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The climatic changes and their role in the urban planning in Iraq (GIS.RS)

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Abstract

Known as the green establishment or sustainable building, they are buildings whose design depends on building technologies that take into account the environment in the materials used, energy consumption and sustainability. Climatic considerations were taken in the field of urban planning of the city? A number of scientific hypotheses have been formulated that serve as an organizational framework for this study. They were represented in the following: The emergence and formation of Iraqi cities in their current location resulted in various environmental impacts. The study aimed to identify the effect of climate elements in determining the location of cities, and to identify the effect of climate elements in The establishment of housing and its characteristics in terms of building materials and others, and the study adopted an analytical approach based on the analysis of a number of climatic factors that significantly affect the establishment of cities. A group of programs were used in this study that complemented others, including the Erdas V.9.1 program and the Alois program. (IL WIS 3.7) and the geographic information systems program (ARCGIS-V.10) The satellite images of the US satellite Landsat for the years 1970 (ETM) 2021 (ETM + 7) were obtained and satellite images were analyzed. The borders of northern Baghdad were projected onto the satellite images and a cut was made. Sub setting for satellite image analysis.

Keywords: Green buildings - nanotechnology - green concrete - sustainable development - waste recycling.

Introduction:

Urban climatology is considered as one of the physical geography branches, which is concerned with studying the climate impact on human activity. The studying the climate impact on the urban planning is one of the concerns and fields of this branch of geographical studies.Urban planning and constructing is no longer confined to the urban planners and architects only;however the geographer has a prominent role in analyzing and interpreting of the climatic elements.But also studying their impact on the planning process, as he links between the climate, space and timethrough his contact with the environmental and practical reality of urbanism, and hence the urban development can be advanced. (Amused, Amjed & et al. 2006. p.120)). The city is not exempted from being a geographical area in which a person can live, but the most accurate situation is the changes that occur to the natural surroundings (environment) by human. It is easy to realize many phenomena inside the urban, and many agents of change, as many scientists confirm that there are variables found inside the urban that effect on the ecological balance of the urban. (Bachman, Leonard R. 2003, p. 400); The urban is a set of regular and organized elements that interact with each other, where we find the elements or compounds which she is composed of interact with each other and each of them affects the other according to a definite purpose .

That's why; the urban is considered an ecological system established by human in the natural surroundings.

1- study Problem:

The problems of the study is, to what extent the urban planning pattern of the Iraqi cities, both the old and modern cities, will be in line with the climatic changes conditions prevailing in the region, and are the climatic considerations taken into the consideration of the urban planning for the city? What is the impact of the climatic elements on determining the location of cities? What is the effect of the climatic elements on the characteristics of urban construction? What is the environmental remediation needed to achieve the man comfort in cities? What is the role of the geographer in the cities' characteristics and locations planning processes?

2- Study hypotheses:

A number of scientific hypotheses have been formulated and considered as a regulatory framework for this study, represented in the following: The establishment and formation of Iraqi cities in their current position resulted of various environmental influences that effectively contributed to highlighting the peculiarity of the architectural environment of these cities. The modern planning pattern of the cities has increased the impact of heat on the population, which was reflected as an increase in the economic burden on them by conditioning their houses, in contrast to the planning pattern in the old cities, which gave them a natural conditioning.

3- Boundaries of the study area:

Iraq is located within the southwestern part of the continent of Asia and in the Asian part of the Arab world, bordered on its north by Turkey, and on the northwest by Syria, on the west by Jordan, to the south and southwest by Saudi Arabia, Kuwait, and the northeast by the Islamic Republic of Iran. Regarding the astronomical location, the study area is located between the two Latitude (37 ~22′40) –°(29 ~3′15)degrees to the north and between the longitudes (38 ~47′55) (48 ~33′50) –to the east, Map (1).

Map (1) The geographical location of the study area in 2021 AD.

Source: Based on the satellite visual data "Thematic Mapper" TM of the American satellite land sat 8/1/ 2021 AD for Iraq, and it consists of three panels 40 row 177 path for the year 2021

AD and consists of 7 bands with a spatial accuracy of 33 meters, and its source is http:/ /glovis.usgs.gov.

4-Objectives of the study:

This study aims to identify the impact of the climate elements in determining the location of cities, and to identify the effect of the climate elements on the housing construction and its characteristics in terms of building materials and others, and to determine the environmental remediation necessary to achieve human comfort in housing, and to spot the light on the role of the geographer in the planning processes of the housing characteristics and locations.

5- Study methodology:

The study adopted an analytical approach based on the analyzing a number of climatic factors that have a significant impact on the establishment of cities in the study area, as well as the descriptive analytical method to determine the current situation and future perception of climatic changes and their effects on changing the locations of modern cities, and the historical approach that concerns the study of the historical development and the impact of climate changes On the shaping and characteristics of cities.

6- Approved Programs:

A set of programs were used in this study that complement each other rather than cancelling each other in order to conduct this study in the required manner, which is aimed at this study. Erdas V.9.1 is a program that contains all the tools for processing and analyzing the satellite imagery and some applications of information systems. IL WIS 3.7 program is an integrated dual-objective program that includes commands for processing remote sensing imagery and the geographical information system program (ARCGIS-V.10), which is one of the most important GIS programs produced by the American company (ESRI) affiliated with the Environmental Systems Research Institute The program provides a wide range of effective tools that help to understand data, perform arithmetic and logical operations, and build a geographical database.

