

Analyzing The Effects Of Industrial Projects On The Achievement Of Sustainable Regional Development: A Case Study Of The Mahawil District

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Abstract

Regional development forms the backbone of the overall development of economies and societies across nations, and the industrial sector can never remain an insignificant force behind the development that generates employment and value addition. The study of the effects of industrial projects on regional development acquires special significance across developing nations like Iraq, with the region of Mahawil in the province of Babil being the case study. The problem of the study could be viewed as the lack of a clear vision regarding the role of industrial projects in the achievement of sustainable development at the district level. The study assumes that an integrated approach on the localization of industrial projects based on a correct estimation of natural and human resources could result in the achievement of sustainable development at the regional area. The study used descriptive analytical and quantitative research methods. The study revealed that the Mahawil region enjoys promising natural and human resources. These include its pivotal location, the richness of its land, and the fact that its population keeps growing; however, these resources are underutilized. The industrial sector faces the problem of infrastructure, a lack of qualified personnel, and lack of financing. The study recommended that there is a need for an integrated development strategy with the localization of industrial projects and proposed development of infrastructure, building the capacity of human resources, development of financing options, development of the regional industrial strategy considering sustainability factors, and development of partnerships between the government and the private sector..

Keywords: *Sustainable regional development, industrial sector, development potential, infrastructure.*

Introduction

Regional development forms the backbone of overall development of the economy and the nations because of its focus on improving disparities that may exist within the different regions and making optimal use of the available resources. On this premise, the industrial sector emerges as one of the major drivers of development because of its capacity to create employment and boost other sectors of the economy.

The study of the effects of industrial projects on regional development acquires special significance within developing countries and Iraq in particular because of the desire of the latter to diversify its economy and reduce dependence on natural resources. The region of Mahawil, which belongs to the province of Babil, can serve as an example of this because it possesses encouraging natural and human resources suitable for the location of industrial projects.

Research problem

If Despite the development potential that the Mahawil district enjoys, there remain clear development gaps and underutilization of resources. The research problem arises due to the lack of a clear vision with respect to the potential that industrial projects may offer toward the achievement of sustainable development within the Mahawil district despite the existence of obstacles that inhibit this.

Research hypothesis

This study rests on the hypothesis that “the existence of an integrated strategy for the localization of industrial projects in the Mahawil district, based on an accurate assessment of natural and human

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resources, will lead to sustainable regional development through increased employment opportunities, improved living standards, and enhanced economic integration between its administrative units.

Conducting research

1. Determine the reality of natural and human development potential of the area of Mahawil.
2. Examine the effects of industrial projects based on regional development within the district.
3. Determine the factors that inhibit industrial development in the Mahawil region.
4. To propose a strategy with respect to the development of the industrial sector of the area on the basis of the principles of sustainable development.

Research methodology

This study adopts a descriptive and analytical method based on the collection of data and information from different sources and its subsequent analysis to arrive at conclusions. Additionally, there will be the quantitative method used in the analysis of statistical information regarding the demographic and economic aspects of the region.

Research structure

- First section: Theoretical framework for regional development and the role of the industrial sector.
- Second section: The reality of development potential in the Mahawil district.
- Conclusions and recommendations
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CHAPTER 1: Theoretical Framework on Regional Development and the Role of the Industrial Sector

Regional development can be considered an intricate process that requires the attainment of well-balanced growth on various levels in the region. This process occurs with due emphasis on the optimal application of the available resources and the equitable distribution of returns on development among the various sections of a region's populace. As part of this process, the industrial sector assumes a crucial role with the view of fostering the development of the region through the enhancement of productivity, job creation, and the development of technology

The concept of regional development and its dimensions

Regional development can be described as "a process of targeted structural change aimed at raising the standard of living of the population of a given region and achieving optimal utilization of its available resources" (Al-Shadidi, 2008, p. 15). regional development comprises various characteristics; these include:

1. The economics side consists of raising the standard of real per capita income, diversifying the region's economics base, improving productivity, and job creation.
2. Social aspects: The purpose of this criterion is the enhancement of the educational, health, and cultural services sector's performance levels as well as the attainment of social justice and the empowering of women and the youth.
3. Environmental dimension: This involves the protection of the environment and natural resources; sustainability and development; and reduction of pollution.

