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Evaluation of the Economic Feasibility and Development Decision for Al-Haji Al-Baree Route within the Bahr Al-Najaf Region

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Abstract

Roads are an economic and development indicator, and the development and multiplicity of roads mean that cities with high sustainable development and vice versa, often have economic and social prosperity. This study focused on two axes, the first is the development potential provided by the development of the Najaf Haji road, the second is an assessment of the reality and economic feasibility of the development decision for this road, which is undergoing deterioration and has been flooded by Bahar Al- Najaf in the last five years. It leads to the prosperity of growth resulting from the area surrounding Najaf, as well as to the city of Najaf in general, as the area turns into a recreational park for tourists to the city of Najaf and neighboring cities for visitors to the holy city. The results demonstrate that a very positive impact was found for both technical impact analysis, social impact analysis, and project idea the project. Whereas, project risk analysis, project sector development analysis, and environmental impact analysis represent the positive impact on the project development.

Keywords: *Al-Hajj Baree Route, Transportation Planning, Decision Support, Project Evaluation, Feasibility Studies.*

Introduction

The development of human gatherings or what is called at the time (cities) was not spontaneous but was the result of several strategic factors. One of the most important of these factors is the location of the city and its relationship to transport and communication lines because the city is a point of convergence and a point of spread for the axes and arteries of transport networks. Roads and transportation have gone through historical stages and multiple development stages through which they have reached what the current transportation networks have reached. Trends and speed, and there are important indicators by which modern cities are measured, which as the prosperity of roads and means of transportation, which indicates the development of the economic and social life of the community and vice versa, where the transportation hub and parallel lifeline are important to the existence of water (Shlash et al., 2008, and Al-Hakim, 2008).

The city of Najaf is very important in Iraqi geography. It is one of the cities with rapid nature in urban growth because it is a center of religious attraction for the presence of holy shrines and population attraction where the level of per capita income is high. It is also a center of tourist, commercial, agricultural, and economic attraction due to the great diversity that the city has in various natural resources and industrial (Al-Helaly, 2021).

The relationship between the city of Najaf and the Bahar Al-Najaf is an old and modern interactive relationship. The Bahar Al-Najaf is an ecological diversity environment. Despite the large urban expansion of the city in recent years and the expansion of its basic design, the Bahar Al-Najaf area witnessed slow growth, as many studies confirmed the continuation. The expansion of the city of Najaf will continue in all directions, except for the Bahar Al-Najaf region, which will remain at a slow growth rate (Al-Kinani and Al-Saati, 2010). The objective of this study is to assess the opportunity for

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investment and development, the feasibility of the project, and the effects of sustainable development on the Bahr Al-Najaf region, by evaluating the decision to develop the land pilgrimage route.

Methodology

Study Area

The governorate of A Najaf is located in south-western Iraq about 161 km southwest of the capital Baghdad and it borders Saudi Arabia. It also shares internal boundaries with the governorates of Anbar, Karbala, Babel, Qadisiya, and Muthanna, see (Figure 1).

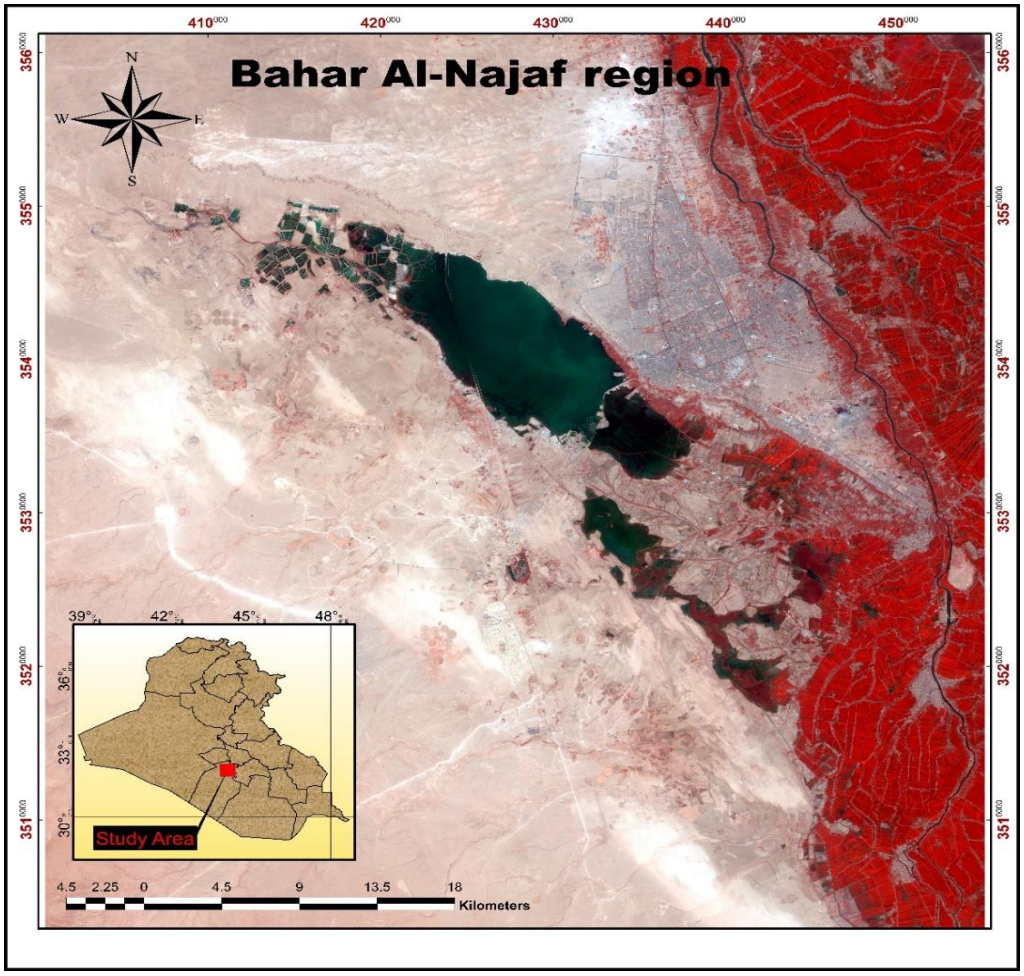

Figure 1. Study area.

It has an area of about 28,824 km2 which is approximately 7% of Iraq's total area. The study area is located in Bahar Al-Najaf, Iraq. The geographic coordinates of this area are longitude (31° 40' 00" N - 32° 10' 00" N), latitude (44° 00' 00" E - 44° 30' 00" E) (Al-Helaly, et al., 2021).

Data Sets Study Period

A collection of descriptive and statistical data, tables, and various charts from various official governmental and academic sources.