7- Analysis of the satellite images:

The satellite imagery of the American Landsat satellite for the years 1970 (ETM) 2021 (ETM +7) were obtained, and the satellite imageries were analyzed, the borders of Iraq were projected onto the satellite images and a Sub setting was made to analyze the satellite images, the geometric, spatial and radio metric correction, and the reflectivity values of the locations were calculated for constructing the green building, the previous results were transferred to the GIS environment using ArcGIS10.8 for the purpose of obtaining special maps of the green building construction locations in Iraq.

First - Green Building Concept and its Environmental Considerations:

Known as the green establishment or the sustainable building, they are buildings whose design depends on the building techniques that take into consideration the environment in the materials used, energy consumption and sustainability, some of them depend on raw materials in construction and are keen on using what exist the surrounding environment of the place, such as building with compacted soil or sandbags, others depend on modern techniques for conservation, generation and recycling of energy using advanced solutions depending on solar energy, reclaimed water, and renewable energy sources. In order to improve the environmental quality of buildings, reduce the negative impact on the ecosystem and help in establishing protocols that assess the environment and the energy, it is necessary to resort to the ecological principles known internationally as the green building, where this project aims to significantly reduce or eliminate the negative impact of buildings on the environment and on the building occupants (Bang, Cathryn & Partners 2010, p.222).

Reasons for establishing the green building:

One of the most important reasons for the establishment of green building is to achieve sustainable development without compromising the quality of life for all the people of the earth, and this was provided by the Hanover Principles, which was announced in 1992 AD, and the depletion of resources and the increase of CO2. Data of the American Green Building Council showed that the annual direct effects of all residential and commercial buildings included 39.0% of the Total energy used and 68.0% of electricity consumption, 30.0% of greenhouse gas emissions and 40.0–50.0% of total CO2 emissions from developed countries are derived from the energy used within buildings, also the green building are much cheaper compared to conventional buildings in terms of heating, conditioning and lighting Because they consume much less energy, they are less polluting, and thus reduce the rosters which make it more reasonable regarding the prices, as well as providing convenient spaces for working and living (Barnett, Dianna Lopez & Browning, William D. 2007, p.55), so currently Many countries have violated new regulatory requirements related to the reduction of energy demand in the new and the existing buildings, the green building represent a way to eliminate inequality in the distribution of resources by providing the poor people better housing with affordable prices, healthier, more efficient resources, and cheaper to own and operate.

Second - green building principles:

1- Reduction of the energy consumption:

By using energy insulators while maintaining good ventilation, using less energy for lighting and electrical appliances, efficient utilization of heat with less pollution, making use of passive and active solar energy, and using latent and natural ventilation systems instead of mechanical systems.

2- Minimizing the external pollution and the environmental damage:

by harmonious design with the surroundings of the location, avoiding destruction of the natural areas, reusing rainwater in the location, treating and recycling wastewater of the location, minimizing the extraction of materials without environmental controls and avoiding materials that produce Harmful chemicals, and the reuse of active materials.

3- Reducing energy and resource depletion:

Through using local materials and resources, on-site materials and the utilization of materials from sustainably managed sources, minimizing the usage of imported materials, reducing the use of materials from non-renewable sources, utilization of energy-reducing materials and using reused or recycled materials when needed, Reuse of existing buildings and structures.

4- Reducing internal and external pollution:

by using non-toxic or low-emission materials, avoiding fibers from insulating materials that enter the atmosphere, ensuring good natural ventilation, reducing dust and allergens, reducing the impact of electromagnetic fields and creating a positive environment in the building and the relationship with the location, in addition to the involvement of the user in the building design,management and assessment of the environmental options (Barrows, John & Iannucci, Lisa 2009, p.89).

Third - the advantages of green building:

One of the most important advantages of green building is the provision of resources for the life cycle of the building, starting from the green design stage, and low energy utilization, thus reducing the global warming, depletion of the ozone layer and causing damage to biodiversity. They help in reducing the impact of the urban heat islands and reduce the damage on the natural environment of the city which in turn leads to the water and air purification, reducing energy costs and durability for the roof of the building, more efficient utilization of materials compared to traditional buildings, as the percentage of energy usage reaches 50.0% and the energy is reduced by 80.0 - 90.0%, which makes green building efficient in preserving the environment and money, of high quality and last for a period Longer, lower cost to operate and maintain, and

greater comfort for occupants (Barrows, John & Iannucci, Lisa 2009, p.101).

Fourth - Green Building Systems:

1- Building envelope:

Includes the walls, openings, roof, and includes the building design objectives, structural safety, temperature, humidity and air pressure control.

2- The walls system:

The most important systems of the green building envelope are the vertical green surfaces that reduce the temperatures of the area surrounding the building and improve the internal climate and act as an insulator for heat, dust and noise, as well as the water wall systems, the Trump wall system, the Steve Bayer system and the Bara system.

3- Window system:

Superior windows with thermal insulation and high light transmittance are used, the green building design standards confirm the effective performance of high-energy windows for heating and cooling purposes, which reduces the use of air-conditioning devices as well as their efficiency in sound insulation, increase thermal comfort and protect furniture from ultraviolet rays.

4- Roof systems:

The most important elements are green roofs, which reduce solar radiation reaching the building structure, and help manage rain water to reduce cooling in summer and air conditioning in winter as well as providing thermal comfort for residents, and cold roofs: energy savings of almost 10.0 - 43.0% are achieved through Inverted solar energy for high efficiency, reduced energy use for adaptation, and hydro-roof: a thermal mass in a building's roof structure that relies on conversion and thermal insulation to be effective in cooling and heating the building.