The role of the industrial sector in regional development

The industrial sector is the major catalyst of development of the economies of various countries because of its distinct properties; these are:

- a) Job creation: Industrial projects result in the creation of job opportunities both directly and indirectly. This reduces the rate of unemployment and improves the standard of living of the populace.
- b) Added Value Enhance: The industry adds value to natural resources; this results in an increase in the country's income and the efficiency of the economy.

- c) Other sector development: The industrial sector interlinks with other sectors of the economy like the agricultural sector and services sector, thereby developing these sectors.
- d) Technological development : Industry supports the transfer of modern technology and its localization and the development of technical and management expertise. This improves the capacity for innovation and development.

Many researchers have highlighted the significance of the industry sector in the pursuance of regional development. For instance, in the study on the significance of the industry sector in the regional development of Saudi Arabia, Mushaq (2010) discussed that the industry sector promotes equality of development across the region and brings about equality of development between the region and other regions. Omar (2016) discussed that the establishment of industrial projects within poor regions facilitates the pursuance of sustainable industrial development.

Requirements with respect to the development

of industry at the To make the region's industrial development successful, certain requirements need to be fulfilled, which include the following:

Infrastructure: This may include road and transport infrastructure, energy and water resources, telecommunication infrastructure, and industrial zones with the required equipment.

- a) Human capital: This comprises a trained and skilled workforce as well as qualified technical and administrative staff.
- b) Financing : This involves the supply of funds that will enable the establishment of industrial projects. This can involve loans or direct investments.
- c) Government Policies: This comprises taxation policies, customs policies, laws governing investments, and official procedures regarding the setting up of industrial schemes.

Chapter 2: The reality of development potential in the district of Mahawil

Brief history of the Mahawil district

The Mahawil district is one of the areas with deep historical roots, as it was part of the Babylonian Empire. Its name is associated with "the land of blackness" due to the fertility of its soil. It witnessed agricultural prosperity during the Abbasid era thanks to the revival of the Nile River and the emergence of new villages. It has been known by various names, including "Al-Mahawil" and "Al-Nileen." Some researchers attribute its name to the abundance of crops or the skill of its inhabitants in trade (Darwish, 1993, p. 48).

Characteristics of the geographical location

The geographical location is one of the main factors that give the region its distinctive characteristics, which affect the economic and social life of its inhabitants. The district of Mahawil is located in the province of Babil between latitudes 44–45 east and 32–33 north within the central latitudes, which gives it high solar radiation most days of the year. The district extends 46 km long and 62 km wide, bordered by a number of neighboring districts and counties. It is about 20 km from Hilla and 80 km from Baghdad, and is connected by a vital road network and railway (see Map 1). Its location near Shatt al-Hilla and the general estuary enhances its economic and agricultural importance. It is also an important passageway for visitors to the holy shrines (Jawad, 2018, p. 96).

