and utilizing those funds for other community benefits.
- Creating Investment Opportunities: Recycling waste attracts investors to recycling projects due to the financial benefits and profits, providing raw materials for various industries [5].
- Generating Energy: Investing in and recycling waste helps generate energy, aiding countries in facing economic changes and providing flexibility in dealing with various challenges and rising raw material prices.

2.4. Sustainable Development

2.4.1. Concept of Sustainable Development [6]

Sustainable development is defined as a societal process that seeks to employ available natural resources to transform the level of a society suffering from social and cultural backwardness into an aware society, contributing to raising the standard of living for the community members. It is also defined as constraints that control human behavior to meet the current and future needs of society, ensuring social justice and improving the environmental reality. Additionally, it is described as the process through which the needs and goals of the community can be identified and prioritized, ensuring the needs of future generations. The general concept of sustainable development is to provide benefits to all members of

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

society over the long term, as it aims to meet the needs of the current generations while preserving the rights of future generations by utilizing available resources using modern technologies. It is characterized by continuity and inclusiveness.

2.4.2. Sustainable Development Goals [7]

The United Nations General Assembly adopted a set of sustainable development goals aimed at eradicating poverty and achieving well-being for community members. There are 17 goals, which are indivisible and applicable in both developed and developing countries. Achieving these goals is linked to the ethics of society and the extent to which governments are committed to implementing sustainable development goals to preserve the rights of community members. Some of these goals include [8]:

1. Eradicating poverty.
2. Providing food security and promoting sustainable agriculture.
3. Ensuring well-being and healthy living patterns for all community members.
4. Ensuring quality and inclusive education for all community members and enhancing educational opportunities [9].
5. Achieving the principle of equality among community members.
6. Providing healthy water and sustainable management of sanitation services.
7. Providing modern energy services to all community members at affordable costs.
8. Promoting economic growth for all community members, providing decent job opportunities, and enhancing the confidence of productive labor.
9. Establishing infrastructure, promoting inclusive industrialization, and encouraging innovation.
10. Reducing inequality between countries [10].
11. Establishing safe and inclusive cities and human settlements for all community members.
12. Ensuring rational consumption patterns and sustainable production.
13. Taking precautionary measures for climate changes and their impacts on community members [11].
14. Preserving water resources and using them sustainably.
15. Preserving terrestrial ecosystems, restoring them, and enhancing their use, such as forest management, combating desertification, addressing land degradation, and addressing biodiversity loss.
16. Encouraging the establishment of peaceful communities and building effective institutions accountable to the law.
17. Enhancing means of implementation and global partnership to achieve sustainable development.

3. Research Methodology

3.1. The Problem Statement

The research problem is represented by the following questions:

- To what extent do waste recycling projects contribute to addressing and improving the environmental reality and reducing risks?
- What are the methods of waste management and treatment?
- Are waste recycling projects economically viable?
- Do they contribute to an increase in the national output?

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

3.2. Importance

The importance of this research lies in studying advanced methods for waste treatment and recycling that align with achieving sustainable development goals to preserve and improve the environment. Additionally, these projects play an economic and social role by providing investment opportunities for experts to participate and support these initiatives. It also encourages the state to offer serious support, overcome obstacles, and enhance the environmental reality in Al-Najaf Governorate [12].

3.3. Objectives

The research aims to achieve several objectives, including:

1. Understanding the concepts of the waste recycling process and its key stages.
2. Identifying the types and sources of waste and residues.
3. Studying the feasibility of investing in this type of project.
4. Exploring the potential to reuse the outputs of the recycling project in other projects and provide raw materials for them as inputs.

4. Feasibility Study

4.1. Environmental Reality of Waste in Najaf Governorate

The composition of waste in Najaf Governorate depends on the consumption patterns, dietary habits, and living standards of its residents. The issue of solid waste, in its various forms (ordinary, agricultural, industrial, medical, etc.), is one of the most significant problems facing the governorate. It represents the largest source of environmental pollution and a threat to the lives of individuals [13].

Additionally, waste increases in Najaf due to its status as a center for religious tourism, with large numbers of visitors coming to the city during religious occasions. This leads to an increase in the amount of waste and its accumulation, which mars the aesthetic view of the governorate. The governorate is also experiencing a construction boom in various fields, resulting in debris and construction waste as shown in Table 1. Furthermore, the expansion in the medical field, with the opening of public and private hospitals and health centers, produces some hazardous medical waste as shown in Table 2.