5- Mechanical services:

Related to the components of thermal comfort inside the building, including the heating, ventilation and air conditioning system; the mechanical aspects of the building such as lighting, sanitary works, vertical transportation and life safety systems. The electrical appliances and products with the energy starlabel are one of the most important mechanical elements that reduce the of energy and resources are, which uses less energy in the range of 20.0-30.0% of the required and water-efficient sanitary installations, biological wastewater systems, wastewater recycling and its usage in irrigation, washing and others.

6- Structure of establishment:

A group of elements that operate to provide a stable balance against gravity and dynamic loads, including the following:

A- Green building materials:

Such as the environmentally sustainable wood, plywood, paints, construction adhesives, insulators and roof systems, some of them reduce air pollution and others are made of recycled glass, plastic, tires or other materials.

B- Nanotechnology:

It represents processing, designing and manufacturing at the molecular level and opening up new possibilities in the green building through a group of products such as the solar energy - collecting coatings, the nanogels, the high-insulating transparent panels and the heat-absorbing windows, as well as recent discoveries such as the laser coating that allow materials to transmit Information to each other, the windows that transfer from transparent to opaque, and the eco-friendly biocides to preserve wood, these products create customized indoor temperatures in addition to the photosensitive and photochromic windows and user management devices (Barrows, John & Iannucci, Lisa 2009, p. 120).

The main idea when constructing these buildings was to preserve the environment and rationalize the energy consumption and this is obviously represented in the materials used in the construction.The metals used in the construction stages are recycled metals, and the bamboo plant was used extensively in those buildings, because

of its economic advantages, especially in the case of its availability in the vegetation area, and it is a fast-growing plant whose cutting does not negatively affect the environment. Green building are concerned with rationalizing the energy usage and optimizing it, as the energy generation system in these buildings is one of the most expensive construction steps, but at the same time it is a great investment in the long term. Among the most important methods used to generate energy in the green building:

- Solar energy system: by installing solar panels on the roofs of the buildings, through which solar energy is converted into electricity.

- Energy generation by wind turbines: where the generators are installed according to the direction of the wind.

- Saving 25% of air-conditioning energy: through a common garden in the roof, with ten centimeters depth, and certain plants are planted on it that are not long, have no roots, penetrate the surface, and usually irrigated with rainwater, in addition to the presence of a backup irrigation network, the plants insulate the heat well In the summer and keep it indoors in the winter.

C –Mud brick:

It is obvious from the name that made of clay, and it is manufactured in the locations from the local soil, taking into account that there is a sufficient amount of clay, and the soil is mixed with water with the use of reinforcing materials such as straw and cement usually, then the mixture is pressed into wooden molds for a while, Then the molds are removed and the bricks are left to dry, and the period of drying sometimes takes several weeks, and as it is made of natural materials, it is characterized by sustainability, being recycled and non-toxic, the buildings built with it are considered healthy buildings (Bauer, Michael & et al 2010, p.89). Mud bricks are characterized by low cost, low energy content used in its manufacture (especially if it is manufactured in the locations and not transported over long distances) and ease of use, as well as high thermal mass (the ability to store and release heat), if the thickness of the bricks is not less than 30cm.

D- Green Concrete:

Concrete is an excellent material for obtaining thermal mass in the houses designed to benefit from the potential solar energy; in the hot and cold climate, the thermal mass helps in regulating the temperature of the house and keeps it warm in the winter and cool in the summer. Adequate shading, the sun will not reach the concrete in the summer, and therefore the coldness of the concrete will help keep the house cool.

E - Wooden panels:

Wooden panels are one of the most widely used building materials, especially in many parts of the world. They are strong, flexible, and ready for use. They are also obtained from renewable sources. They are one of the materials that are easy to work with and require basic skills, which make them ideal for the builders owners of the buildings. (Bauer, Michael & et al 2010, p.120). There are some types of flexible woods and other solid wood boards, and most of the wood boards have a low thermal mass, flexible and light wood boards do not have a usable thermal mass, but they are acceptable insulating materials, and although high-density wood has a medium thermal mass, it fades in a short time, houses made of wood panels must be insulated and the thermal mass must be increased if there is a need for that such as the use of concrete floors, and if the floors are made of wood only, it must be insulated from the bottom (Bauer, Michael & et al 2010, p.121).

7- The internal environment:

represented in defining the aspects of the human dimensions including the physical and psychological comfort of the human to create a comfortable and healthy internal environment for the human use in harmony with the data of the location that contains it and directly related to the natural environment systems and includes the internal environment, thermal comfort, providing a healthy internal environment, natural ventilation, lighting, electromagnetic fields, furniture and finishes And visual communication with external spaces, sound insulation and beauty.

8- The location:

An important element in integration with the green building and requires that the location should be sustainable and includes rainwater management, reducing urban heat island impact, reducing light pollution, preserving landscape and water, managing transportation, and low impact site management.

9- The streetsorientation and planning:

the eastern direction must be chosen, as the garden and the building will be protected from the winds, and the presence of any dwelling or adjacent building does not cover the eastern sun, as happens in the streets with an east-west direction, and in the streets oriented from north to south ,the lands to the east have the most favorable position, and to have the southern sun in the winter, the building must be deviated as far as possible to the north, with a terrace, extending from east to south, while in the lands to the west, the building must be positioned in such a way to get appropriate tanning from the south and maintaining a free view in front of the balcony, and when necessary, we construct the building in the rear borders. With regard to the appropriate orientation for other directions of the streets, in order not to get any obstructive view for the establishment, it is preferable to choose lands adjacent to properties that have already been built from the side of the sun, and indeed the direction of The layout of the building can be completed taking into account this establishment and thus avoiding the risk of later deprivation of the sun through the new installations.