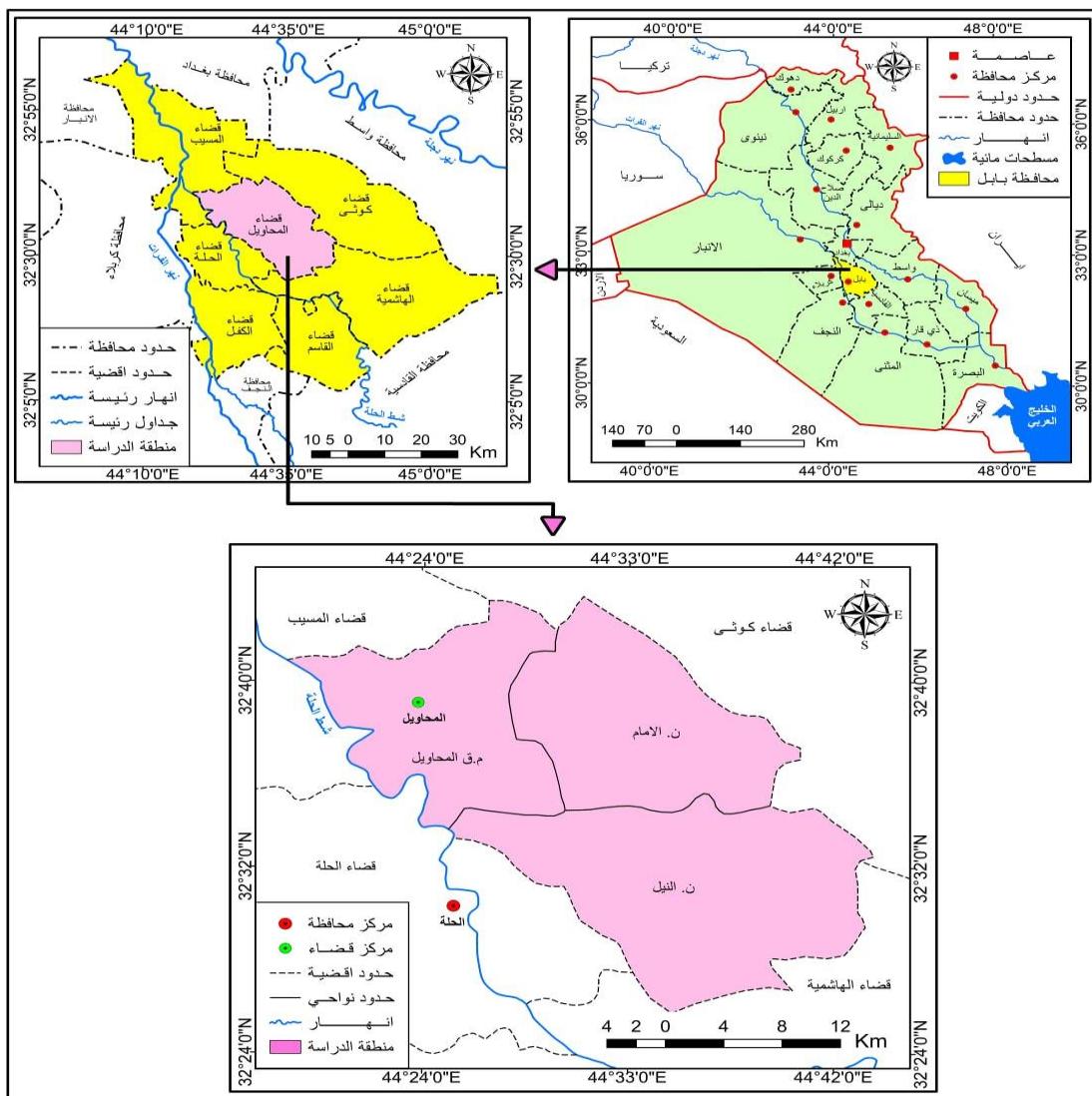
Table (1) Areas and percentages of administrative units in the district of Mahawil for the year 2023

Administrative units	Area (km ²)	Percentage(%)
Al-Mahawil Judicial Center	286.171	29.6
Imam District	223.494	23.1
Nile District	456.236	47.3
Total	965.901	100
Total for the province	5308.542	
Percentage of judiciary to province		18.2

Source: Ministry of Planning, Central Statistics Organization, Areas of Districts and Subdistricts of Babil Province 2023.

The district of Mahawil occupies 18.2% of the area of Babil Governorate, with the subdistrict of Al-Nil Al-Akbar accounting for 47.3% of its total area, followed by the district center and then the subdistrict of Al-Imam, reflecting a notable disparity in internal spatial distribution.

