Dirasat: Human and Social Sciences, Volume **50**, No. 6, Special Issue 1, 2023

Deanship of Scientific Research

Sustainable Planning for Investing in Natural Resources in the Jazeera Region in Al-Anbar Governorate

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Received: 13/3/2023
Revised: 27/7/2023
Accepted: 21/11/2023
Published: 30/12/2023

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Citation: Mutar, Z. F., & Ramel , K. A. (2023). Sustainable Planning for Investing in Natural Resources in the Jazeera Region in Al-Anbar Governorate. *Dirasat: Human and Social Sciences*, *50*(6), 185–201. https://doi.org/10.35516/hum.v50i6.7051

Abstract

Objectives: This study aims to explore and identify the natural resources existing in the Jazeera region in the Anbar Governorate and analyze their spatial distribution. In that region, there are numerous natural resources, including renewable energy, raw materials, water, and biodiversity, all of which play a crucial role in achieving economic growth. The study also aims to determine how the distribution of natural resources affects the nature of development investments and show the impact of that distribution on identifying feasible development investments, so that sustainable development can be achieved in the region.

Methods: The study adopts an inductive approach to collect and analyze information accurately and comprehensively. As a result, data were gathered from multiple sources, such as previous studies and research, government reports, field surveys, and a comprehensive review of the existing resources. Quantitative methods were used to analyze the data to ensure the accuracy and objectivity of the results. ArcGIS software was utilized for visual analysis, satellite imagery interpretation, mapping, and data visualization.

Results: It has been found that the studied area possesses immense and diverse natural resources that form an important basis for achieving strong economic development. These resources can be sustainably exploited to support local development, enhance investment opportunities, and promote economic growth in the region.

Conclusions: The economic feasibility of each natural resource should be determined, especially in the field of alternative energy source investments, and the focus should be on adopting sustainable planning for strategic investments in any natural resource, especially in agricultural production.

Keywords: natural resources, sustainable development, development planning.

التخطيط المستدام لاستثمار الموارد الطبيعية في منطقة الجزيرة بمحافظة الأنبار

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قسم الجغرافية، كلية الآداب، جامعة الأنبار، الأنبار، العراق

ملخّص

الأهداف: تهدف الدراسة إلى استكشاف وتحديد الموارد الطبيعية المتوفرة في منطقة الجزيرة بمحافظة الأنبار وتحليل توزيعها المكاني وصياغة استراتيجيات معززة بخطط وأهداف تنموية لأنماط الموارد الطبيعية وآفاقها المستقبلية. تتركز في منطقة الدراسة مصادر متنوعة من الطاقة المتجددة والمواد الخام والمياه والتنوع البيئي وهذا يلعب دورا مميزا في استقطاب وتوفير مؤهلات التنمية الاقتصادية. كما وتوضح الدراسة أيضا كيفية تأثير وتوزيع الموارد الطبيعية على تحديد طبيعة الاستثمارات التنموية وفهم العلاقة بينهما لتحقيق التنمية المستدامة.

المنهجية: اعتمد البحث في تحقيق أهدافه المنهج الاستقرائي من أجل الوصول الى الحلول الصحيحة لمعالجة المشكلات التي يدور حولها البحث، وجرى الحصول على النتائج بما وظف فيه من أساليب كمية وتقنيات مختلفة تعتمد على مؤشرات ومستويات التخطيط المستدام بصورة صحيحة ودقيقة بغية تحقيق التنمية المكانية في منطقة الدراسة.

النتائج: تشير معطيات الدراسة الى تقييم شامل لاهم الموارد الطبيعية التي تسهم في الاستثمار وتحقيق التنمية المكانية؛ إذ إنّ الامتداد المساحي للمنطقة وموقعها الجغرافي المهم جعل منها تنوع مناخي- طوبوغرافي ساعد على استلام المنطقة كمية من الأمطار لأكثر من 2 مليار م3 سنويا وخزين من المياه الجوفية يقدر بـ(15) مليار م3، مع تركز إشعاع شمسي يصل بمعدل سنوي (435.3) سعرة/ سم^2 يمكن استخدام كل ذلك في تعزيز فرص الاستثمار والنمو الاقتصادي.

الخلاصة: الامتداد المساحي للمنطقة البالغة (13714) كم^2 وتنوع مواردها الطبيعية من المياه والترب الصالحة للزراعة التي تقدر بـ (118315) دونم مستغلة بمحاصيل مختلفة اهمها المحاصيل الستراتيجية، وغيرها من الموارد يمكن أن يرفع من المستوى الاقتصادي المتدني للمنطقة المدروسة.

الكلمات الدالة: الموارد الطبيعية، التنمية المستدامة، التخطيط التنموي.

Introduction:

The sustainable development of natural resources relies in planning and exploitation technique of these resources and it is an inseparable relation that can't be disconnected, because the spatial development depends on a collection of ingredients and one of them is the natural resources. No matter how the definition of the sustainable development differs, the natural resources remain the milestone, and it is impossible to plan any development project without depending on them. The usage of the natural resources has been highly increasing after the industrial revolution, and that led to racing and putting high pressure on them, in order to elevate the economic reality and fulfill the population's desires after the rising of the living standards and the growing population. And the high demand on water, soil and the vegetation in some areas in a way that's higher than its storage and renewal capability, and that made a gap between these balances and their manufacture expansion, so the problem of draining of those resources is looming in the horizon after the excessing of using them and destructing a lot of them directly and indirectly. The studied area is one of those areas that suffers from bad management and excessing of using its resources which reflected on soil salinity in enormous parts of it, lack of natural plants and spreading the phenomena of quicksand.

- **The issue of the research:** how much are the natural resources contributing in the fulfillment of spatial development in Al-Jazeera area in Al-Anbar governorate which is still substandard?
- What are the sufficient capabilities to invest in alternative energy which might rise up with the area's development reality?
- **Research hypothesis:** Al-Jazera area within Anbar Governorate represents a geographical region with untapped developmental potential in terms of natural resources, namely rainfall and renewable energy sources (solar energy, wind energy). These climatic factors can be harnessed through sustainable planning to enhance spatial development levels by promoting economic activities and ensuring the preservation and management of resources.
- **The purpose of the research:** The objective of the research is to identify the most important available natural resources in the Al-Jazera area and their spatial distribution. This will help determine the nature of developmental investment opportunities and develop comprehensive plans and strategies for their preservation and sustainability.
- **The spatial limit of this research:** the studied area is located in the western part of Iraq, and in the northern part of Al-Anbar governorate, and astronomically located between latitude (33 11 – 35 06) north, and between longitude (7 – 41) east, and geographically Nainawa and Salah Al-Deen governorates is on the north and the northeast, Euphrates River is on the south, Syrian borders are on the west and the sedimentary plain is on the east and southeast, administratively it is located in Al-Anbar governorate which includes all of Rawa district and some villages and townships that are located in Al-Jazera region for Al-Qaiem district, Al-Haditha, Heet, Al-Ramadey and Al-Faloja. Map (1)
- **Research Methodology:** The research utilized an inductive approach to gather and analyze information, leading to accurate results. Quantitative methods were also employed for analysis. The Arc GIS software was used to analyze visual and satellite imagery, draw maps, and illustrate important data relevant to the research.
- **The structural of the research:** in order to reach accurate detailed results, this research included discussing and analyzing these listed major axis:

1. The first axis: the natural features of natural resources in Al-Jazera area in Al-Anbar governorate.
2. The second axis: planning requirements for management of the natural resources.
3. The third axis: sustainable development indicators for natural resources.