- **Landsat – 8**

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The image belonging to the **Landsat-2** satellite is downloaded [earthexplorer.usgs.gov] (Earthexplorer, 2022) and prepared for the current study as shown in **Figure 2.** The date of acquisition for each image has been illustrated as mentioned in Table 1.

•Sentinel - 2

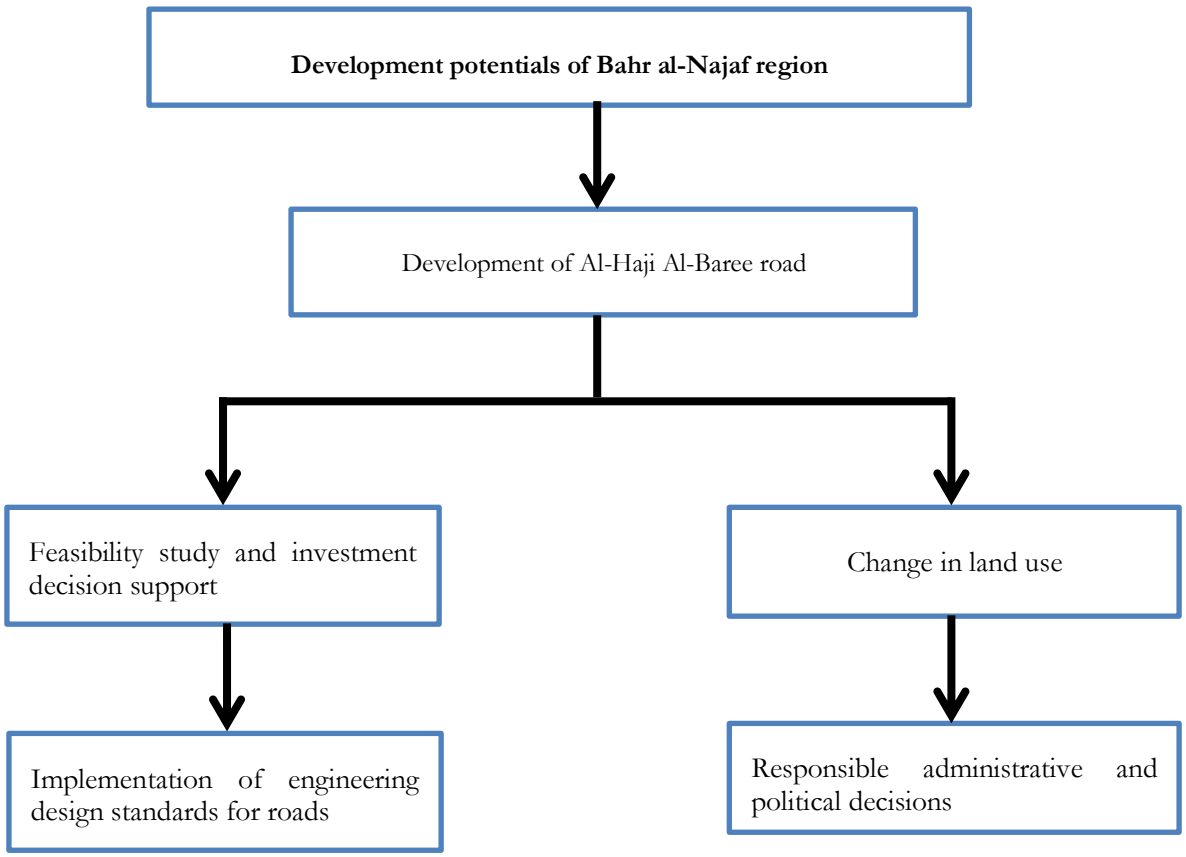
The image belonging to the **Sentinel-2** satellite is downloaded [earthexplorer.usgs.gov] (Earthexplorer, 2022) and prepared for the current study as shown in **Figure 2**. The date of acquisition for each image has been illustrated as mentioned in Table 1.

Table 1: Date of acquisition for (Landsat2 and Sentinel-2) data sets.

Dataset	Sensor-ID	Parameter	Characteristics	Platform
Sentinel-_2	MSI	Platform		
		Date	2020-09-25	Sentinel-2B
		Spatial Resolution	10m-20m-60m	
Landsat-_2	MSS	Path/Raw	168/38	
		Date	1976-10-03	
		Spatial Resolution	60 m	

Processing Steps of The Work

The Process of This Study Is Indicated in Figure 2.