Map (1) Geographical location of the Mahawil district of Iraq and the province of Babil.



Source: Ministry of Water Resources, General Authority for Surveying, Administrative Map of Babil Province, scale 1:1,000,000

Natural potential of the study area

Geological structure

The study of geological structure is essential for understanding the nature of rocks, soil, groundwater, and natural resources in the study area (Ali, 2011, p. 26). During the Quaternary period, Iraq experienced tectonic movements that contributed to the formation of the modern sedimentary plain in which the area is located (Al-Khalaf, 1959, p. 41). Sediments in the area vary into two main types:

- River sediments: These include clay, sand, and gypsum sediments resulting from the ancient Euphrates River, in addition to lowland sediments consisting of a mixture of clay, sand, and salt crusts (Encyclopedia of Hilla Civilization, 2012, p. 27).
- Aeolian sediments: These are concentrated in the eastern regions and consist of sand and silty materials carried by the wind, dating back to the Holocene period (Ali, 2011, p. 26).

Surface

This area is within the sedimentary plain, its surface being flat with a gentle slope that goes to the south. The slope of this area does not exceed 16 cm per kilometer. The elevation runs from 30 meters in the northern part of the area to 22 meters in the south with slopes running from the north and west to the east, contributing to better drainage of water within the lines of the river channels and agricultural channels. The general surface of the region is flat, but the level rises relatively when nearing the Shatt al-Hilla compared to places farther away, although there are some minor undulations not exceeding two meters per 100 meters (Hilla 1961, p.6).

Soil

Soil is the basic input in agriculture; its characteristics determine the appropriateness of land for cultivation and crop type, as well as the method of irrigation. This is in agreement with what has been reported by Al-Bahiri, 2006, p. 280; Shlesh, 1985, p. 13. Mahawil district soil belongs to the sedimentary plain and is composed of river deposits. It has a flat surface with smooth texture, while it has a relatively rough texture along watercourses. This is according to Karboul, 1976, p. 120.

Soil types in the study area:

A. Riverbank soil: It is found along the terraces of ancient irrigation canals and rivers. It consists of light textured soil, either sandy or clayey, containing organic matter with a low salinity and shallow depth of groundwater. It is a fertile soil with good permeability, and it can be used for vegetable cultivation, fruit trees, and palm trees (Al-Nusrawi, 2019, p. 62; Al-Asadi, 1996, p. 198). b. River basin soils: These are found between river shoulders and depressions. These soils are soft in texture, with a high percentage of clay, low drainage, and saline groundwater. Land use is for salt-tolerant crops of barley and corn; in some areas, vegetables are cultivated with soil improvement treatments (Al-Abadi, 1981, p. 36).

Water resources

- a) Surface water: Surface water is represented by rivers and streams, which constitute the main source of life in the study area, as is the case in most areas of Iraq. Map 4 shows that the River Euphrates passes through the northwestern part of the area outside the administrative boundaries of the study district. Its course is higher than the level of land to its east, and this difference in level has been utilized in digging a number of streams to carry water eastward, including the Al-Musayib Al-Kabeer project. It is noticed that south of the city of Al-Musayib, it bifurcates into two main branches: Shat Al-Hindiya and Shat Al-Hilla.
- b) Groundwater: In the study area, the utilization of groundwater is determined by its quantity, quality, and depth. The depth of groundwater varies from 3-4 meters in high areas in river regions and may even reach the surface of the earth in swampy regions (Karbala, 1967, p. 47). Its level varies according to seasons, with it rising during winter and falling during summer. Groundwater is saline, with a high salt content ranging from 500 to 50,000 parts per million, equivalent to 0.75-80 mm/cm, and its salinity increases with depth, making it unsuitable for

Human Potential of the Region

Population

The study of population aims to understand the relationship between population size, geographical distribution, and settlement patterns, as well as to explain the reasons for this distribution and its impact on land use. Population data for the Mahawil district indicate continuous growth in population between 1977 and 2023, with the number rising from around 99,000 in 1977 to more than 402,000 according to 2023 estimates. Growth rates peaked during the period 1987-2009, then began to decline gradually, reaching 2.1% in the most recent period, reflecting a relative improvement in economic and demographic conditions. Despite variations in growth over the decades, according to recent estimates and after excluding the project population, the population of Al-Mahawil was approximately 251,686. Previous growth rates show that the district has experienced a period of natural growth, reaching high levels in some periods as a result of multiple factors, making the area an environment conducive to growth and population attraction if the appropriate economic, social, urban, and environmental conditions are in place.