10- Means of cooling, air conditioning and reducing energy consumption:

This undulating green roof is one of the architectural designs and techniques that help naturally to ventilate buildings, as architects and designers seek to use new methods and techniques in designing buildings to ventilate them in natural ways without using air conditioners, and these techniques' importance increased Recently, in light of the sharp rise in the global temperatures, and the number of the air conditioners in the world is expected to triple by 2050 AD, to deal with heat waves that have become more frequent as a result of climate change, but the problem is that the air conditioners do not only consume large quantities of electricity, but they also contain refrigerant materials that are considered among the gases that caused the global warming, (Bauer, Michael & et al 2010, p.109). These materials have become the fastest spreading sources of greenhouse gas emissions in the world, and green domes contribute to the surface of Academy in the natural flow of air inside the building. These hills are designed so that the low pressure on one side draws air; when the wind is blowing, into the building through mechanically controlled roof windows, and the plants covering the roof of the building help reduce temperatures inside the building.

11- Energy conservation:

This can be done by cleaning or replacing the air filters of air conditioners and ovens; To avoid air entering through polluted filters, adjust air conditioners to normal temperature, and avoid excessive cooling or overheating; In the summer, it is recommended to set the temperature at 25 degrees Celsius, and 20 degrees Celsius in the winter, and by reducing the use of the car through walking, cycling, or riding buses; in order to save fuel, choose a fuel-efficient car when buying it, slow down the car when driving, not drive for a long time, and buy products made from recyclable materials, because they require less energy to be produced compared to those made from raw materials.

12-Building location and orientation:

orientating the buildings and it means the appropriate orientation of the building according to the main directions north - south - east – west, The location of the building in the concerned area must take into account the shape and height of the surrounding buildings in relation to the path of the sun in winter and summer, in order to determine the shaded and sunny areas, in temperate climates the preferred orientation is in the east-west direction, glass roofs to the south and whole walls in northern regions In other climatic conditions a different orientation from the direction of the helium heat axis can be useful, and the design and distribution of interior spaces will follow the same logic in order to ensure the thermal comfort (Witten, K, Exeter,

2003, p. 159). In general, all environments that do not need special lighting, such as stairs, corridors, and services, should be in the north, and environments that need daylight should be in the south facade, the bedrooms should be in the southeast or southwest, the kitchen is generally to the east because the sun is less hot in the morning, and the entrance should be designed not to let in cold air every time the door is opened, and the warning is to not to expose the entrance to the cold winter winds. Thus it is necessary to protect the northern wall from strong winds.

Fifth- Characteristics of the sustainable green building:

Green urban planning contains the same ideas and shares its principles with sustainable planning as they both focus on the design that is consistent with the nature, as well as forming communities that live a better lifestyle. The principles of the green planning are based on the triple- zero framework of zero fossil fuel energy use, zero waste, and zero emissions, on the other hand, sustainable planning focuses on designing transport cities that provide public transportation services so that their residents can provide their daily needs. (Edwards, Brain 2005, p. 140)

One of the main features of green building is emphasizing the protection of the existing ecological balance, and the improvement of environments that may have been damaged in the past.Green building are usually constructed on environmentally sensitive lands, with taking the actions to restore vegetation, green building requires the least amount of materials possible, through good design and the consideration of the removal of the unnecessary materials in the finishes, and in addition (Witten, K, Exeter, D and Field, A (2003) p.187) the construction of such buildings ration the use of materials as well as water recycling, and The most important characteristics of green building are the following:

A- Insulation and Construction: Many new buildings are insulated using recycled materials such as old blue jeans or blown fiberglass; Proper insulation contributes to saving energy bills significantly in the future. Walls can be made of iron and concrete, but using treated wood will not be more expensive than it. Many cities have wood warehouses where the recycled or abandoned wood leftovers can be purchased when the construction is done. They are hard, cheap and often can be luxurious too.

B-Household appliances and equipment:

One of the most important criteria of the green building is to look for a low flow shower faucets or pressure toilet taps, and even use composted toilets, and take into account the use of energy-saving washing machines and dryers, or placing a clothesline in the outdoor yard to hang wet clothes on days In the sun, make sure that the air conditioning units are fully insulated and clean, and look for instant gas stoves or energy-efficient water heaters.

C - Flooring:

Instead of using expensive hardwoods that pose a threat to the planet and deplete forests, many real estate builders have found that the bamboo is inexpensive and beautiful alternative, which is technically not wood but grass, and so far considered one of the most durable and easiest renewable flooring materials in the world, as well as cork that can be renewed easily, (Edwards, Brain 2005, p. 142) the house can also be a strong and inexpensive alternative to old linoleum rolls, which are made of flax and other natural fibers.

D - The Paint and other materials:

Many paint manufacturers usually look for environmentally friendly alternatives instead of oil and rubber, and one example is in choosing milk-based paints that smell like milk when used instead of irritating and carcinogenic chemicals, and the recycled glass is used is now used in tiling the kitchens and bathrooms, the sink gears are made from recycled materials which look more beautiful and unique (Fox, K., (1974) P. 702), Instead of the granite stones extracted from mines.

E - Solar energy:

Solar energy does not only mean expensive panels that are placed on your roof, although this is one of its types and it is called active solar

energy. However, home solar energy can be considered as investing in thick segmented windows or in more complex photovoltaic cells. Although solar energy tends to be an expensive investment at first, the benefits begin to show up in your monthly energy bills (Edwards, Brain 2005, p. 144).