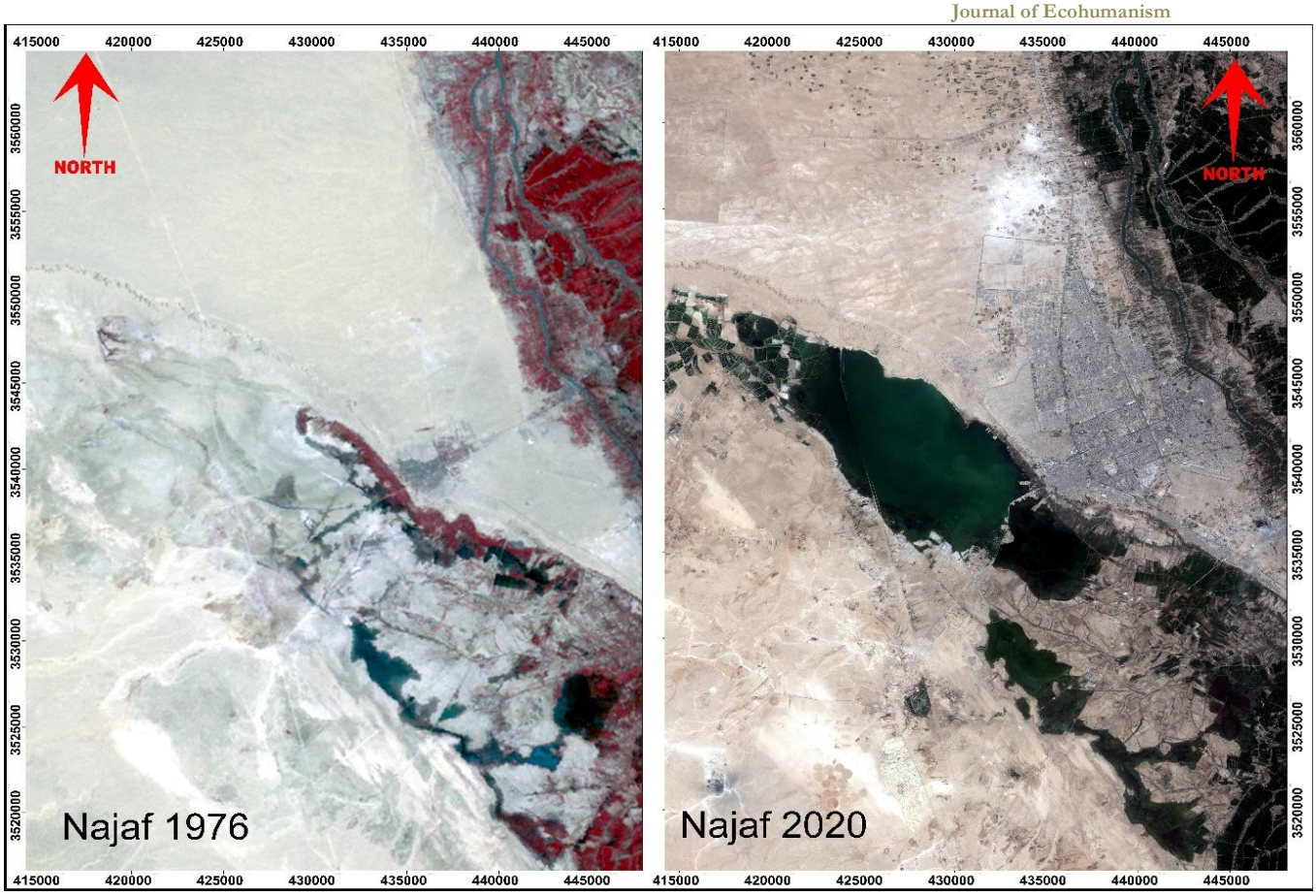


Figure 2. The data used in this study.

The urban development of the city of Najaf and the Bahr Al-Najaf region between 1976-2020

Najaf 1976

Figure 3 shows the city of Najaf in 1976 and the city limits in that year with the road network and the main transport hubs that connect the city with the rest of the governorates of Iraq. The area of the city was estimated (at 12,661) square kilometers.

And the Bahr Al-Najaf region, as the figure shows, is almost devoid of population centers and other economic activities such as urban, industrial, commercial and agricultural projects. The land pilgrimage road is an old dirt road that is almost a simple mesomorph road, and it is heading towards the Kingdom of Saudi Arabia, crossing the Najaf depression areas that lie below the city and then towards the desert Towards the Kingdom, sources indicate that the depression in that period did not contain any development activities, except for the rare such as the strategic line road. What is observed from the figure is that the water consists of water bodies that spread in the sea area along the river (Al-Sudair now and formerly Al-Ghazi), as well as water swamps in low areas and not large areas, as shown in Figure 3.

Figure 3. Al-Najaf in 1976 and 2020

Najaf 2020

In recent years, the city of Najaf has witnessed a great urban expansion. The geographical area of the city has increased due to several reasons, the most important of which is the increase in the population and the conditions that the country has witnessed in the past years (Al-Helaly, 2021).

Figure 3 shows the city of Najaf in 2020 and the city limits in that year with the road network and the main transportation hubs that connect the city with the rest of the governorates of Iraq. The area of the city was estimated (at 135.895454) square kilometers and the population this year was (1471,592 people) and the number of cars was 228,384 as indicated in Table 2.

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Table 2. Information and data of the Central Statistical Organization in 2018

Total population	1471592	Rural dwelling percentage	29
Population growth rate	2.1	Population growth rate / Iraq	2.58
Unemployment rate	9.4	The number of travelers inside and outside the governorate	24098
Economic activity rate	41.6	The number of passengers inside the governorate	6465
Urban dwelling percentage	71	The number of travelers outside the governorate	17633

The First Axis

The repercussions of the development of Bahar Al- Najaf through the development of the Al-Haji Al-Baree road has become a magnet for various activities and various events, which can be summarized as:

Residential Sector

Al-Noor City was established in 2012 with several housing units reaching 20,000 housing units. There has also been a great development in the residential communities that are located within the geography of the Bahr Al-Najaf region, which are Mazloum village, Al-Rahima village, Al-Ghazalat village, Al-Aziya village, and Al-Asawid village, as shown in Table 3, which encouraged the relevant conservative institutions to develop the administrative borders of Bahr Al-Najaf region. The current Al-Haji Al-Baree road is the main and only artery in linking these residential communities that can grow widely in the coming years, as they are likely to grow on both sides of the road pilgrimage to the so-called satellite cities that will It is linked to the city of Najaf and the Bahr Al-Najaf region is a center of attraction for these cities, provided that the city's location is chosen through a set of environmental, social, economic, hydrological and other determinants because of the environmental peculiarities of the Najaf Sea .

Table 3. The population numbers in the villages of the Al-Nour district.

The villages of the Al-Nour district	Population-2009	Population-2017	z
Alghazalat	-	-	2500
Mazlum	3824	2138	3900
Al-Hayyadiyah	250	131	250
Al-Rahima	1406	432	2000
Aleizia	311	344	1000
Alasawid	190	189	450
Alnuwr Alawlaa Walthaania	-	-	15000
Total	5981	3234	25100

Industrial Sector

The Bahr Al-Najaf region is a natural source of raw materials for various industries and important mining areas for raw materials, from which annually the total number of vehicles carrying raw materials of sand and gravel can be summed up to 3000 vehicle per hour. The Ministry of Industry and Minerals, in cooperation with the local government, took the initiative to establish important industrial cities in the Bahr Al-Najaf region, including:

The industrial zone for polluting industries, which is with dimensions of 12 * 8 km and is located to the right of the current road pilgrimage as demonstrated in Figure 4. This city has been activated through investment opportunities represented by cement factories, brick factories, and screening plants. Also, the

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road pilgrimage is considered the only axis responsible for the growth of this area now. and in the future . The industrial zone for non-polluting industries, with dimensions of 1000 * 5000, is located to the left of Hawally Road, which will be a major reason for the growth and development of this area. It can be seen in Table 4 the investment opportunities provided by the Najaf Governorate's investment in the Najaf depression.

Agricultural Sector

The lands of the Bahr Al-Najaf desert area are fertile, and the relevant authorities took the initiative to give agricultural investment opportunities in a good way, and crops were an important tributary in the market of the city of Najaf and other provinces. To sustainable development in the agricultural sector in the Bahr Al-Najaf depression that is influential in the national economy, see Table 4 and Figure 4.