Previous Studies:

1. "Mineral Resources and their Investment in the Western Desert of Iraq" by Abd Saleh Fayyad, Desert Studies Center, Anbar University, 2009.

2. "Natural Resources in Abu Al-Jeer Village: Investment and Future Prospects" by Khalid Akbar Abdullah and Qasim Ahmed Raml, Journal of Anbar University for Humanities Sciences, Special Issue for the First Scientific Conference of Humanities Colleges, 2011.

3. "The Future Demand for Water Resources in Iraq and the Levant" by Sawsan Subhi Hamdan, Journal of the College of Education, Al-Mustansiriya University, Issue 6, 2005.

4. "The Geographic Reality of Development Centers and Proposed Spatial Trends in the Western Desert of Iraq" by Hassan Mahmoud Ali Al-Hadithi, Journal of the Iraqi Geographical Society, Issue 28, 1995.

5. "Geographic Analysis of Natural Resources and their Investment Potential in Anbar Province" by Mohammed Kareem Ibrahim Farhan Al-Dulaimi, Unpublished PhD Thesis, College of Education for Humanities Sciences, Anbar University, 2013

The first axis: the natural features of natural resources in Al-Jazera area in Al-Anbar governorate.

Planning and investment of natural resources in any area depends on the natural features prevailing in it, therefore this axis included discussing and analyzing the natural features and the nature of the natural resources and the connection between them through their quantity, type and their spatial distribution in Al-Jazera area in Al-Anbar governorate as the following:

First: climatic elements:

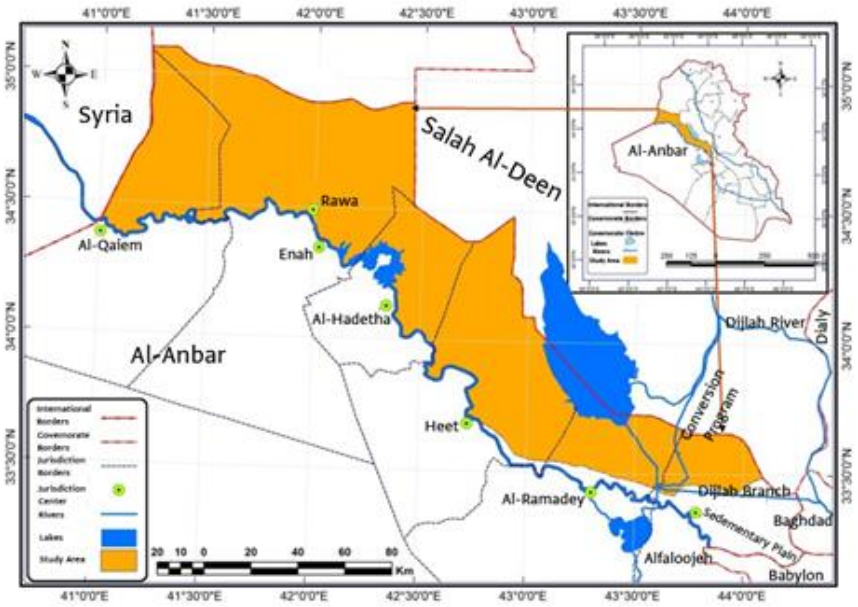
The climatic elements are considered an important natural resource at present, through their contribution in providing water resources and creating life methods for plant resources on one hand, and their role as renewable energy source on the other hand. Rain, temperature, solar radiation and wind are the most important climatic elements that effect on defining the importance of developing the resources which exists in the area.

The solar radiation is considered the main source for energy in the atmosphere, and this energy is responsible for all weather phenomena. The solar radiation is electromagnetic waves that move between two bodies even if there is not materials between them, and it goes at the speed of light (300) thousands kilometer per second (Dix 1981) or it is the amount of emitted energy from the sun outgoing in different directions represented by light and thermal energy (Karbal 1986). Or it is a set of etheric radiation from the sun (Al-Rawi 1990).

The solar irradiance is considered the main source of energy in the atmosphere; it contributes in more than 99.97% of the transferred energy in the atmosphere and on the earth's surface (Trewartha 1968).

And it is responsible of all the operations that happen in the atmosphere like the atmospheric disturbance, clouds, lightning and thunder and many others (Stringer 1972), whereas the lowest rate of solar irradiance reached 428.3 w/cm2/day in Enah station, while the rate reached 445 w/cm2/day in Al-Ramadey station. Table (1).

And also the temperature rates is rising gradually the further we go to north and northwest towards south and northeast, and alongside with rising from sea levels which takes the same direction, as the lowest average annual temperature in Al-Qaiem station reached 20.5 Co, and the highest in Al-Ramadey station reached 22.2 Co. Table (2).



Map (1): The location of the studied area in Iraq and Al-Anbar governorate

Source:

1. Ministry of irrigation, General authority of survey, Iraq's administrative map, scale 1: 1000000, in the 2000.
2. Ministry of irrigation, General authority of survey, Iraq's administrative map, scales 1: 1000000, in the 2020.

Table (1): climatic rates for solar irradiation (watt/cm^2/day) for (Al-Qaiem, Enah, Al-Haditha and Al-Ramadey) stations, between the years (1990 – 2019)

Station	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Rate
Al-Qaiem	224,8	307,2	410,7	495,1	555,3	631,7	621,2	601,8	500,3	357,4	266,4	217,3	432,4
Enah	221,4	303,9	407,2	489,6	549,4	628,1	620,3	597,1	495,1	353,2	262,1	212,5	428,3
Al-Haditha	226,7	311,2	413,2	499,1	557,7	632,9	623,7	603,5	502,6	359,6	269,2	222,6	435,1
Al-Ramadey	232,1	332,3	418,3	509,1	575,1	644,2	636,3	609,3	509,7	367,4	277,4	229,4	445

Source: ministry of transportation, meteorological organization and seismology, the department of climate (unpublished statement), between the years (1990 – 2019).

Table (2) temperature rates (C^o) for (Al-Qaiem, Enah, Al-Haditha and Al-Ramadey) stations, between the years (1990 – 2019).

Station	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Rate
Al-Qaiem	6.9	9.7	14.5	20	25.2	30	32.4	32.2	28.5	23.2	14.7	9.2	20.5
Enah	7.3	10	14.8	20.7	26.4	30.5	33.2	32.4	29	22.6	14.4	9.1	20.9
Al-Haditha	7.5	10.4	14.8	21.1	27	31.2	33.6	33.3	29.5	22.9	14.7	9.4	21.3
Al-Ramadey	9.5	11.6	15.5	21.8	27.3	31.5	34	33.6	29.9	24	16.5	11.3	22.2

Source: ministry of transportation, meteorological organization and seismology, the department of climate (unpublished statement), between the years (1990 – 2019).