F- Gardens and green spaces:

One of the criteria for green building is also to seek for vital and green spaces involves plants that require less irrigation, taking into account the acquisition of barrels to collect rainwater. Many cities sell them through energy and water programs and projects or convert your water system into Gray water which involves using recycled water from dishwashers and washing machines to water your lawn or wash your car and look for local trees in your area, and plant them so that these trees can protect your windows from the bright sun during the hottest days.

Sixth: Green building provides a better life:

Researches has proven that the construction of green building raises the initial cost of the building by about 5%-10%, however in the medium term extended up to ten years, the green building returns the direct financial investment, in addition to the obvious benefits of saving natural resources and the emission of greenhouse gases and other pollutants. In order to remove doubts from the hearts of the houses owners, it is necessary to raise the level of awareness and enhance confidence among those who are involved in the construction process (initiators, planners, project managers, implementation contractors, producers of building materials and residents of buildings). The awareness process must focus on the fact that green building does not include savings financially and environmentally only; its advantage lies in requiring more serious planning and stronger cooperation among all involved in the construction process (Díaz, K. 1985, P.P 65-77). One of the examples of environmental architecture designs, we mention, for example, the design that aimed at reducing energy consumption, which is to cover the roof of the building with soil and plant it with local shrubs, thus transforming the roof into a beautiful orchard, and in this way, the temperature of the building is reduced, in summer by a few degrees. Also, through the air conditioners used, energy efficiency is increased; Instead of emitting hot air outside, it is directed into the ground, thus saving about 30% of the electricity needed to run it. The building is designed so that it does not need electricity to light it during the day; in most of the daylight hours, natural lighting is sufficient, thus saving about 20% of lighting expenses. In addition, the wastewater generated from the building is circulated by a special purification process; So that the treated water is used to irrigate the gardens around the house; as well as the presence of a well to collect the rainwater. Residues of weeds and trees that are uprooted during construction operations are used in the manufacture of compost. While the distinctive trees on the construction site are preserved, (Cummins R. 2000 PP. 55–72) by constructing the building around them.

Seventh- Waste Maintenance and Recycling:

Building waste is defined as the materials that remain after the completion of construction work, and may be desirable or undesirable for users or people who have completed the construction process, and these materials may be of direct use resulted through the presence of excessive quantities of materials used in construction processes, Or it may be of indirect use materials produced by the construction process, so it is a mixture of different materials valid or invalid for direct use (Witten, K, Exeter, 2003, p. 169.)The services include the processes of collecting, transporting, sorting and recycling waste from construction and demolition work, benefiting from building materials, recycling and reusing them at the project location to reduce the transportation costs, dispose of waste, preserve natural resources, and benefit from what achieves the requirements of the leadership system in energy and environmental designs, the recycling of the demolition and construction contributes In Iraq, effectively reducing the percentage of waste resulting from construction and demolition activities, and these wastes are recycled through two factories established for this purpose in

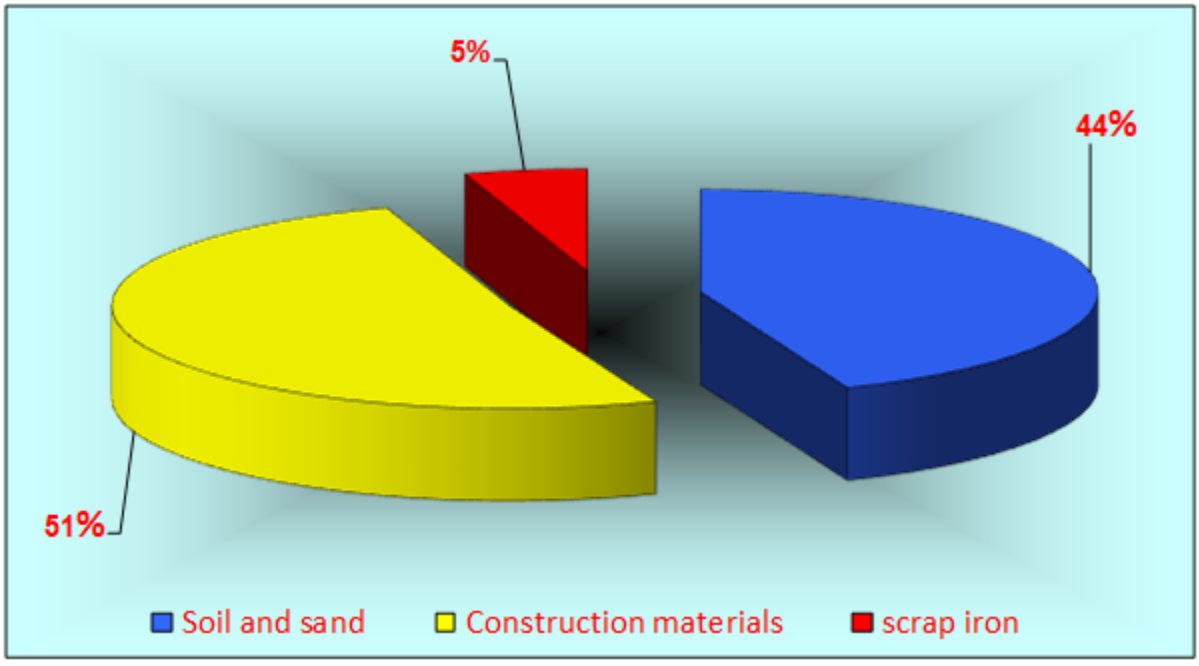
Baghdad, with a combined capacity of 10,000 tons per day, and the recycling of construction and demolition wastes results in 4 different sizes of gravel (Energy Star 2006. P.44), they are used in the infrastructure projects, in addition to the use of sand resulting from the treatment processes to cover the waste carried to the landfill, and these products are provided in the market at reduced prices, and each factory treats this waste in a way that ensures the preservation of the environment and using advanced technology. By studying Table (1) and Figure (1), it is obvious that the amount of soil and sand amounted to 44%, construction materials 51% and scrap iron5%.