Table 1 shows that the total amount of non-hazardous waste was 991,567 tons per year in 2022, equivalent to 2,716.6 tons per day. Meanwhile, hazardous waste, including slaughterhouse waste and medical waste, amounted to 499,500 kg per year in 2022, equivalent to 1,850 kg per day.

Table 1.
Non-hazardous waste in Najaf Governorate.

Non-hazardous waste	
Quantity (Tons)	**Waste type**
626,775	Regular Waste
363,480	Demolition, Construction and Debris Waste
1,312	Scrap
991,567	Total Non-Hazardous Waste / Year
* 2,716.6	Total Non-Hazardous Waste / Day

Source: Prepared by researchers based on [14].

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

Table 2.
Hazardous waste in Najaf Governorate.

Hazardous waste	
Quantity (tons)	**Waste type**
499,500	Slaughterhouses and medical waste
499,500	Total hazardous waste/Year
**1,850	Total hazardous waste/Day

Note: * Quantity of non-hazardous waste/day = Total of non-hazardous waste during the year/365 days.
* * Quantity of hazardous waste/day = Total of hazardous waste during the year/270 days.
Source: Prepared by researchers based on [14].

4.2. Municipal Services in Najaf Governorate

Municipal institutions generally focus on waste collection for residents within urban areas. They are not responsible for services in rural areas according to Municipal Administration Law No. 165 of 1964, which has led to lower service levels in rural areas compared to those within the basic design boundaries of the municipality. Nevertheless, municipal institutions conduct waste collection campaigns even though it is outside their official duties.

In 2022, there were 10 municipal institutions in Najaf Governorate, serving an estimated population of 1,208,581 people. The amount of waste collected daily was approximately 1,717,191.8 kg/day.

The average amount of waste generated per person daily in Najaf Governorate is 1.4 kg/day. However, the efficiency of waste collection is hampered by a lack of equipment, inefficiency of available machinery, a shortage of municipal workers, and insufficient financial allocations to improve the municipal service level in the governorate [14].

4.3. Geographical Distribution of Landfill Sites in Najaf Governorate

Najaf Governorate is relatively small in area compared to its population, with a total area of 29,346 km^2 and a population of approximately 1,630,807 as of 2022. The increasing population leads to a rise in generated waste, which is managed through various disposal methods.

These methods include dumping waste in environmentally approved and non-approved sites, using landfill sites belonging to other municipalities, and the most common method, dumping in vacant lots.

There is one landfill site with environmental approval according to the municipality's basic design, and one site without such approval. Additionally, there are four random dumping sites.

The daily generated waste in Najaf Governorate poses a significant problem compared to the current disposal methods. There is a need for waste recycling stations to mitigate environmental pollution, reduce cancer-causing emissions from burning waste at random sites, and limit the spread of odors and rodents [14]. Average daily waste generated per person = Daily collected waste / Served population.

The economic feasibility of the ring road project includes several stages. The first stage is estimating the investment costs in its two parts: estimating fixed capital and working capital. The second stage is estimating the operating costs in its two parts: estimating the fixed costs and the variable costs. The third stage is estimating the project revenues, and finally extracting the financial ratios and determining the project feasibility [15].

4.4. Waste Isolation and Recycling Project

The waste recycling plant under consideration consists of buildings and civil installations including the plant building, roofed areas, storage facilities, and an administrative building with waste storage in t he form of containers. The plant includes conveyor belts, sorting areas, and machines for separating soli d materials from organic ones. It also includes grinding and shredding machines, machines for producin g organic fertilizer, and a machine for adding other materials (fermentation machine) to produce the org anic fertilizer. Additionally, there is a 25 kg bagging system. The plant also houses a set of smelting and

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

pressing machines for iron, aluminum, and copper, a machine for grinding and melting glass. The factor y requires complementary spare parts and operational equipment such as cars, machinery, and other unf oreseen items. The plant's production capacity is 1,500 tons per day. The plant sorts waste to produce o rganic fertilizer, iron, aluminum, glass, plastic granules, copper, lead, and paper. It operates 8 hours in t wo shifts, totaling 16 hours per day (day and night shifts) [16].

4.5. Estimating Investment Costs & Operation Costs

The investment cost was estimated in its two parts, fixed and working capital, and the annual operating costs were estimated based on a technical study prepared by the Jordan Green Building Council, which is considered the guide in this type of feasibility studies, in addition to the use of a group of opinions from engineers in the field of environment, roads, sustainable development, organic chemistry, and other specializations [16].