Rain in the studied area is known to be sparse, unstable and has lack of contrast between two different system, for it starts to rain in October the date of low pressure area, and continues raining until it reaches its climax during the winter months, then it starts decreasing gradually until it is finished at the end of April and the beginning of March, alongside with the receding of low pressure system. Meanwhile summer is dry Table (3).

Table (3) the monthly amount of rain and annual total (mm), for (Al-Qaiem, Enah, Al-Haditha and Al-Ramadey) stations, between the years (1990 – 2019).

Station	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
Al-Qaiem	24.5	21.5	26	18	5.5	0	0	0	0.2	9	13	22	139.7
Enah	23.7	22	25.3	12.4	7.1	0	0	0	0.9	12.5	19	21	143.9
Al-Haditha	19.5	28.5	21	16	5	0	0	0	0.3	6.5	22.6	23.2	142.6
Al-Ramadey	18.3	18.8	13.2	12	4.6	0	0	0	0.2	8.4	14.5	17	107

Source: ministry of transportation, meteorological organization and seismology, the department of climate (unpublished statement), between the years (1990 – 2019).

As for the annual and monthly ratings for the wind speed in Al-Jazera area in Al-Anbar governorate is distinguished by its contrast, for the annual rate of wind speed ranges between 305 m/sec in Al-Haditha station and 205 m/sec in Al-Ramadey station, Table (4).

In general, the mentioned climatic data does not compose any challenge facing the advancement levels of spatial development in the studied area, and can depend on the data of wind and solar energy in the field of producing electrical energy that is considered an important developmental anchor. However, the process of investing these alternative resources in the field of producing electrical energy is still facing challenges on the scale of the studied area and on most of the countries of the world on different levels such as the following:

1. Technical skill (technology): The renewable energy resource needs high skills in order to deal with it and benefits of its economic value. And that needs providing trained research and scientific groups with full equipment to understand the needs of investing and producing them.
2. The high cost of creating and setting up the projects for the renewable energy resources.
3. The changing of the case temporally and spatially, especially the ones that depend on climatic circumstances because of the instability of their resources like the solar irradiation and the wind speed and others.
4. The difficulty in dealing with them after production like moving and storing them because it is located far from the processing centers.
5. The dropping demand on production especially that most of their applications specialized in electrical and light energy, whereas it is used less in other fields.
6. Monopolistic politics of capitalist countries.

Table (4) the monthly rates of wind speed (m/sec) for (Al-Qaiem, Enah, Al-Haditha and Al-Ramadey) stations, between the years (1990 – 2019)

Station	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Rate
Al-Qaiem	2	2.4	2.6	2.9	3	3.5	3.8	3.3	2.4	2	1.9	1.7	2.6
Enah	2.3	2.9	3.4	3.5	3.8	4.9	5.5	4.6	3	2.5	2.1	1.9	3.4
Al-Haditha	2.4	3	3	3.7	3.9	5.1	5.5	5	3.4	2.6	2.4	2	3.5
Al-Ramadey	2	2.2	2.9	2.5	2.8	3	3.8	2.7	2.3	1.7	1.8	1.8	2.5

Source: ministry of transportation, meteorological organization and seismology, the department of climate (unpublished statement), between the years (1990 – 2019).

Second: Soil:

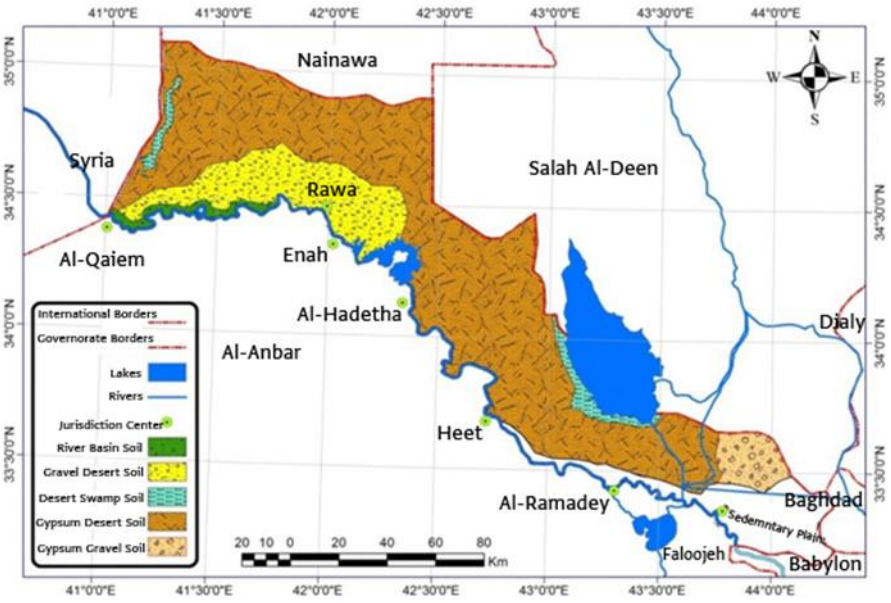
Soil has been represented as the most important natural resource for humans, because it is the first and the last resource to provide food resources for them. Therefore, studying its types and features is important. There are basic qualities that have an effect on the features of the soil; the most important one is soil texture and structure, as well as the organic materials. That's why soil susceptibility for preserving water and food materials differs by the size of the soil grains (Al-Mosuli 2014). Soil

with high permeability which stores groundwater under it helps with flowing the water for a long period of time and can happen year round, if this water was utilized in the right and regular way (Al-Jubory 2018).

Types of soil can be identified in the studied area by its features, deposition environment and availability as the following (Buringh 1960). Map (2).

1. Gypsum desert soil:

\This soil covers large parts on the area; it extends from the Syrian borders from the west to the administrative borders of Salah Al-Deen governorate from the east and from Euphrates River from the south to borders of Nainwa governorate from the north, except the area between Brawna and Al-Obour region which contain mixed gravel soil. Its major layers consist of gypsum, lime and sand which format Al-Fateha and Enjanah, whereas the proportion of gypsum in it ranges between (0.3 – 50%) (Ministry of planning 1975), this soil also characterizes by its low thickness which is lower than 105 meter, and it was formed in the results of rocks fragmentation which were affected by water and wind erosion factors ([Habib Allah 2014]). And because of the dry climate that is reflected to lacking of natural plants caused by rainfall decrease and that led to lacking of the organic material in this soil type, but its permeability is defined by the quantity of the hard sand grains in it, as the minimum reaches (10 mm/h) (24cm/day) (Deli 1975).



Map (2) types of soils in the studied area

Source: Buringh, Soils and Soil Conditions in Iraq Ministry of Agriculture, Baghdad: 1960, Map of Iraq, Scale 1:1000000

2. Gravel desert soil:

This type of soil runs through the southwest of the studied area, Euphrates River is on the south and Syria is on the west, and the deserted gypsum soil is on the north and east, (map 9). The deserted gravel soil main ingredients are sand and gravel which have high permeability due to its large grains and the lack of the organic materials which are less than (1%) (Al-Hasnawi 2014).