Table (1) Types of construction wastes in Iraq.

Type	**(%)**
Sand and soil	**44**
Construction materials	**51**
Scrap iron	**5**
total	**100**

Source: Prepared by the researcher based on the data of the Iraqi Ministry of Environment in 2021.

Figure (1) types of the construction wastes in Iraq.



Source: based on the data of table (1).

Construction wastes may include several different components, such as; Tiles, ceramics, electrical wires, wood, iron, iron or plastic pipes, glass, paints, glues, insulation materials, gypsum boards, bricks (Energy Star 2006. P.50) and other materials that may be directly or indirectly involved in the construction process, and these materials are usually of a relatively high cost, especially if the cost of construction work is high, this leads to a demand for a larger amount

of materials used during the construction process, which in turn increases the amount of construction wastes resulting from this process, and the first step includes reducing The amount of wastes that ends up in landfill, simply by reducing the amount you produce in the first place, and through careful planning. The building and construction sector is one of the most important energy consuming sectors, as it represents one third of the world's total energy consumption, as well as causing one third of CO2 emissions in the world, and this leads to environmental, health and psychological problems for humans and society with an increase in other urban problems in the city, and this is caused by Reliance on fossil fuels and construction materials and excessive consumption of natural resources that cause an increase in environmental emissions that result in global warming (Energy Star 2006. P.56). The concept of green buildings emerged with sustainable trends in the fields of architecture and urban planning, it is considered an integrated architecture with the environment and nature, as it works on reducing the pollution rate to 1/6 of CO2 emissions in the world, and provides a safe, comfortable and healthy environment for humans, and reduces the consumption of natural resources and preserves them for future generations by recycling wastes and sewage, roofs and facades Green and the use of building materials adequate to the environment, as well as the integrated design of buildings and the urban context in terms of shaping and orienting the buildings, using sustainable constructing materials, renewable energies and others. The climate in Iraq, especially in the summer, is characterized with high temperatures may reach 50 degrees Celsius, with temperatures dropping in winter and varying greatly between summer and winter, (Garrison, Noah & Horowitz, Cara 2012, p. 256). Therefore, we need buildings that take into account the thermal comfort requirements of humans, reduce energy consumption and natural resources, and provide an appropriate healthy and psychological environment that reduces harmful emissions to the environment. There are many obstacles to the construction of the green buildings in Iraqi cities; the most important of them are laws and legislation that need to be legislated in line with technological progress in the field of architecture, as well as technical, financial and other obstacles.

- **The Climatic changes in Iraq and their reflection on the Iraqi city:**

Climatic change is a natural phenomenon that occurs every several thousand years However, due to the increased human activities, this has led to the acceleration of climatic changes, and the United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change in the climate that is directly or indirectly attributed to human activity and leads to a change in the composition of the global atmosphere that it is noted in addition to the natural variability of the climate, over regular periods of time, meanwhile the greenhouse effect: it indicates that the atmosphere currently contains 380 parts per million of carbon dioxide, which is the main gas that causes global warming, compared to 275 parts per million that were present in The atmosphere before the industrial revolution, as the global warming phenomenon is known as the gradual rise in the temperature of the lower layer of the atmosphere near the Earth's surface, and the reason for this temperature rise is the increase in the emission of greenhouse gases , and the most important of these gases, is methane, which is formed by microbial interactions In the rice fields, the ruminant livestock, and from burning the biomass (trees, plants and animal waste), as well as from stagnant swamp water. In addition to methane, there is the nitrous oxide gas (also formed from microbial reactions that occur in water and soil) and a group of chlorofluorocarbons (which cause the erosion of the ozone layer) and finally ozone gas, which is formed in the lower atmosphere. The quantitative estimates of greenhouse gases in Iraq, as shown in Table (2), indicate that they amounted to about 197 million tons of carbon dioxide equivalent in 2020, according to the United Nations data on the amount of carbon dioxide emissions resulting from the consumption of petroleum products and natural gas, where It increased by about 106 million tons in 2015-2016 to about 210 million tons in 2018-2019, and decreased to about 185 million tons in 2021, due to global conditions, including the outbreak of the Covid-19