Table 3.
Estimating fixed capital.

Details	Amount ID (Iraqi Dinar)
Establishment expenses	228,000,000
Land	500,000,000
Buildings, facilities and services	7,450,000,000
Other service facilities	575,000,000
Water, electricity and support services	960,000,000
Diesel/Heavy cars and engines	790,000,000
Cars and engines/Light	490,000,000
Office furniture and equipment	445,000,000
Basic machines and equipment	97,500,000,000
Secondary equipment and supplies	255,000,000
Total fixed capital	109,193,000,000

Table 3 includes an estimate of fixed capital based on several axes, but the main axis is the estimate of the costs of civil works necessary for the waste recycling plant in addition to the main machines and equipment, including transportation, installation and spare parts fees, according to the technical study.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

Table 4.
Estimating working capital for an operating cycle.

Estimating working capital for an operating cycle			
Annual fixed costs	**Duration/ Working day**	**Total amount**	**Required amount**
Management services, fuel and spare parts	3	92,850,000	23,212,500
Administrative expenses	3	202,193,000	50,548,250
Marketing expenses	3	115,500,000	28,875,000
Interests and fees	3	40,000,000	10,000,000
Depreciation	3	19,942,500,000	4,985,625,000
Obsolescence	3	4,943,800,000	1,235,950,000
Amortization of start-up expenses	3	45,600,000	11,400,000
Amortization of trial operating costs	3	411,600,000	102,900,000
			6,448,510,750
Annual variable costs	Duration/Working day	Total amount	Required amount
Raw materials	3	54,922,332,960	13,730,583,240
Production services, fuel and spare parts	3	194,550,000	48,637,500
General production expenses	3	177,300,000	44,325,000
Salaries and wages/production	3	1,306,800,000	326,700,000
			14,150,245,740
Total working capital			20,598,756,490
Total investment costs			129,791,756,490

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

Table 4 includes a summary of operating costs and working capital estimates, based on calculations of fuel consumption, administrative expenses, and human resource costs. The most critical estimated item is the cost matrix. In this regard, researchers conducted a field visit to the Directorate of Municipalities of Al-Najaf Governorate, consulting with senior management about waste collection and the possibility of utilizing existing human resources and machinery. There was a high level of readiness from the department heads, (Cost per ton) The cost of one ton of waste was determined based on some tables that were provided to us by the Najaf Municipality for the month of February 2021 AD, as the municipality's table included a statement of the monthly waste rate collected by the Najaf Municipality, which amounted to (34,000) tons per month, at a rate of approximately (1,140) tons per day only for the Najaf Governorate, while the costs of collecting waste, which included operating costs for each of (maintenance and spare parts for mechanisms, salaries and wages, general supplies) amounted to (1,710,000,000) dinars for the month of February, and it is approximately at this rate for the rest of the months, i.e. a daily rate of (57,000,000) dinars per day.

4.6. Estimating Revenues

The revenues were calculated based on the statistics available from the Iraqi Ministry of Planning and the Najaf Municipality. Details of the components of one ton of materials that constitute the outputs, the percentages of metals, glass, paper and organic materials, as well as the emitted gases, the most important of which is methane, were obtained. Table 5 shows the calculation of the project's revenues.

Table 5.
Estimating revenues.

Estimating revenues					
Products and wealth	**Formation ratios**	**Price per ton**	**Quantity tons per day**	**Quantity tons per year**	**Total amount**
Organic Materials	0.75	150,000	4,187	1,381,775	207,266,202,000
Glass	0.07		391	128,966	0
Paper	0.02	50,000	112	36,847	1,842,366,240
Metals	0.02	300,000	112	36,847	11,054,197,440
Plastic	0.07	300,000	380	125,281	37,584,271,296
Other	0.07	60,000	402	132,650	7,959,022,157
Sale of electricity 60 MW					
					265,706,059,133
Other income		Interest	Operating level	Amount	Interest amount
Bank interest		0.04	0.25	6,043,992,460	60,439,925
					60,439,925
			Total Annual Revenue		265,766,499,057

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

4.7. Income Statement and Cash Flows

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

Table 6.
Income statement.