Table (2) Population of the Mahawil district for the years(2023-2009-1997-1987-1977)

Growth rates in the province	Growth rates in the district	Percentage of judiciary to province(%)	Population (inhabitants) Province	Population (inhabitants) District	years
---	---	16.8	592016	99747	1977
6.4	3.7	13	1102574	143610	1987
0.69	2.4	15.4	1181745	182069	1997
3.20	4.2	14	1729666	299578	2009
2.2	2.1	17	2346696	402400	2023

source: Researcher based on data from the Central Agency for Public Mobilization and Statistics, estimates for 2023.

Population density

Population density is an important indicator for measuring the spatial distribution of the population, both in terms of the total population and in terms of urban and rural environments. This data is mainly used in urban planning, where it helps determine the carrying capacity of different areas for spatial development purposes. The population density indicator also makes it possible to assess the need to expand residential areas in cities and villages and to understand the main trends in population concentration. Table 3 shows the variation in population densities within the district of Mahawil, where the district center recorded the highest population density (483.522 inhabitants/km²), due to its small area and high population. It is followed by the Nile district with a density of 152,681 inhabitants per km², then the Imam district with a density of 195,533 inhabitants per km². The overall average population density in the district was 277,245 inhabitants per km².

Table (3) Population and population density of the Mahawil district in 2023

Administrative unit	Area (km ²)	Population (inhabitants)	Percentage of the province(%)	Population density (persons/km ²)
Judicial Center	286.171	138370	5.8	483.522
Imam District	223.494	43657	1.8	195.533
Nile District	456.236	69659	2.9	152.681
Total	965.901	251686	10.6	277.245

Source: Researcher's work, based on data from the Central Bureau of Statistics, estimates for 2023..

Economic indicators

a) Economically active population

Table 4 shows the number of economically active people by age group (15-65 years) and by administrative district, with an overall average of 55.41% across all administrative districts

Table (4) Number of economically active persons in the district of Mahawil and its affiliated units for the year 2023

Administrative unit	Number of economically active persons in the 15-65 age group
Judicial Center	76670
Imam District	24190
Nile District	38598

Source: Researcher based on table data (population and age groups).

The number of active persons was calculated by multiplying the population of each administrative unit by (55.41%), which is the percentage of active persons in the governorate as a whole. This method was used because no statistics were available at the district level (Central Statistics Organization).

b) Unemployment rate for age groups 15 years and above:

Table (5) shows the unemployment rates in Iraq and Babil province, where the unemployment rate in Babil province (5.5%) was part of the total unemployment rate in Iraq. (%16.5)

Table (5) Unemployment rates in Babil Governorate for 2021

Administrative unit	Unemployment rate
babil	5.5
iraq	16.5

Source: Regional and Local Development Department, Iraq Labor Force Survey 2021.

* No data available for unemployment rates at the administrative unit level.

c) Poverty rate:

The poverty rate in Iraq was 20% of the total population, while in Babil province it was 15%.