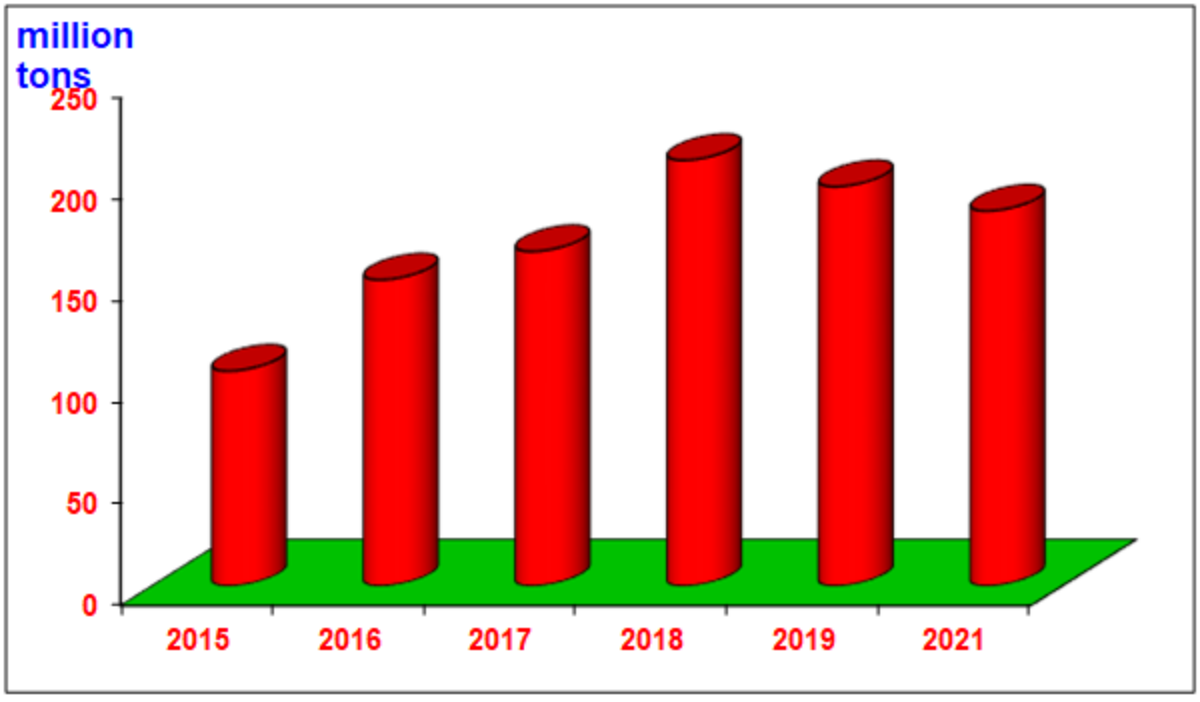
pandemic, which led to the suspension of most industrial activities in the world, including Iraq.

Table (2) the amount of carbon dioxide emissions in Iraq and its amount in the world during the period 2015-2021

Years	The amount of emissions in Iraq (million tons equivalent of carbon dioxide)	Amount of emissions in the world (%)
2016 – 2015	106	0.32
2017 – 2016	151	0.56
2018 – 2017	165	0.58
2019 – 2018	210	0.70
2020 – 2019	197	0.55
2021 – 2020	185	0.45

Source: According to international estimates, the database of the World Resources Institute, Washington, USA, in 2020.

Figure (2) The amount of carbon dioxide emissions in Iraq in million tons equivalent during the period 2015-2021



Source: Based on the data of table (2)

The electricity sector is the main source of carbon dioxide emissions resulting from the consumption of petroleum products in Iraq in 2021, where the CO2 emissions reached about 42.2% of the total emissions, followed by the transportation sector with a rate of about 16.4%, then the industrial sector with a rate of about 17.1%, Roads and contracting with the least ratio of 2.1% of the total emissions, and the average contribution of the agricultural sector to the amount of carbon dioxide emissions during the period 2015-2021 AD was about 14.8%, despite the fact that Iraq's emissions of greenhouse gases represent only 0.45% of the world's total emissions in 2021, which made Iraq move towards a sustainable development strategy in the field of green building by conducting studies that would reduce the temperature rise through the tendency to green building as they preserve the natural environment and reduce temperature rise.

- Choosing the efficient regions for the establishment of sustainable cities in Iraq:

The development of the environmental design (green or sustainable) believing that buildings that provide an environment which preserves the health of its users and uses less energy and leads to a reduction in its negative impact on the environment will not be feasible if it is isolated from the culture and lifestyle of the community. If the energy usage in the buildings is reduced to be applied in other activities, the design trend will not achieve its goal, so it is necessary to link this design thought to the basic values that prevail in many cultures around the world (Word, D, Self, 1973.p.520). Sustainability requires transformations in our beliefs and actions and building institutions that exclude the values of inconsistent consumption, greed, and violence, in order to reach principles and values that help in developing the spiritual basis for the development in our lives and our society, such as the affirmative values on the richness of work and obtaining happiness with less consumption, and not holding on to seeking of wealth.

1- The role of GIS in choosing the optimal location:

The best way to respond the environmental problems is the necessity to take the environmental considerations into the development plans and projects through what is known as the assessment of the environmental impact on the projects, which is part of the tasks in designing establishments and environmental planning. Due to the increase in the population and limited resources, environmental problems have worsened to a stage that the traditional methods are unable to solve. This prompted the search for more rapid and more advanced methods to find appropriate solutions in the shortest time (Turner, J., 1967.p.896) and the attempt to predict them before they occur. The use of computer programs played a major role in responding the environmental problems, and one of the most widely used programs in This field is the geographic information system (GIS), and with the aim of adopting a scientific methodology in scientific procedures for environmental impact assessment, we have used the GIS system in order to choose the optimal location for the proposed development (for the city of Iraq, which represents the case of the study) so that it fulfills a set of requirements that will reduce its negative effects and increase the positive impacts, By taking advantage of the ability of GIS for spatial analysis, processing, modeling and presentation.