3. The soil of river basin:

This soil spreads from the Syrian borders and as a narrow path beside the Euphrates River to the north of Rawa region, then this type of soil vanishes, because of the rising of Al-Jazera hill which ends on the river's borders. This soil is composed from sand, mud and mixed ingredients known by its novelty of its composition, enormous depth and high validity for agricultural investment. The high floods had a big role in the existence of sandy gravel layers in the sandy terraces.

4. Gypsum gravel soil:

The gypsum gravel soil is found limited areas as shown in the map number 9, as it can be found in the eastern corner besides the Salah Al-Deen borders, and it contains gravel and sand with a high level of gypsum that might reach 35% (Al-Mosuli 2014), this soil characterized by its high permeability, due to the nature of its ingredients, as these ingredients gets softer as going deeper due to water existence deep down in the earth.

5. Desert swamp soil:

The deserted swamp soil is concentrated in the lowlands that some seasonal valleys that has internal discharge, and this soil is highly noticed in these two areas, the first is located in the far west of the studied area alongside with the Syrian-Iraqi borders (Al-Bogars and Al-Tawela), and it is located in gypsum configurations, its soil formed due to declining of a group of valleys with the residue they contain, as well as there are dozens of natural springs with low flow between these highly salinity swamps, whereas the raising of the temperature led to increased evaporation from these swamps which increased the activation of the capillary property and raising of the underground water levels and throughout the time these salts were formed and kept alluvial clay layer underneath (Al-Jalybawey 2010).

And the other area is located on a line that surrounds Al-Tharthar Lake from the south and the west, and now it is immersed with water from the lake.

Third: natural plant:

The type of the natural plant life and its density in the studied area have been affected by the dry climatic conditions that is represented in the length of the dry duration that is more than 8 months, besides the lack of rainfall, discontinuity and irregularity of it, it might rain in short duration that's not more than a few minutes and in light rain showers. Besides the effect of rain on plants, there are other factors; the soil and the nature of the surface are the most important factors, that's why these plants adapted to these rough conditions which affected on their spreading in the area, except the periods of time after the rainfall in the rainy years, that's when the annual plants are widely existed and the perennial plants starts to grow. The herbaceous plants represent most of the studied area which can be divided into two types and they are:

1. Perennial plants: Those are plants that were able to resist the rough environmental conditions; those conditions are the length of the dry duration or the salinity and the raising temperature rates which led to raising evaporation rates. Those plant were able to adapt to these circumstances due to the leaves shapes which resembles pointed needles that reduce the evaporation and most of the times these leaves are covered with a waxy layer, some of these plants also have long stalks which helps to absorb humidity from the depth of the soil, some of the perennial plants stock water in the leaves stalks and its ground tubers (Walton 1976), two of the most important types are artemisia and haloxylon which are shrubs that exist in high numbers in the areas of sand dunes and gypsum sand soil, consecutive drought years and the continues random logging led to the lacking of these shrubs. Also there are other plants like calligonum, rhanterium, thistle, achillea millefolium and others, and those are important areas for grazing animals after the ending of the annual plants, and the most important herbs in the studied area are caber and nemesia which grow in the middle of valleys and low grounds.

2. Annual plants: these plants is known by their short life cycles, where it start growing immediately after raining and continue growing during winter and end at the end of April almost with the end of raining season. Those plants represent a high percentage of the plants in the area that reaches about 60% of all natural plants (Al-Khateeb 1978). That's why they are important resource for grazing animals that the owners of sheep go to during the raining season; they are also used in some medicine treatment. Diplotaxis, wheatgrass, filament, chamomile, gum plant and others are the most important plants in the area; they grow in high numbers inside valleys and undergrounds. The plant that is present the most in the studied area is diplotaxis.

The second axis: planning requirements for managing natural resources:

Human aspirations and the renewal of his thoughts and inventions gave varied concepts on natural resources which have qualitative and quantitative dimensions in time and space, thus, the concept of natural resources is a dynamic concept, not

static, because some changes in the level of technical knowledge or economical benefit from the resource and its discovery might change it from being nothing to a valuable economic resource that provides benefit, like using wind and solar energies and others, and when the demand of these energies increase they will become a commodity that have an economic value like other nonrenewable resources.

Here we can define the main requirements for continuous development planning to invest in natural resources as the following:

1. Having detailed and specified studies defining type and size of the available resources and spatial distribution in quantity and quality and theirs investment fields, and that's a main requirement in the field of development planning to develop the levels of continuous spatial development in the studied area.
2. Study the developmental reality that exists in all activities and economic sectors as well as the population's reality because of the importance of setting future developmental directions.
3. Having fully planning system specialized in drawing and setting the right plans to invest in the natural resources in the studied area.
4. Having suitable investment allocations to set plans and implement them as well as preparing the suitable investment environment in the studied area.
5. Having advanced research centers and centers to train the workers and qualifying them.
6. Having accurate economic development policies with adopting accurate planning in the field of setting development plans defined by time dimensions and clear development goals.
7. Working on the political, economic and security stability which reinforces the opportunities of having accurate and successful development policies.
8. Choosing the units that are working on developing the natural resources' investment in the studied area depending on efficiency, professionally and sincerity.
9. Following and evaluating the selected plans during the implementation phases in order to reach positive results.
10. Concentrating on achieving the sustainable development in the field of investing the natural resources.

And in order to show a clear image on the natural resources, so it has been dealt with in some details as the following:

First: needs and goals for planning water resources:

The sustainability of water comes in the front line of the working programs when planning any economic project, because the food security is connected to the water security, also water is the most important issue in the world, in spite of it is a social, economic, development and legal issue, it is a strategic security issue that's related to the lives of people and their stability, and overlaps other issues that led to armed conflicts, problems and disputes, so water well become in the future a strategic commodity that's more important than other commodities. Thus, we made this study to concentrate on the priorities of planning to sustain water through some programs and techniques to face the challenges and water problems in the future. And the most important goals of planning to water resources sustainability are the following:

1. Providing water for drinking and services which includes providing water foe washing, bathing, cooking and home needs, that goes along side with the human aspirations and elevation of their social, cultural and economic level.
2. Providing water for agricultural economical and industrial uses to provide food and important needs for human considering the increasing demand on these needs with the increasing number of population in the future.
3. Achieving the perfect use of the available water resources in all its kinds.
4. Protecting the water resources from attrition and pollution in front of all challenges connected to increasing population number and their development in all fields, in addition to climatic changes and the appearing problem of global warming that affected on the water intake and type in dry and semi dry regions.
5. Setting full management principles for water resources, like a main method on the front line of water policies and economical and environmental projects.
6. Developing and qualifying the human capabilities in the field of water resources and its management.
7. Enrich the role of academic scientific researches in water resources management.