Income Statement					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Growth rate %	**0.75**	**0.80**	**0.85**	**0.90**	**0.95**
Sales	199,279,544,350	212,564,847,306	225,850,150,263	239,135,453,220	252,420,756,176
Sales returns	0	0	0	0	0
Net sales	199,279,544,350	212,564,847,306	225,850,150,263	239,135,453,220	252,420,756,176
Cost of sales	42,450,737,220	45,280,786,368	48,110,835,516	50,940,884,664	53,770,933,812
Total operating income	156,828,807,130	167,284,060,938	177,739,314,747	188,194,568,556	198,649,822,364
Fixed costs	5,851,543,000	5,851,543,000	5,851,543,000	5,851,543,000	5,851,543,000
Net operating income	150,977,264,130	161,432,517,938	171,887,771,747	182,343,025,556	192,798,279,364
All other revenues	45,329,943	48,351,940	51,373,936	54,395,932	57,417,928
Net income before tax	151,022,594,073	161,480,869,878	171,939,145,683	182,397,421,488	192,855,697,293
Tax	0	0	0	0	0
Net income after tax	151,022,594,073	161,480,869,878	171,939,145,683	182,397,421,488	192,855,697,293

Table 7.
Cash Flows.

Sales	199,279,544,350	212,564,847,306	225,850,150,263	239,135,453,220	252,420,756,176
Cost of sales	42,450,737,220	45,280,786,368	48,110,835,516	50,940,884,664	53,770,933,812
Total operating income	156,828,807,130	167,284,060,938	177,739,314,747	188,194,568,556	198,649,822,364
Extinctions	19,942,500,000	19,942,500,000	19,942,500,000	19,942,500,000	19,942,500,000
Earnings before interest and taxes	136,886,307,130	147,341,560,938	157,796,814,747	168,252,068,556	178,707,322,364
Benefits	40,000,000	40,000,000	40,000,000	40,000,000	40,000,000
Taxable profit	136,846,307,130	147,301,560,938	157,756,814,747	168,212,068,556	178,667,322,364
Tax	0	0	0	0	0
Profit after tax	136,846,307,130	147,301,560,938	157,756,814,747	168,212,068,556	178,667,322,364
Net cash flow	156,828,807,130	167,284,060,938	177,739,314,747	188,194,568,556	198,649,822,364

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

4.8. Financial Indicators

Table 8.
Financial indicators.

1	Payback period	0.69	سنة
	Number of years required to cover the amount in the project when the annual net flow is constant		
2	Operating cost coverage ratio	3.23	مرة
	Using revenues to cover operating costs		
3	Interest coverage ratio	6,644	مرة
	Using project revenues to cover interest costs		
4	Return on investment	1.45	%
	Measures the profitability of the project to total investments		
5	Break-even point	16.4	%
	The point at which the project's sales revenues equal its total production costs		
6	Liquidity ratio	0.88	More then 1
	Measures the ability to quickly pay off obligations		
7	Current ratio	2.70	More then 1
	Amount of assets covering liabilities		
8	Asset turnover ratio	1.83	More then 1
	The project's ability to exploit available resources		
9	Working capital turnover ratio	9.67	More then 1
	Management's efficiency in using working capital		

4.9. Results Analysis

The payback period of the project was approximately eight months after achieving a full operational cycle. The project's ability to pay its short-term obligations was approximately (270%) of what is required. As for the project's liquidity, it is (88%). The project's ability to exploit available resources was approximately (183%) of what is required. The project management was highly efficient in using working capital, estimated at approximately (9.6) times more than what is required. The project's profitability to total investments amounted to approximately (145%). The project is not sensitive to increased costs and decreased revenues. [17].

5. Conclusions

1. The increase in waste quantity in Al-Najaf Governorate due to the rise in living standards.
2. The widespread phenomenon of waste being dumped in empty lots.
3. The proximity of landfill sites to residential complexes in the governorate, leading to an increase in respiratory diseases.
4. The disposal of household waste without sorting, complicating the recycling process.
5. The municipality's shortcomings in environmental and health planning for organizing waste sites, leading to their random and extensive spread.
6. The waste recycling process consists of interconnected operations that achieve environmental, economic, and social benefits representing the dimensions of sustainable development.
7. By reviewing the extracted financial ratios, it became clear that the project has a high economic feasibility that is beyond comparison, and the reason can be justified by the huge amount of waste present in the targeted area, in addition to the fact that Iraq is a new experience in such industries

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

related to sustainable development and an industry that provides resources and raw materials for other industries that are considered of great importance and are in demand in Iraq and other neighboring countries.