Table 4. Investment opportunities for Bahr Al-Najaf until 2019 Source Najaf Investment Authority.

residential sector	Almaymuna company	Durrat Al-Najaf Residential City	Industrial sector	Mashreq Tayf General Trading Company	GRC factory for the production of facades, aluminum factory, carpentry factory, and air passages
	Barakat Al Ritaj Company	Ahl al-Bayt Residential City		Pierre/Moussa Michel Fattoush	mineral water factory
	Millenium Company	Residential complex (Bab Ali(		al'umara' Contracting Company	Establishment of an industrial city
	Ghadaq Altabiea Company	Establishment of a housing complex for jurists		Kar Engineering & Construction Co., Ltd.	Najaf Cement Factory
	Biaban Company	Al-Mimar Residential Complex		Abdul Amir Hassan Shibr	Cement and clinker production plant
	Islamic National Bank	Al-Muntader Residential Complex		Qutaiba Farman Amin	cement factory
	Sabic and Brush Company	Residential complex		Goodness International Resources Ltd.	cement factory
	Al-Saqr Al-Jarrah Company	Zulfiqar Residential Complex		Diouf Al-Rahman Company	cement factory
	Al-Saqr Al-Jarrah Company	Amir al-Mu'minin (peace be upon him) residential city		Safa Muhammed Salih and Wahaj Al Thuraya Company	Factory for the production of insulating panels and channels
	Jamal Al-Basat Company for Spare Equipment Trading, Information Technology, and General Contracting	Teachers Residential Complex		Golden Network Company	Asphalt plant and its derivatives
agricultural sector	Al Shaker Company	Integrated agricultural project	tourism sector	International Hospitality Group Holding	A five-star hotel with a shopping mall
	Hassan Syed Wasaf	Ostrich breeding		International Hospitality Group Holding	five stars hotel
	Pierre & Moussa Fattoush Company	model farm		International Group Holding	Four-star hotel

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Ali Morah Hassan and Ali Hussein Kazem Halil	wheat and barley farm		Desert Ages Company	five stars hotel
Nazim Obaid Shabat	Integrated agricultural project		Al Noor International Holding Company	Zulfiqar Tourist City
Mohamed Yassin Abed Aoun	model farm		Murex Company	tourist hotel
Hussein Kazem Halil	wheat and barley farm		Khairat Al Furat Company	five stars hotel
Hassan Abdel Amir Mayali	wheat and barley farm		Sunshine Company	Tourist hotel and conference hall
Ward Alwan Abbas	wheat and barley farm		mahroma company	tourist hotel
Mohamed Nagy and Moayad Shukr Nouri	Wheat and barley farm and sheep breeding		Sharaf Al Shams Company	Fadak Tourist City
Sahar Al Barari Company	Cow station and dairy factories			
Haider Gasib Abdel Reda and Louay Abbas Abdel Samad	integrated farm	service sector	Fadel Malik Hussein and Hussein Mahmoud	The tourist city of peace
National Company	model farm		Hussein Abbas Khudair and Khaled Abbas Khudair	Najaf wedding city
Basheer Al'iislah Company	nature reserve		Zamzam Tourism Company	entertainment center
Zaid Sabah Aziz	Integrated modular farm		Millenium Company	Shopping center
			Salem Mujbel Clip	mall with park
			Allawi Hassan Jabr	Parking lot with multi-purpose shops

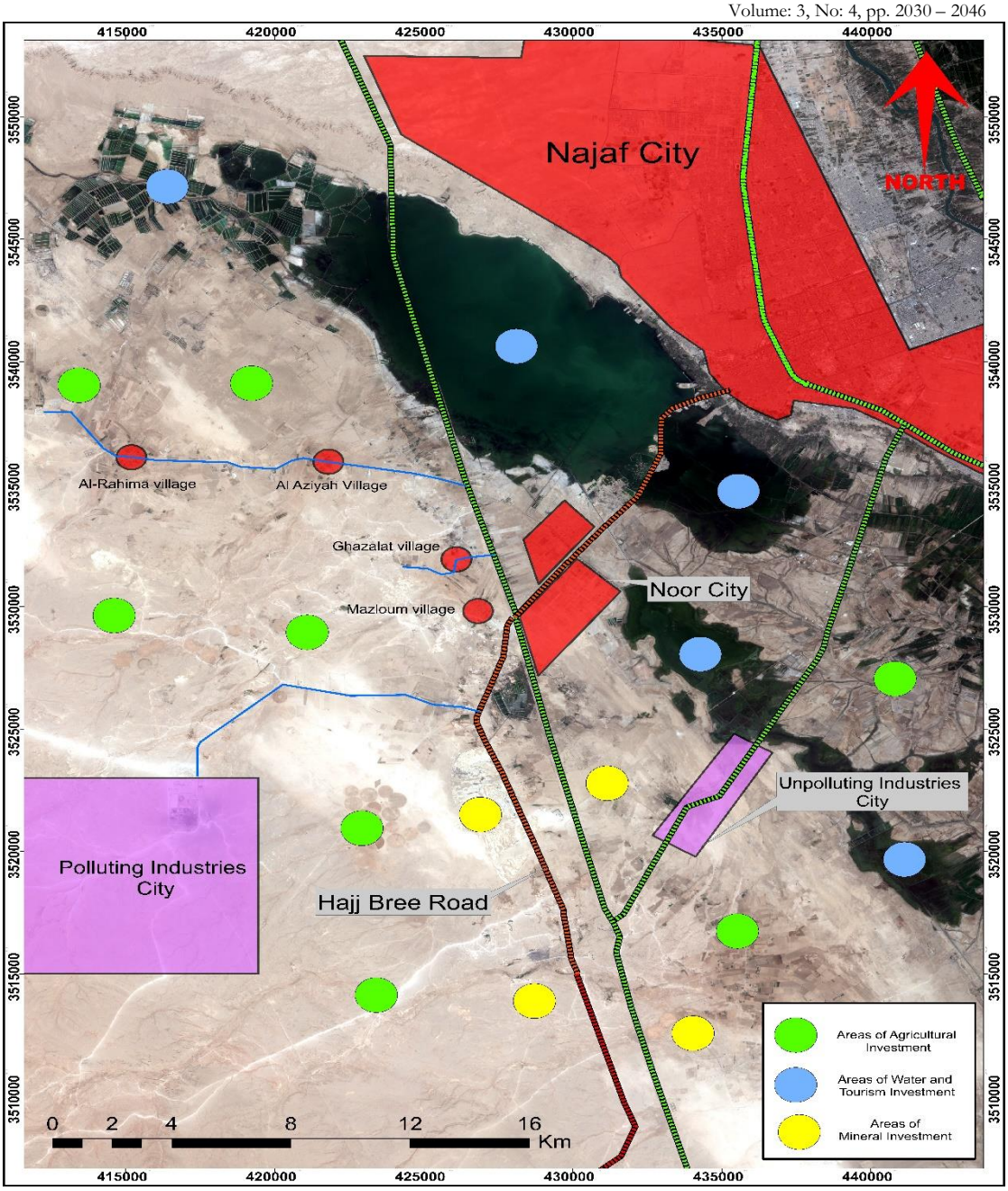

Figure 4. Hajj Baree Road and the Bahr Najaf Region

Water Sector

The great expansion in the geographical area of Najaf Lake during the past five years opened new horizons for the investment of Najaf Lake in a modern fashion in a large water reservoir with an area of 162 square kilometers. The lake is an important source of its perception and the sustainable development of the lake will make this road one of the development hubs see Figure 4.