8. Searching and looking for new water resources and developing existing water resources in all ways possible.

Second: requirements and goals of planning soil resource management:

The concept of soil management concentrates on finding new ways to protect the earth capability and production in high efficiency that can achieve self-sufficiency for the needs of the current and future population, in addition to its capability of absorbing any strange added materials in it (pollutants) which are the results of the development process (planning ministry 1975).

1. The soil has been considered as the most important natural resource for human beings, because it is the first and the last resource to providing food resource for them, also the animals depend on it which are also a food resource.
2. Soil, agricultural and animals resources is considered as a plain resource for many industries, and here comes from the importance and vitality of the soil as a natural resource for all human activities, so, protecting it is so important to its existence.
3. Whereas the sustainable soil management concentrates on using the soil in high efficiency in planning to protect its features, with achieving the greatest economical income to meet the different and changeable needs, and continuing to improve its production abilities on the long term with protecting other environmental elements, thus, the sustainable soil must have the following considerations:

a- Capable of producing plants.

b- Capable of protecting its quality, fertility and production abilities.

c- Capable of produce all crops.

d- The ability of adding new agricultural spaces that can produce to it.

e- The production of the land is sufficient to meet the needs of the current population and can face the expectations of increasing population number in the future.

4. The role of planning and using lands is not specialized only on selecting the suitable investments, it also provides the decision makers with sustainable scenarios to soil management that can improve production to meet the increasing needs and achieve spatial development. Especially that there is a big gap between the low existence of agricultural lands and the highly increasing of population (population explosion); this gap presented a race to production, and that made the producers increase the production to meet the increasing demand throughout using the best ways and techniques to reach the specified target of production, and this presented a challenge in front of achieving spatial development and the concept of natural resources management and environment protection in the absence of setting successful solutions on the local, international and regional level.

Third: requirements and goals of planning to invest in natural plants:

Natural plants have unknown possibilities for a lot people regarding the improvement of development actions, whereas they prepare the environmental systems to diversity, considering it the habitat of animals and plants which contains different types. The most important benefits of the natural plants are:

1. The natural plants are an important source that organizes the atmospheric gasses, especially the forests that are known for being the lungs of the world, they absorb the carbon dioxide from the air and use it in the photosynthesis and release oxygen, and by doing that they are preserving their roles in the natural cycle in the air.
2. Plants are source of food for human beings that provide him with almost everything they need from food such as grains, fruits and others plants which are considered an important source for people and animals equally.
3. The natural plants are food source for animals (animal feed) that's why animals depend on plants as a source of food, as they represent the perfect environment for animals' variety.
4. Plants resources represent an important source for plain materials in a lot of industries, like papers industry, some vegetarian oils, producing rubber and tobacco and many others.
5. Some kinds of herbs are used for medical purposes like medicine and drugs production.

6. An important source for building and energy, woods are being used for building and also a source for fuel in many countries.

Forth: requirements and goals for planning for alternative energy resources (solar irradiation and wind):

The concept of natural resources is a dynamic concept, not static, because some changes in the level of technical knowledge or economic benefit from the resource and its discovery might change it from being nothing to a valuable economic resource that provides benefit, like using wind and solar energies and others, and when the demand of these energies increase they will become a commodity that have an economic value like other nonrenewable resources.

On the studied area regarding its natural data, meanwhile could be benefited from the solar and wind energy, because of their importance they have been discussed in details as the following:

1. Solar energy:

Sun is considered an important resource of the renewable clean energy that man used it from long time ago and it developed bit by bit until it reached to generating electric energy, in addition to other usages. Solar energy is used in more than 150 countries the most known is The United States of America, Germany, Spain, India, Australia and Japan. While The United Arab Emirates takes the lead between the Arab countries in producing solar energy.

2. Wind energy:

Wind energy is listed in the mechanical or kinetic energy and it is the oldest types of used energy in the world, it was used for pushing sailing ships, grain grinding and raising water then in generating electrical energy. Some reports and data (The American ministry of energy was one of them) indicate to the huge electrical energy that has been achieved by the wind is 15 times more than the world's needs, which is equivalent to 10 billion oil tank/year (Ali 2018), moreover, using the wind energy has been rising in the advanced countries with the beginning of the twenty-first century such as The United States of America, Germany, India and many others although it is still the third in line after the water and solar energy, and China took the lead in producing wind energy and became first in line by the year 2019.

The third axis: planning of sustainable strategies to invest of the natural resources in Al-Jazera region in Al-Anbar governorate:

This axis includes specifying the basic theoretical foundations of the sustainable strategies planning for investing in the natural resources considering them as the base that branch off from it any future developmental considerations for investing in the natural resources in the studied area, and that's through discussing each and every axis at a time as the following:

First: strategies of sustainable planning of water resources:

Generally, the full strategic of managing water stands on obvious anchors that are connected to setting the current situations and future visions of needs in the light of the available water resources on one hand, and the obstacles and challenges on the other hand, and all of them set up in maintaining surface and underground water resources and developing them as the following:

1. Rationalize consumption of using the available water resources, and importing the economic rationalization principle in managing water resources and demanding water through providing the consumption cost and providing water on the contrary if it was for drinking water and home needs or agricultural or industrial or economic benefits to reduce wastage, that include the following:
   a. Guide the citizens through commercials with the importance of water and how to maintain it.
   b. Provide the measuring and controlling devices for different uses.
2. Rationalize consumption of using water in irrigation because it is the largest consumer of water, that's why the new irrigational ways should be used especially running projects for suitable irrigation networks and maintenance to reduce the waste, information and researches have proven that installing new irrigation system leads to consumption of more than 50% of irrigation water and increase the production by 35%.
3. Rationalize consumption of water for home and industrial needs through raising the efficiency of distribution

network for urban areas considering the instructions above.

4. Spatial developing of the water resources by improving their quality and quantity by reducing the wasted water caused by evaporation or leakage by preforming actions such as reducing the surface of the water flats and using ways to reduce the high levels of evaporation like installing cover to stop evaporation and planting large trees around the water flats to reduce dry wind speed. As well as stopping the urban irregularities. Also by increasing the quantity of the harvested water and gathering it for benefitting from it.

5. Maintaining the quality of surface and underground water from the pollution manifestations which have been highly increasing lately due to the industrial development and what comes with it from other pollutions.

6. Work on adding new water resources by treating the sewage water and desalting the salty water and reuse it, this issue might be highly important and should be focused on, especially in the countries that are poor in water resources and use this water as an additional resource that can contribute in development process.

7. Support the international cooperation for regional and international waters and commit to a full program for water shares that resemble the country's aspirations and fulfill all the engaged countries' needs. And that's applied to underground international water and rivers considering them a rightful right for all engaged countries, and which encourages building good relationships not only on water axis, but also on achieving sustainable development for the citizens of these countries.

Many countries dedicated their efforts to invest in desert lands with a dry climate from long time ago, and that's by reserving rainwater and benefiting from it in various usages such as supplementary cultivation, in addition to using it in enlarging the underground water as needed (Abo Saadeh 1983).