6. Recommendations

In terms of the conclusions and findings that are arrived in this work, the following are recommended:

1. Support and facilitate the establishment of waste recycling projects by providing facilities and attracting investors to establish a special waste recycling plant and make the best use of it.
2. Burning waste causes great harm, as burning every 1 ton of waste produces 3.7 tons of carbon dioxide and harmful smoke that causes cancer.
3. Educating community members about the importance of reducing waste, especially household waste, and the importance of isolating waste in special boxes according to its type, whether paper, plastic, metal, etc.
4. Educating workers in hospitals and health centers about the dangers of medical waste and chemicals and allocating appropriate places and advanced methods for disposing of them.
5. Encouraging environmental and health behavior in school curricula in order to create an aware generation experienced in correct environmental habits and culture through concepts of the importance of preserving human health and living organisms and maintaining the cleanliness of streets and green areas.
6. Benefit from successful global experiences in waste recycling, such as the Swedish experience, which has finished recycling its waste and has begun importing and investing in waste from neighboring countries.
7. Starting to refer the project to an investment company according to the government conditions of the Najaf Governorate Investment Authority and generalizing the successful experience to the governorates of Iraq, and giving this project the utmost importance when compared to other projects as it provides the basic and important resources for local industries, and this is consistent with Iraq's strategy of focusing on industry and establishing industrial cities.

References

[1] C. A. f. S. a. Q. C. Ministry of Planning, *Waste Code*, NAJAF: Ministry of Planning, 2015 First Edition.

[2] S. Kamal, "Waste Recycling, Its Effects on the Environment and Its Role in Achieving Sustainable Development," *Economic Transformations Journal*, vol. Volume 3, no. Issue (2), p. P.33, 2023.

[3] V. T. Pokhrel D, *Municipal solid waste management in Nepal, : practices and challenges*, *Waste Management*, Nepal, 2005, pp. pp 353-366..

[4] M. E. M. S. E. Kaseva, "Appraisal of solid waste collection following private sector involvement in Dar Salaam city," no. Tanzania, Habitat International, pp. pp 353-366., 2005.

[5] M. Y. Kafi, "Environmental Economics and Globalization," no. Dar and Raslan Foundation for Printing and Publishing, p. p 412., 2014.

[6] M. A. A. Rabie, Sustainable Community Development, Amman, Jordan: Dar Al-Yazouri Scientific Publishing and Distribution, 2015.

[7] L. K. B. D. S. V. &. W. A. Holden E., The imperatives of sustainable development: Needs, Justice, Limits Routledge, 2017.

[8] S. M. a. S. Mohammed, Environmental taxation and its role in achieving sustainable local development, an intervention within the third national forum on sustainable local development and the environmental dimension, Algeria: Al-Anwar Association for Scientific and Cultural Activities, University Center in Medea, 2008.

[9] H. J., The 2030 Agenda and the sustainable development goals , the challenge foe Aquaculture development and management, FAO fisheries and Aquaculture circular, 2017.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543

[10] Y. B. Y. a. W. Sakhri, "Rational Waste Management Towards a More Comprehensive Concept of Environmental Sustainability," *Algerian Journal of Human Security*, no. Algeria, p. p. 55., 2019.
[11] Z. Mohammed, Environmental feasibility study of investment projects and their role in achieving environmental security and sustainable development, Djilali Bounaama University - Khemis Miliana, Journal of Economics and Environment, 2019.
[12] K. I. Nour, "Analysis of the Relationship between Waste Recycling and Sustainable Development Goals 2015-2023," *Journal of Administrative and Economic Sciences*, vol. Volume 26, no. Issue 117, p. 387, 2020.
[13] A.A.-A. Shukr, "Applied Methods in Analyzing Regional Development Indicators," *Najaf Region as a Model*, *Journal of Arts*, vol. Supplement No. 134, p. p. 289., 2020.
[14] S. o. t. M. o. Planning, Environmental Statistics for Iraq (Municipal Services Sector) for the year 2022, Najaf: Central Statistical Organization, 2022.
[15] D. M. Al-Ajlouni, *Economic Feasibility Study and Project Evaluation*, Amman: Dar Al-Yazouri for Printing and Publishing, 2019.
[16] T. J. G. B. Council, "The educational manual for waste sorting," *The approved guide for waste management in Jordan*, no. ISBN 978-9957-8751-0-7, p. P.20, 2016.
[17] T. Mustafa, *Financial Evaluation of Projects*, Jordan: Dar Al-Jamid for Publishing and Distribution, 1st edition, 2020.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 8, No. 6: 2726-2737, 2024
DOI: 10.55214/25768484.v8i6.2543