Tourism Sector

The Najaf Badia region, which overlooks the Najaf depression and its lake, is considered one of the important environments that contain an important biological diversity in which it is stocked in the summer and the other seasons. Serving most of the Badia and the Tanbou, the future of these areas will not pass without this important axis

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Description Of the Current and Future Road and Traffic Study

The Hajj Baree route starts from the beginning of the Bahr area, which is the area adjacent to the city of Najaf and ends at the border of the Kingdom of Saudi Arabia, which is estimated at a length of 270 km. The length that starts from the point (00 + 0) to the station (00 + 27) is the section that is most used by most activities such as housing, factories, laboratories, and others at present. Asphalt, with a width of 7.25 meters, is shown in Figure 4.

- The second axis is the evaluation of the investment decision and the economic feasibility of developing Al-Haji Al-Baree route
- Evaluation of the project idea

The idea of Al-Haji Al-Baree development project will be assessed depending on a range of standards, as well as the use of a measure (LIKERT) to determine the intensity of experts' assessment of the project, and the relative weights of the standards have been developed to distinguish the standards in terms of impact intensity as indicated in Table5 and Figure 5.

Table 5. Evaluation of the idea of the project.

Evaluate the idea of the project					
The weight of the standard	Evaluate the idea of the project				
	Idea Level	high	Moderate	Weak	
		3	2	1	
0.10	High	3			The study of local skills and expertise available
0.10	Moderate		2		The level and size of the new technologies used
0.10	High				Current products and services with industrial interactions
0.10	High	3			Previous experience in this activity
0.10	High	3			The proposed project for state legislation and policy for the State
0.05	High	3			Review the former projects that have not been implemented
0.05	High	3			The possibility of sataing the basic needs of society
0.05	High	3			The project supports state plans and directions
0.03	Moderate		2		Virtual requests for the market
0.02	High	3			Distribution, sale, and export of service or product
0.05	Moderate		2		Power competition with similar projects
0.05	High	3			Prospects for future demand
0.02	Moderate		2		Analysis of production costs compared to the market
0.03	Moderate		2		Local and external resources available to resources and materials
0.05	High	3			Regional and geographical integration that supports the idea of the project
0.10	High	3			Survey and opinions of external interest and specialists by project idea
1.00	2.6	6.93	0.92	0	Average project idea
Evaluate the idea of the project					Accept

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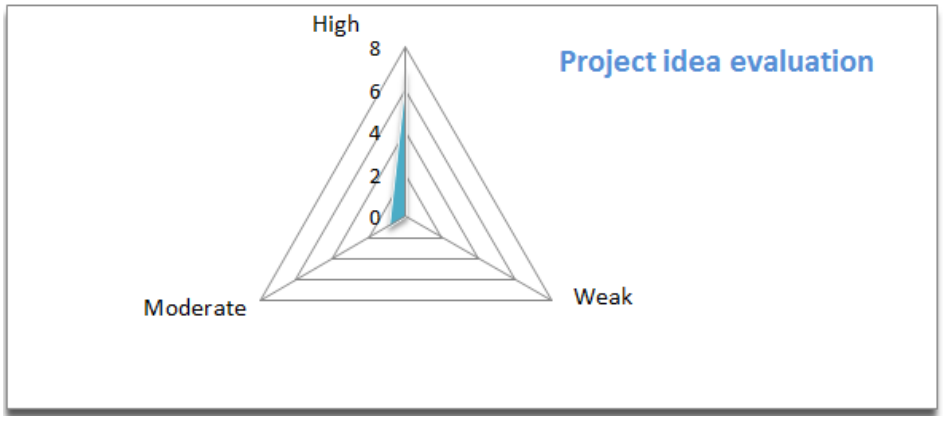

Figure 5. Evaluation Triangle of The Project Idea.

Project Justifications

The main standards that are used to assess the justifications of the project are indicated in Table 6 and Figure 6.

Table 6 Evaluation of the justifications of the project.

Evaluate the justifications of the project					
The weight of the standard	Evaluate the idea of the project				Justifications
	Justification level	High	Moderate	Weak	
		3	2	1	
0.10	High	3			Desires and needs of the external beneficiaries of the project
0.10	High	3			Desires and needs of the organization building the project
0.15	High	3			The desires and needs of the state for the construction of such a project
0.10	High	3			Technical creativity to employ resources and then implement the project
0.10	Moderate		2		Compatibility and conformity of legislation and laws to implement the project
0.15	High	3			The project is considered an urgent need and its implementation cannot be delayed
0.15	High	3			Possessing the knowledge and experience of the investor in the project
0.07	High	3			The project is distinguished by its strategic dimension and necessity
0.03	Moderate		2		High level of motivation for decision-makers to implement the project
0.05	Moderate		2		The chances of success and overcoming obstacles are high for the project
1.00	2.4	6.48	0.72	0	Average project justifications
Average project justifications					Accept

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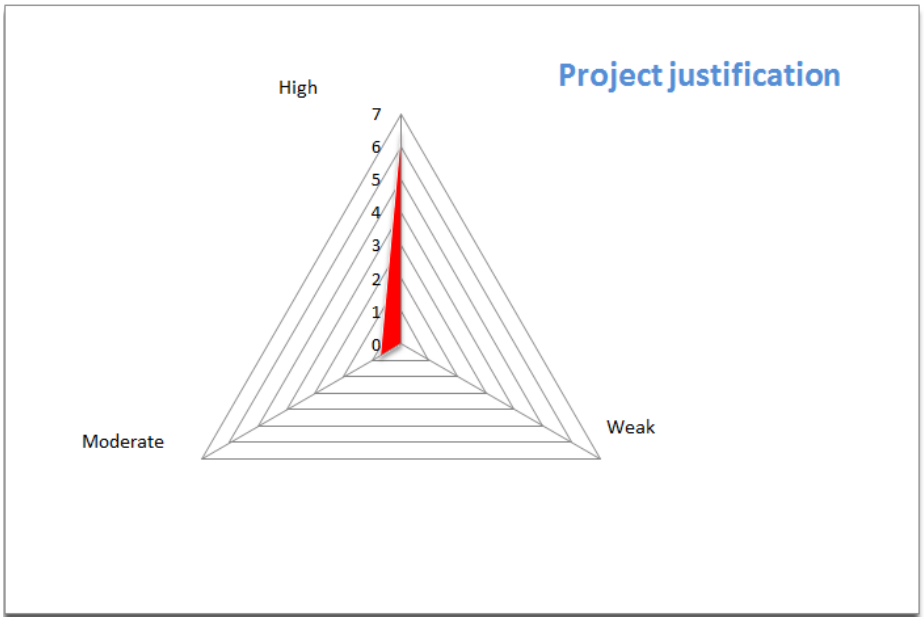

Figure 6 The results of project justifications.