The gathering of the rainwater is gathered successfully in a lot of Arabian countries then using it in different fields, while the volume of harvested water in Tunisia reaches to 36 billion m^3/year, and in Syria to 48 billion m^3/year, while in Yemen it reaches about 68 billion m^3/year, and Morocco about 150 million m^3/year, and in Sudan reaches the highest number which is 1 trillion m^3/year (Kharabshe 2009).

Harvesting water is done by putting barriers in the bottom of valleys to reduce the flow velocity and storing rainwater and benefiting from it in increasing the soil humidity or enlarging the underground water or for direct usage in agricultural, watering animals and home needs (Khalil 2005). And this system is used in a limited means in Iraq in separated areas like in the northern Iraq by using terraces to reduce water movement it's also used on the western hill by making small dames in the bottom of the valleys that do not reach the wanted levels (Al-Abeed 2008).

And since the local rainfall is in the form of rain showers in a short time, as well as its fluctuation and increase in the amount of evaporation/transpiration due to high temperatures, the best way to preserve this water from waste and loss is to harvest it and store it in lakes that are immune from the influence of climatic factors, or to transfer it to geological layers, and then reuse it easily in different fields. Hydrological studies have shown that the increase in the density of cracks, fractures and cavities can be relied upon to locate sites with high permeability that help rocks to catch and collect groundwater, and wells that are excavated in limestone and sandstone located within the lengths of linear structures and their intersections or near them increase their drainage productivity by (55) times more than the productivity of wells that are far from these structures. (Al-Moomny 2000).

Some hydrological information indicates that the total area of rain in Iraq exceeds (99.8) billion m3 (Arab Organization for Development 2002). As for the study area, statistical methods were used to estimate the area of rainfall in two ways to ensure the accuracy of the results, as follows (Shehadeh 1983):

- The first method: This method is summarized by multiplying the average rainfall by the space of the total area, as the average rainfall was (133.3) mm, and for the purpose of showing the amount of climatic precipitation, point precipitation was converted into cadastral data as follows:

Rainfall (mm) = 133.3 = 0.1333 (m) depth of rain

Area of rainfall = Area (m) x Depth (m)

Area rainfall = 13714000000 x 0.1333 = 1828076200 m3

- The second method: It relies on equal rain lines to extract the average rainfall by measuring the area between each two map lines (3) and multiplying it by the average rainfall for these two lines. After that, all the values are collected to obtain the cadastral rainfall for each region, and thus the cadastral rainfall of the region reached (184, 7025, 000) m3. Table (5).

Table (5): The estimation of the rainfall area of (m3) for the study area

The amount of rainfall between each line / (m3)	Area between each two lines / (m2) *	Average rainfall altitude between each two lines (m)	Rain Line
154000000	616000000	0.25	300-200
775075000	4429000000	0.175	200-150
531375000	4251000000	0.125	150-100
386575000	4418000000	0.0875	100-75
1847025000	13714000000	-	Sum

The source is based on:

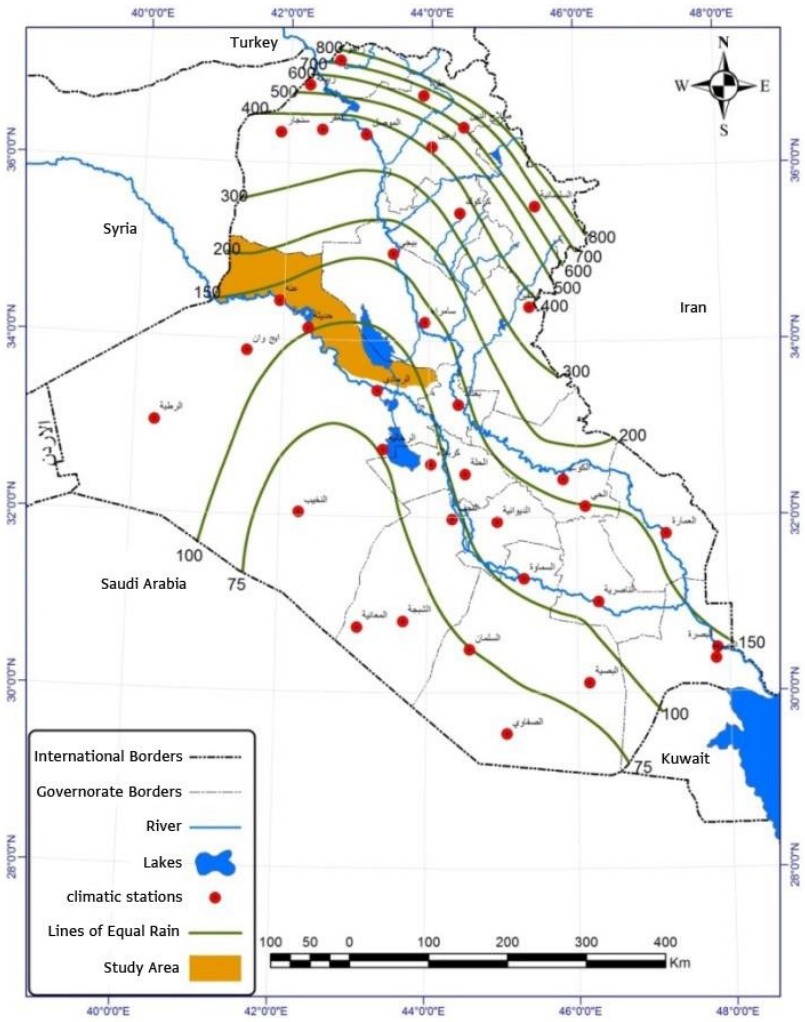
1. Map Number (3).
2. Noman Shehadeh, practical climate, second edition, Jordan, (1983), page (24).

(*) The area was extracted using the system of (9.3. S.I.G Arc).

And through the results reached through the two methods, we found that the results are very similar. Therefore, the results of the first method were relied upon, as they represent the lowest probability of precipitation, and then determine the water budget in the light of this by applying the equation of Kharofeh (**) to measure latent evapotranspiration for the rainy months only, through which the following was revealed:

Latent evaporation/transpiration = 74.9 mm = 0.0749 m
Evaporation volume = 0.0749 x 13714000000 = 1027178600 m3

And by subtracting the amount of evaporation / transpiration (m3) from the area precipitation (m3) of the study area, it became evident that there is a water surplus of about (800.9) million m 3 that can be used in the water harvesting process. This water can also be exploited in various fields, including supplying underground reservoirs, through which a positive change can be made in the quality and quantity of groundwater, and this in turn reflects positively on the various investment fields, especially agricultural investment and doubling the agricultural area, as well as the aspiration of establishing other projects, foremost of which are rural settlements and desert oases projects.



Map (3) Iraq's equal rain lines

Source: Republic of Iraq, general authority for meteorology, Atlas of Iraq's Climate, Baghdad, (1989), page (90).

Second: Strategies for sustainable soil planning:

Soil planning strategies must be based on comprehensive detailed data and information about the characteristics of the environment in terms of natural and human aspects, then estimating the expected effects of development on the environment, positively or negatively.