Table (6) Poverty rate in Babil province 2021

Administrative unit	Poverty rate:
babil	15
iraq	20

Source: Central Bureau of Statistics, Poverty Survey and Assessment in Iraq 2021.

d) Employment Index:

Based on the data in Table 7, it is clear that the employment index for age groups (15 years and above) varies according to sector and place of work. The percentage of workers in the government sector at the level of all administrative units reached 38.8%, with the judiciary recording the highest percentage at 51.3%, followed by the Nile district at 37.5% and the Imam district at 27.6%. The private sector accounted for the largest share of the workforce in the judiciary, with a total of 60.1%, with the Imam district leading the way at 72.2%, followed by the Nile district at 62.0%, and then the judiciary center at 46.1%. Other sectors accounted for the smallest share, at 1.13%. From this, it can be concluded that the private sector is the main employer in the study area. With regard to the workplace indicator, it was found that 42.4% of the total workforce in the judiciary work within the area, with the Imam district leading with 50.4%, followed by the Nile district with 41.3%. As for those working outside the region, they accounted for 56.7% of the total judiciary, with the judiciary center recording the highest percentage at 64%, followed by the Nile district at 58.7%, and finally the Imam district at 47.6%, which is an important indicator for measuring the strength of economic activities within the region

Table (7) Indicator of workers by place of work and sector aged 15 years and over in rural areas.

Administrative unit	Number of employees	Government sector(%)	Private sector (%)	Other sectors (%)	Within the village (%)	Outside the village (%)
Judicial Center	7687	51.3	6908	46.1	390	2.6
Imam District	1477	27.6	3864	72.2	9	0.2
Nile District	3516	37.5	5818	62.0	52	0.6
Total	12680	38.8	16590	60.1	451	1.13

Source: Ministry of Planning, Babil Planning Directorate, Babil Rural Development Survey Data 2017.

Human Settlements

The Mahawil district consists of three urban administrative units, in addition to rural settlements that make up the largest area and have the largest population, due to the agricultural nature of the region.

Urban settlements

The center of the Mahawil district ranks first in terms of the largest urban agglomeration, followed by the center of the Imam subdistrict, then the center of the Nile subdistrict in third place in terms of urban population, as shown in Table 8.

Table (8) Spatial distribution of urban settlements by population and residential neighborhoods.

Administrative unit	Number of neighborhoods and shops	Population
Judicial Center	12	35398
Imam District	9	14730
Nile District	6	7917
Total	27	58046

Source: Ministry of Planning, Central Agency for Public Mobilization and Statistics, unpublished data, 2022.

Rural settlements:

Rural settlements in the Mahawil district occupy the largest area and have the highest population density. Their distribution varies between administrative units depending on natural and human factors. In the center of the district, settlements follow a linear pattern along river corridors and major transportation routes such as the international highway and the Baghdad-Basra road and railway. In the Imam subdistrict, they are scattered randomly, with the exception of a few linear clusters along a watercourse west of the subdistrict. In the Nile district, the linear pattern prevails along the river channels, which is common in agricultural environments.

Table (9) Spatial distribution of rural settlements by population, counties, and villages.

Administrative unit	Number of villages	Number of provinces	Male population (%)	Population Female (%)	Population
Judicial Center	19	35	46370	52	43244
Imam District	9	23	12873	51	12301
Nile District	12	40	27278	51	26455
Total	40	98	86521	51.3	82000

Source: Ministry of Planning, Babil Planning Directorate, Babil Rural Development Survey Data 2017.

Tourism potential and attractions in the district of Mahawil

Tourism in the district of Mahawil in the province of Babil is characterized by its diversity, with 178 archaeological sites, most notably religious sites concentrated in the Imam area with three shrines and mausoleums for visitors. Recreational tourism also includes parks, restaurants, malls, and small hotels, as well as rivers and orchards that offer opportunities for tourist activities.

Table (10) Spatial distribution of religious shrines and monuments in the district of Mahawil for the year 2023

Administrative unit	Shrines and holy sites	Number of archaeological sites
Judicial Center	0	51
Imam District	0	25
Nile District	3	102

Total	3	178
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Source: Tourism Department, Babil Province, 2023.