Project Beneficiaries

The main characteristics of the beneficiaries of this project could be discussed and mentioned in detail in Tables 7 and 8. Therefore, different types of groups with different sectors have been discussed in this study.

Table 7. The project beneficiaries.

The approximate total number of workers in the project/individual	200
Number of project beneficiaries in the community/individual	3000000
Number of cities benefiting from the project/city	12
Age groups (1-16)	direct benefit
Age groups (16-36)	direct benefit
Age Groups (36-56)	direct benefit
Age Groups (56-76)	direct benefit
Unemployed	direct benefit
Workers in the private sector	direct benefit
Employees in state departments	direct benefit
Workers in the mixed sector	direct benefit
The number of age groups benefiting	**4**

Table 8. Project Beneficiaries by Sectors

Insurance sector	not benefited	Universities and educational institutions	beneficiary
Job opportunities and jobs	beneficiary	Travel, tourism, hotel, and restaurants	beneficiary
Banks	beneficiary	State departments, institutions, and trade unions	not benefited
Clothes and luxuries	not benefited	Wholesale and retail trade sector	not benefited

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the medical sector	not benefited	Industrial institutions and laboratories	beneficiary
Toys and flowers	not benefited	Machinery, machinery, and equipment sector	beneficiary
Sports and clubs	not benefited	Agriculture and Livestock	beneficiary
Real estate and property	beneficiary	Electronic and Internet services	not benefited
Transportation and communications	beneficiary	Structural materials and construction	beneficiary
Number of sectors benefiting	9		

Projects With Investment Attraction and Industrial Interlocking

There are several projects which lead by different authorities as indicated in Table 9.

Table 9. Projects With Investment Attraction.

Lake Najaf Residential Tourist Project	Najaf Investment Authority
Lake Najaf World Trade Center	Directorate of Water Resources
400MW Clean Energy Project	Najaf Electricity Directorate
Model farm project	Fayd Al Qaseem Company
Model farm project	Fayd Al Qaseem Company
Establishment of a free trade area	Fayd Al Qaseem Company
Cultivation of (7000) dunums of palm seedlings	Fayd Al Qaseem Company
Naphtha hydrogenation unit project and gasoline improvement in Najaf Governorate	San Refinery
Heavy Water Treatment Project	Fayd Al Qaseem Company
Cow milking machine project in Fadak	Fayd Al Qaseem Company
Cement Kar Factory Project	Najaf Investment Authority

Suggested Projects

The suggested projects were listed and discussed with the suggested owner as indicated in Table 10.

Table 10. Suggested project in Bahr Al-Najaf region.

waste recycling project	Najaf Investment Authority
Glass manufacturing plant project	Najaf Investment Authority
Palm oases project in Bahr Najaf	Fayd Al Qaseem Company
40,000acres agricultural village project	Fayd Al Qaseem Company
Kinetic power plant production project	Fayd Al Qaseem Company
Tourist Village Project	Fayd Al Qaseem Company
Isfahan Steel Company	Fayd Al Qaseem Company

The Degree of Endemicity

Table 11 indicates the degree of endemicity which is 0.4. It is a high endemicity.

Table 11. The degree of endemicity.

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The degree of endemicity	0.40	Less than 1 high endemicity
The total number of workers in the project	2,000	
Job opportunities in the region	20,000	
Total workers in the same activity in the region	5,000	
Job opportunities in the region	20,000	
The project area is an attractive and encouraging area to establish the project in		

A Set of Descriptive Criteria

Several descriptive criteria have been discussed in this study with their evaluations as indicated in Table 12. The overall level is very good.

Table 12. A Set of Descriptive Criteria.

Descriptive criteria	
Per capita ratio and human development indicators	Very good
The direct and indirect benefits of the project	Very good
Raising the level of income and living conditions	Very good
Increasing the level of technical skills and training	Very good
Raising the social level and developing living conditions	Very good
The criterion of balancing the expenditure on the project with the benefits achieved	Excellent
Develop technical knowledge and increase the experience curve	Moderate
Supporting the current facilities of the institution	Excellent
Availability of infrastructure in the project area, represented by water, electricity, and sewage networks	Very good

Environmental Impact Analysis

The impact of environmental analysis of the current project demonstrates a positive effect as indicated in Figure 7.

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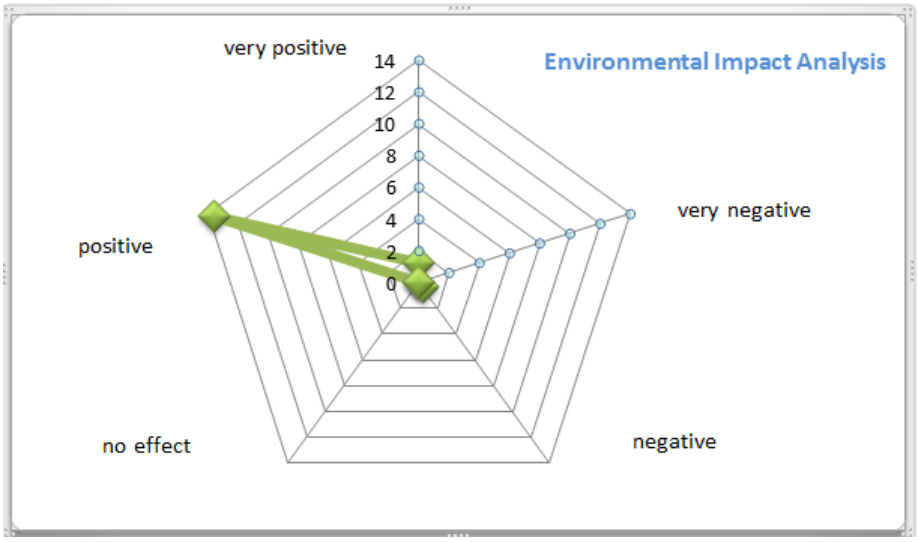

Figure 7. Environmental analysis.

Social Impact Analysis

A very positive effect has been noticed in the social impact analysis for Al-Haji Al-Baree route as indicated in Figure 8.