Here comes the evaluation of soil yields as an element of an integrated set of elements for the planning process of the project to be carried out, i.e. an integration between the environmental and economic assessment, meaning that the reliance shouldn't only be upon the economic aspects of inputs and outputs. Rather, the project costs must include environmental protection and soil conservation expenses (United Nations 2019). Here, the focus should be on the following:

1. Systematic assessment of soil capacities and alternatives for the optimal use of soils, improvement of economic and social conditions through participatory multi-sectorial and individual processes, encouragement of land use systems with appropriate crops, as well as reclamation of degraded soils and their investment, which is part of the integrated chain of soil management.
2. Evaluating soils according to their productive capacity classification, identifying needs and challenges, and developing plans to implement optimal options for sustainable management at the scale of the field, the natural resources,

and the nation.

3. Monitoring the assessment of the environmental impacts resulting from the exploitation of any area in the short and long term, and providing decision makers and owners of economic projects with the necessary information.

4. Finding complementary measures that adapt to the characteristics of the soil and increase its productivity.

As for soil maintenance, it is expressed in a set of measures that are taken to preserve the soil and manage it wisely, and this is done through the following:

1. Establishing a careful program for soil conservation represented by a balanced management between investing it economically and preserving the moisture and nutrients that are needed for the soil.

2. Setting court laws to stop all transgressions, whether urban ones, or removing their vegetation cover through logging, vandalism, or overgrazing.

3. Developing modern methods and equipment used in agricultural operations, such as tillage, and selecting suitable crops while following appropriate and economically equivalent agricultural cycles.

4. Applying an effective system of irrigation and agricultural drainage that commensurate with soil characteristics and quality.

5. Protecting soils from erosion and salinity using some different methods and techniques, such as the use of organic fertilizers, washing the soil from time to time, the use of tape cultivation, terraces, and other programs for stabilizing the soil and protecting it from erosion.

We conclude from the foregoing that planning for soil management in its modern concept includes the means and methods of controlling and organizing soil conditions, so that it reaches environmental measures for the soil that are balanced and appropriate for the production of all kinds of crops in accordance with the future economic aspirations and the preserving of the soil at the same time.

Third: Sustainable planning strategies for living organisms (plants and animals).

The concept of the sustainability of living organisms needs an integrated management of programmed planning for the survival and continuity of different animal and plant species and protecting them from extinction, whether these species are economic or non-economic. Therefore, biodiversity is one of the most important human resources, and it must be sustained for the benefit of present and future generations.

Planning the management of living organisms is an essential part of developing natural resources, and preserving the environment from degradation that harms all other elements of the environment and its resources. Those resources are the basis of spatial development, which depends on indicators, including the following:

1. Ecosystem Maintenance Indicators:

They are integrated indicators to develop an optimal management of the environmental elements group that preserve the dynamic and ecological processes freedom of the biosphere for its continuity and sustainability. Among these environmental elements, for example, is the cycle of oxygen and carbon dioxide in nature, soil processes and formation, and the elements of fresh water renewal in nature; all of which affect in one way or another the life and spread of living organisms. Maintaining the balance of this system helps the activity of biodiversity, and ensures the longevity. This is achieved by the rational and balanced interaction of these systems without the occurrence of a defect that exceeds the cases of their renewal.

1. Planning indicators for managing biodiversity:

This is the most important indicator for the development of living organisms and natural resources. It also is the basis for preserving the environment from degradation and pollution that harms ecosystems and their resources. Comprehensive planning for integrated scientific management is the only way to continuously preserve natural resources on the one hand and biodiversity on the other hand. This management is based on two basic principles (Ministry of Planning 1975):

- Knowing and keeping inventory of the types and forms of living organisms.
- Knowing the characteristics of the environment suitable for each species through conducting scientific and

laboratory experiments, in order to complete the information and build an advanced database for the various animal and plant classifications, and to preserve them from deterioration and extinction, as well as investigating their genetic structure.

These two principles represent the core of the wise management of biodiversity, which aims to protect all living organisms for any possible cause. This integration to preserve living organisms for future generations in light of the challenges is done through the following:

1. Establishing a network of natural reserves that contain ecosystems and protect endangered species.
2. Scientific management of natural reserves based on economic frameworks and support for eco-tourism to find various opportunities for economic integration.
3. Implementing advanced programs to preserve and propagate living organisms and their genetic assets that are under the threat of extinction outside the natural habitat.
4. Activating international and local legislation and agreements to end abuses of the resources of living organisms, and spreading environmental awareness and education regarding environmental protection.
5. **Fourth: Strategies for sustainable planning for renewable energy resources.**

Spatial development involves a rapid transformation of the technological base of the economic structure, especially the industrial one, which helps save natural resources and improves environmental conditions. Countries have striven to increase the use of renewable energy sources as it is one of the main factors for advancing spatial development, after the emergence of signs regarding shortage and deficit in traditional energy resources, which prioritized the acceleration of economic growth by achieving safe and stable use of renewable energy sources.

Renewable energy is used in developed countries such as Germany, France, America and others, and the three most active renewable energy markets in North Africa and the Middle East are Morocco, Egypt and Jordan, with more than $15 billion in the years from 2015 to 2019.

The most important considerations that exacerbated the use of renewable energy sources in spatial development are:

1. It is considered an important power source due to it being environmentally friendly, renewable, and inexhaustible. Also, it can exist almost anywhere in the world.
2. It helps to get rid of environmental issues such as global warming and pollution through the use of clean sources, and it restricts in the use of other sources.
3. It increases the life span of exhaustible and depleted resources, as it is a useful alternative that achieves a balance between natural resources and their uses.
4. Confronting the economic crises and the increasing world's population, especially after the fluctuations in fossil fuel prices and other problems that result from it.
5. Achieving spatial development in all aspects of the economic structure, from infrastructure to industry, as well as providing various job opportunities.
6. The desire to achieve high standards of living.
7. Confronting the political and economic blocs and their consequences, which restrict the growth of the economies of countries and manipulate their levels.

Conclusions:

1. The availability of water in appropriate quantities, whether groundwater or rainwater, is considered the cornerstone for the formation of important economic growth centers in the region, especially since the amount of water collected from rainfall reaches approximately one billion cubic meters per year.
2. Natural resources in the study area are distributed unevenly in terms of type and quantity, represented by continuous solar radiation for more than nine months throughout the year and wind energy, which meets international standards for wind energy investment..
3. The natural resources are distributed in the study area contrastingly in terms of type and quantity.

4. The study area still lacks accurate detailed studies through which it is possible to determine the extent to which these resources can be utilized in the field of developing levels of spatial development, including the possibilities of agricultural production, especially since the study area, with its spatial dimension, is still lagging in the economical and urban fields.

5. The adoption of sustainable development planning supported by accurate economic policies is the decisive factor in formulating any future development directions aimed at achieving the investment of the available natural resources towards developing levels of spatial development in the study area.

Recommendations:

1. Conducting detailed and comprehensive studies that specify the type and size of the available natural resources in the study area, as well as how to benefit from them.

2. Determining the economic feasibility of each natural resource, especially in the field of investing in alternative energy resources.