Infrastructure and Municipal Services

Road Network

Transportation is a key element in the infrastructure for successful economic and social activities, as it connects them and affects their effectiveness. With the increase in population and vehicles and the acceleration of life, the movement of people and goods has become a vital necessity, prompting countries to develop transportation systems using modern technologies (Al-Ferjani, 2010, p. 8).

The study area has a network of land transportation that includes roads and railways. The total length of roads in the Mahawil district is approximately 2,846.73 km, of which approximately 444.46 km are paved. As for railways, they pass through the district center and parts of the Nile area with a length of 22 km.

Table (11) Lengths of main and secondary roads in the district of Mahawil 2022

road	type	Length / km
Highway (Baghdad - Hilla)	Main road	83
Al-Mahawil Road - Al-Saddah	Secondary road	12
Al-Mahawil Road - Imam District	Secondary road	10
Al-Mahawil Road - Al-Jawadin District - Al-Shuhada District	Secondary road	1
Al-Mahawil Road - Al-Mashatil District	Secondary road	1

Source: Ministry of Housing, Babil Roads and Bridges Directorate.

Rural roads in the district and administrative units

Rural areas in the district are connected by an extensive road network, with the district center having the largest number of roads, with 43 roads covering a total length of 149.960 km, followed by the Nile subdistrict with 26 roads covering a total length of 97.800 km, and then the Imam subdistrict with 24 roads covering a total length of 60.975 km. These roads reflect the extent and spread of rural areas in different regions.

Table (12) Number and lengths of rural roads in the district and affiliated units 2022

Administrative unit	Number of rural roads	Length of rural roads / km
Judicial Center	43	148.960
Imam District	24	60.975
Nile District	26	97.800

Source: Ministry of Housing, Babil Roads and Bridges Directorate.

Railways

A strategic railway line runs through the district of Mahawil, starting in Baghdad and ending in Basra, passing through the province of Babil and the district of Mahawil for a length of 12 km, in addition to 8 km in the Nile subdistrict. The area has one station in the district center. This line is important both now and in the future when planning for development.

Table (13) Spatial distribution of railway lines in the district of Mahawil and administrative units.

Administrative unit	Length (km)	Number of stations
Judicial Center	12	1
Imam District	0	0
Nile District	8	0
Total	22	1

Source: Structural Plan for Babil Province, Phase 2 Report, 2011, p. 178.

Conclusions

1. The Mahawil district is characterized by promising natural and human resources, qualifying it to be a center for industrial development, yet these are not being utilized to their full potential.
2. Industrial projects have also made significant contributions to sustainable regional development through job creation, income increase, and stimulation of other economic industries.
3. The industrial sector in Mahawil has a series of problems and obstacles that affect its development, notably weak infrastructure, a shortage of qualified staff, and the difficulty of obtaining financing.
4. With urgency, the need arises to formulate a comprehensive development strategy that aims at localizing industrial projects in the district while keeping in view the principles of sustainable development.
5. Most of the Mahawil district depends on the private sector for job opportunities; this means that supporting this sector and providing an appropriate environment for its growth is very important.

Proposals

1. Infrastructure development: The government and local authorities should invest in the development of infrastructure for industrial projects such as roads, electricity and water networks, and equipped industrial zones.
2. Human resource development: It is necessary to focus on vocational training and qualification programs in conjunction with educational and training institutions in order for the young people to acquire adequate skills that will be required in the industrial sector.
3. Access to Finance: The banks and financial institutions provide soft loans and investment incentives necessary to develop small and medium-sized industrial projects in order to encourage entrepreneurs to invest in this sector.
4. Elaborate on a regional industrial strategy: There is a need for a clear strategy for developing the industrial sector in the Mahawil district, through which priorities would be established and high value-added industries targeted, also considering environmental aspects.
5. Enhancing public-private partnership: Public-private partnership in the implementation of industrial projects and the exchange of experience and knowledge should be encouraged to maximize the available potential.
6. Utilization of local resources: Emphasis should be given to the industries dependent on the availability of resources in the district, like agro-based and food industries, aiming at higher value addition while reducing import dependence.

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