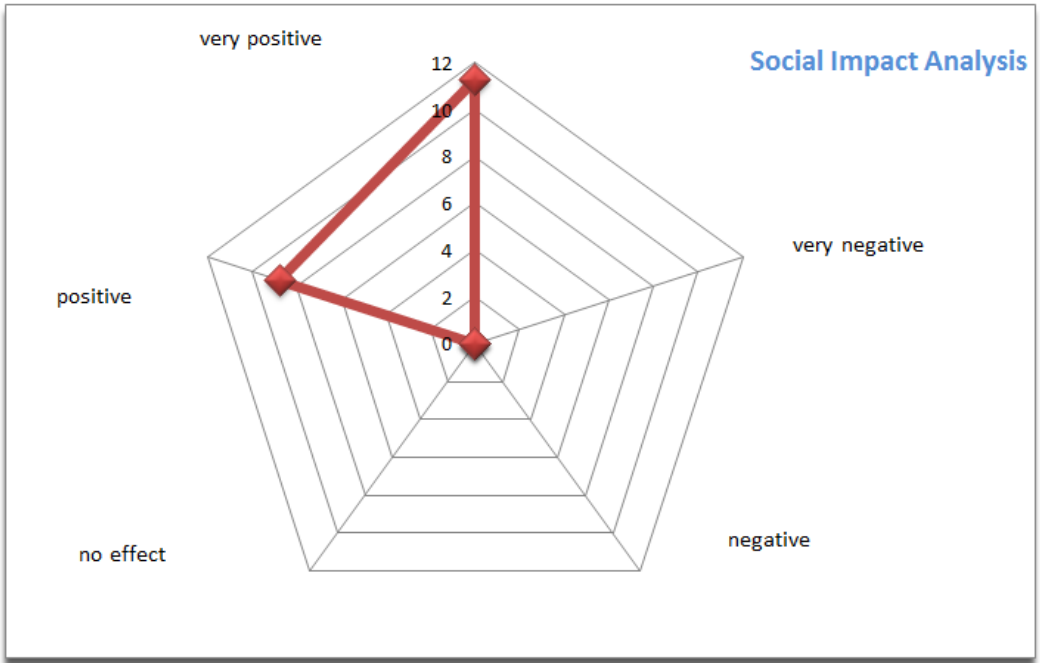

Figure 8. Social impact analysis.

Strategic Impact Analysis

The SWOT analysis can be defined as a strategic planning and strategic management technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to project planning (Abdel-Basset et al., 2018). The SWOT has been used to investigate the effect of strategic impact analysis as indicated in Figure 9. The analysis shows accepted results.

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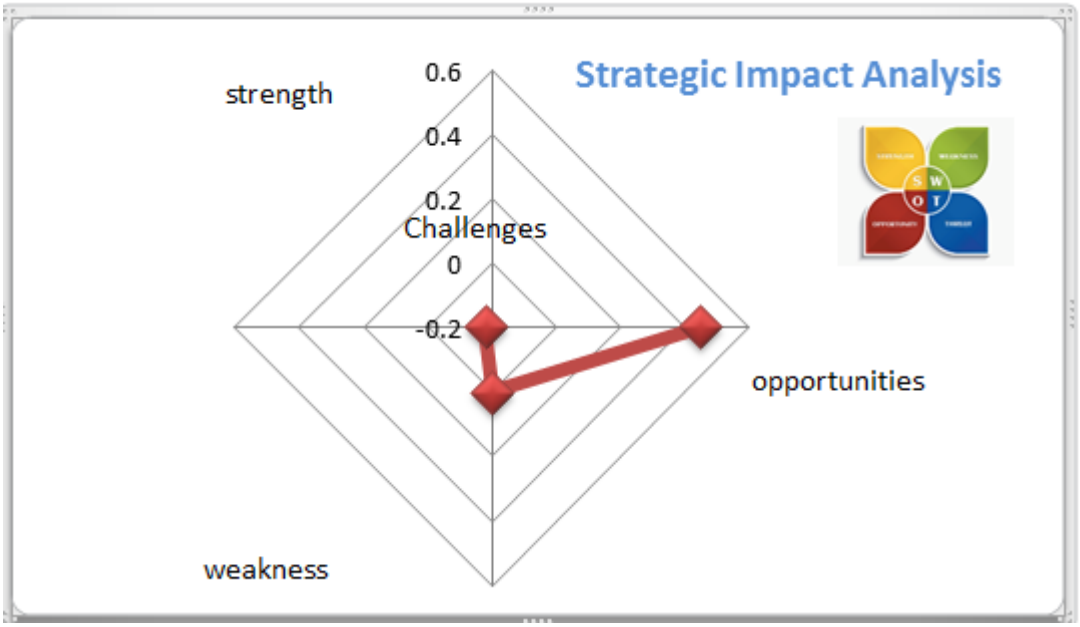

Figure 9. Strategic impact analysis.

Project Risk Analysis

Ten standards have been investigated in this analysis such as project sensitivity, increase in loan value, high loan interest, exchange rates change, high competition, inflation, and lack financial liquidity (Vodova, 2011). The analysis indicates accepted results as shown in Figure 10.

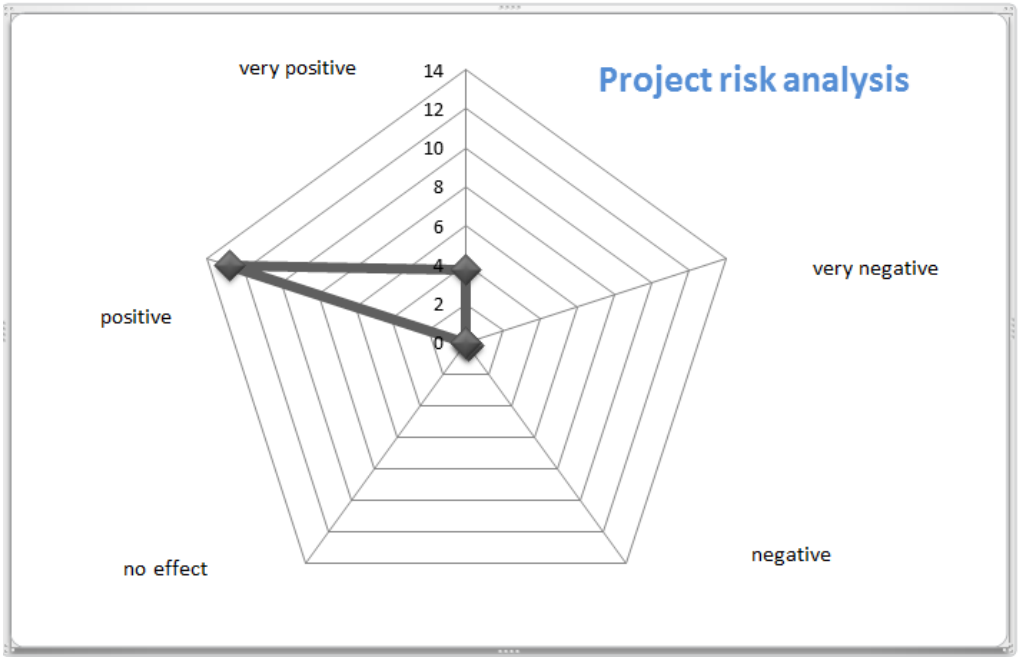

Figure 10. Project risk analysis.