3. Focusing on adopting sustainable planning in the investment of any natural resource, especially in the field of agricultural production and planning for population stability.

4. Working to achieve security, as well as political and economic stability in order to create an appropriate investment environment within the study area.

5. Benefiting of international development experiences in the field of development of dry desert areas

المصادروالمراجع

أبو سعده، س. (1983). هيدرولوجية الأقاليم الجافة وشبه الجافة. *مجلة الجمعية الجغرافية الكويتية*، 1، 9.

الامم المتحدة. (2019). منظمة الاغذية والزراعة ،تخطيط استخدام الاراضي، ورقة عمل رقم(4) روما، ص7.

إي. تي. (1972). *سترينجر: تقنيات المناخية. جامعة برمنغهام*، 189.

بورينج. (1960). *التربة وحالات التربة في العراق وزارة الزراعة*. بغداد.

الجبوري، س. (2018). الهيدرولوجي. *كلية التربية ابن رشد، جامعة بغداد*، 65.

الجليباوي، ز. (2010). *جومورفولوجية حوض وادي بنات الحسن. رسالة ماجستير غير منشورة*، كلية الاداب ، جامعة الانبار، 43.

جي. تي. (1968). تروارثا: مقدمة في المناخ. (ط4). نيويورك: مكجرو–هيل بوك كومباني.

ح. م. (1981). *تلوث البيئة (الغلاف الجوي والمياه والضوضاء)*. بينغهامتون بالون برس.

حبيب الله، ع. (2014). *المراعي الطبيعية مفاهيم وتطبيقات*. (ط1). جامعة السودان للعلوم والتكنولوجيا.

الحسناوي، ز. (2014). تأثير التعرية الريحية وثباتية التربة على توسع ظاهرة التصحر وتشكل الكثبان الرملية في محافظة النجف. *مجلة سر من رأى*، 10(39)، 312.

خرابشة، ع. (2009). *الحصاد المائي في الاقاليم الجافة وشبه الجافة في الوطن العربي*. عمان: دار صفاء للنشر والتوزيع.

خليل، م. (2005). *تنمية الموارد المائية في الوطن العربي*. القاهرة: دار الكتب العلمية للنشر والتوزيع.

دلي، م. (1975). دراسة مناخية للأمطار اليومية والسيلان السطحي في العراق: نشرة فنية (79). بغداد: وزارة الزراعة والإصلاح الزراعي.

الراوي، ص. (1990). *أسس علم المناخ*. الموصل: دار الحكمة للطباعة والنشر.

شحاذة، ن. (1983). *المناخ العملي*. (ط2). الأردن.

العبيد، ع. (2008). التلازم بين الخزانات الأرضية والسدود الصحراوية ضرورة اقتصادية. *المجلة العراقية لدراسات الصحراء*، 1(1)، 113.

علي، م. (2018). *جغرافية الطاقة اسس ومشكلات*. عمان: دار الصفاء للطباعة والنشر والتوزيع.

كربل، ع. (1986). علم الطقس والمناخ. *كلية الآداب، جامعة البصرة*، 40.

المنظمة العربية للتنمية الزراعية. (2002). *تعزيز استخدام تقانات حصاد المياه في الدول العربية*.

الموصلي، م. (2014). *اساسيات التربة العامة*. (ط2). عمان: دار الوضاح للنشر.

المومني، ل. (2000). أثر الاستشعار عن بعد في استغلال الموارد المائية وتنميتها والمحافظة عليها من التلوث: تجربة الأردن. مجلة دراسات اجتماعية، بيت الحكمة، بغداد، 7، 61-66.

والطون، ك. (1976). *المناطق الجافة، تعريب نوري خليل البرازي*. مطبعة العاني ، منشورات جامعة بغداد.

وزارة التخطيط، هيئة التخطيط الإقليمي. (1975). الدراسة الإقليمية الشاملة لتخطيط أعالي الفرات. 18-19.

References

Abu Sa'dah, S. (1983). Hydrology of dry and semi-arid regions. *Kuwait Geographical Society Journal*, 1(9).

Al-Hasnawi, Z. (2014). The impact of wind erosion and soil stability on the expansion of desertification and the formation of sand dunes in Najaf Governorate. *Sar Men Raa Journal*, 10(39), 312.

Ali, M. (2018). *Energy geography, foundations and problems*. Amman: Dar Al-Safaa for printing, publishing and distribution.

Al-Jalibawi, Z. (2010). *Morphology of Wadi Banat Al-Hassan Basin. Unpublished Master's Thesis*, College of Arts, University of Anbar, 43.

Al-Jubouri, S. (2018). Hydrology. *Ibn Rushd College of Education, University of Baghdad*, 65.

Al-Mawsili, M. (2014). *Fundamentals of General Soil*. (2nd ed.). Amman: Dar Al-Waddah Publishing House.

Al-Momani, L. (2000). The Impact of Remote Sensing on the Exploitation, Development and Conservation of Water Resources from Pollution: Jordan Experience. *Journal of Social Studies, House of Wisdom, Baghdad*, 7, 61-66.

Al-Obaid, A. (2008). The correlation between reservoirs and desert dams is an economic necessity. *Iraqi Journal of Desert Studies*, 1(1), 113.

Al-Rawi, P. (1990). *Foundations of Climate Science*. Mosul: Dar Al-Hikma for Printing and Publishing.

Buringh. (1960). *Soil and soil conditions in Iraq*. Baghdad: Ministry of Agriculture.

Daly, M. (1975). *A Climatic Study of Daily Rainfall and Surface Runoff in Iraq: Technical Bulletin (79)*. Baghdad: Ministry of Agriculture and Agrarian Reform. Baghdad.

E.T. (1972). *Stringer*. Birmingham University: Climatic Techniques.

G.T. (1968). *Trewartha, An Introduction to Climate*. (4th ed.). New York: McGraw-Hill Book Company.

H.M. (1981). *Environmental pollution (atmosphere, water, noise)*. Binghamton Polytechnic Press.

Habib Allah, A. (2014). *Natural pastures: Concepts and applications*. (1st ed.). Sudan University of Science and Technology.

Karbal, A. (1986). Weather and Climate Science. *College of Arts, University of Basra*, 40.

Khalil, M. (2005). *Water Resources Development in the Arab World*. Cairo: Scientific books house for publication and distribution.

Kharabsheh, A. (2009). *Water harvesting in the arid and semi-arid regions of the Arab world*. Amman: Dar Safa for publication and distribution.

Ministry of Planning, Regional Planning Commission. (1975). The comprehensive regional study for planning the Upper Euphrates, 18-19

Shehada, N. (1983). *The Practical Climate*. (2nd ed.). Jordan.

The Arab Organization for Agricultural Development. (2002). *Promoting the use of water harvesting technologies in the Arab countries*.

United Nations. (2019). Food and Agriculture Organization. Land use planning. Working Paper No. 4, Rome, p. 7.

Walton, K. (1976). *Dry Regions, Arabization of Nuri Khalil Al-Barazi*. Al-Ani Press, University of Baghdad Publications.