Project Sector Development Analysis

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In this analysis, nine standards have been adopted such as increasing the sector's infrastructure, inventing new ways, qualification of specialized cadres, achieving growth in the sector, achieving quality in output, transferring modern technologies, increasing job opportunities, increasing the state's share of activity, improving the balance of payments, and stabilization of the sector. Figure 11 demonstrates the acceptable results of this impact.

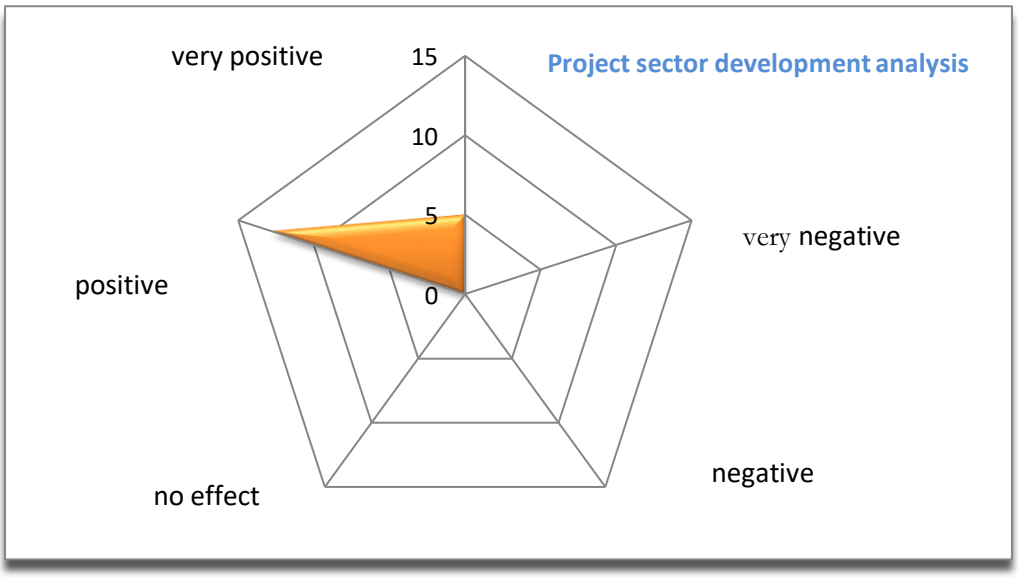

Figure 11. Project sector development analysis.

Technical Impact Analysis of The Project

The effect of technical impact analysis indicates that this impact is very positive as shown in Figure 12. several standards have been studied such as service and product production volume, adequate project site, determine the technical life of the project, proximity, and distance from the markets, industrial interlocking, specialized technology transfer, innovative production methods, low power consumption, no waste, and uncomplicated production methods.

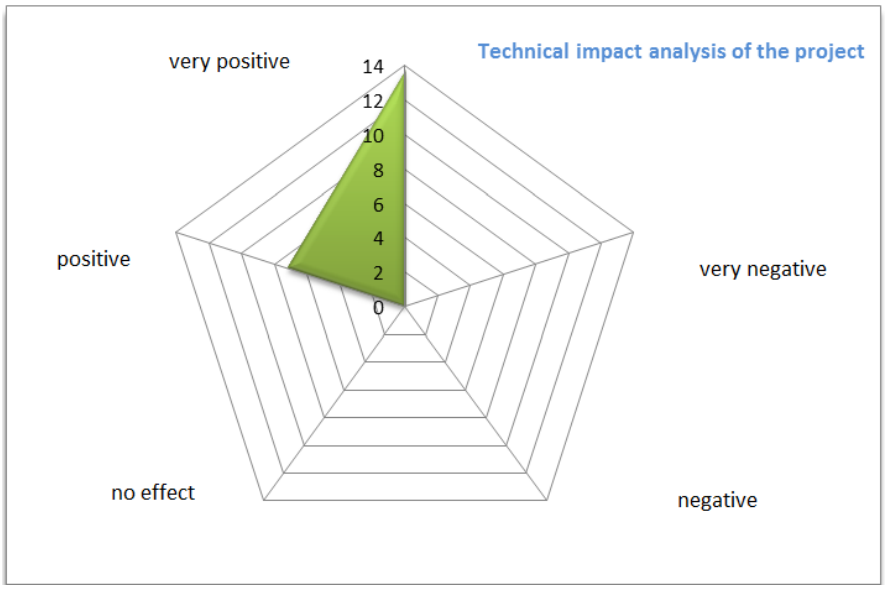

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Figure 12. Technical impact analysis of the project.

Conclusion

The main significant points from this study are:

- Noting the urban development and the population growth rate of 2.6% annually in the country, and the expansion taking place in the administrative boundaries of the holy city of Najaf, this encourages the possibility of starting the construction of the main infrastructure that attracts investment in the region. The project of Al-haji Al-Baree road is significant.
- The presence of a single-window department in the Investment Authority in Najaf Governorate is a point of support and strength for the proposed investment projects in the region.
- Based on a set of criteria for evaluating (the idea and justifications for investment and development) on the Al-haji Al-Baree road in the city of Najaf, and after evaluating the weights of the criteria according to their relative weight, it turned out that the idea of developing the Al-haji Al-Baree road is acceptable.
- The number of groups benefiting from the development of the Al-haji Al-Baree road in Najaf reached (six) categories out of (eight) categories as direct beneficiaries of the project.
- The beneficiaries of the project by sectors, reached (ten) sectors out of (eighteen) sectors, including travel and tourism, hotels and restaurants, job opportunities, banks, and banks.
- The number of projects with investment attraction and industrial intertwining has reached more than (twelve) different projects in the region, some of which are classified as having a strategic dimension.
- The degree of endemicity reached (0.4), which is evidence that the project area is an attractive and encouraging area for the establishment of projects in it.
- In addition to the initial evaluation of many of the criteria supporting development and investment in the region was positive, these criteria are based on the evaluation using scientific criteria and weights included in the research (environmental impact analysis, social impact analysis, strategic impact analysis - SWOT, project risk analysis, project sector development analysis, and analysis technical impact of the project).

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