A- **Data collection and preparation of satellite images and plans for work**:

The data was collected and used to choose the best location for the green urban development projects, where the maps were obtained from the military surveying at a scale of 1: 100,000, a map of the Arabian Gulf system, a map for Arabian fault system information about the environmental and archaeological sites, museums, and DEM points of Iraq with an accuracy of 1: 100,000, through which we were able to Modeling the elevations over the entire study area, in addition to an aerial image of Iraq from LAND SAT, with an accuracy of 15 meters in 2021 AD. The satellite image was analyzed using ERDAS program and Google Earth image.

B-Inserting the maps and the information into the computer and numbering them:

This was done through the following stages:

-Scanning stage: the entire map was scanned with a scanner.

- Geo-referencing stage: The Geo-referencing is assigning the plan to the real space corresponding to the ground, and clearing it of most of the distortions accumulated on it, which is the most important stage, as the global ellipsoid WGS84 was adopted and the projection that suits the study area (Iraq) and approved by the General Authority for Remote Sensing, which is UTM Z37N, which is the Universal Transverse Mercator system that divides the globe into 60 regions towards the north and south, each region extending over six degrees, and each region having a central longitudinal line, and the IN, 1S regions starting from W - 180 degrees, and Iraq is located in the 32nd region north.

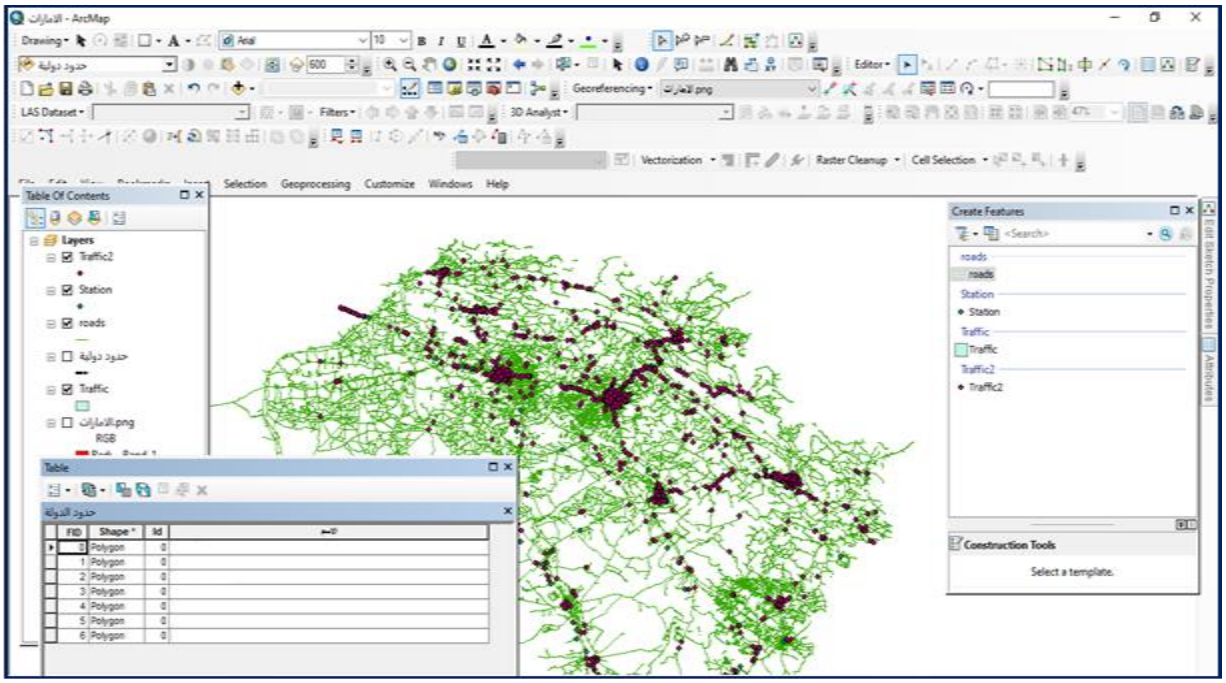
WGS_1984_UTM_Zone_37N
Projection: Transverse Mercator

Central Meridian: 39.000000

GCS_WGS_1984
Datum: D_WGS_1984

The maps were directed in a linear way (at least three control points are not on the same line), using a toolbar, Georeferencing, where four control points were added for each map through the tool "Add control points" and by adding a link in each of the corners of the map and entering the correct coordinates that are taken from the map A link table is formed with the coordinates of the four control points that were used to geo-reference the map (source and destination), as shown in Figure (3). In the same way, the aerial image of Iraq was directed, in addition to the maps and images obtained from. Google Earth, and digitizing the maps using GIS tools. The image (Raster data) was converted to radial features, with geometric properties (point - line - polygon) and provided with the associated descriptive information so that spatial and descriptive queries can be applied together and various analysis that users of the map concern. (Simon, F., 1978.p.210) This was done in two stages: - Spatial digitization of features from the digitizing map, using the computer, so that it was digitized on the image of the referenced map.

Figure (3) shows a set of layers that were scanned (roads in all degrees- Residential communities-Iraq borders)



Source: outputs of Arc GIS 10.8 program for year 2021.

-Attributing descriptive data, which is the stage in which spatial data is provided with its appropriate and available descriptive information, within the table of each layer.

We initially created a database for the project Damas and created a Dataset in it called Altilal, which has the UTM Z37N projection system and the WGS84 ellipsoid.

- Polygon Feature classes for (the borders of the Iraqi governorates, lakes, residential areas).

- Linear feature classes for (roads, highways, highways, railways, faults, and borders with neighboring countries).

- Point Feature classes for each of the artifacts in the area, points denoting residential areas, Figure (2). The layers were uploaded from the geo-referenced maps and the aerial photograph of Iraq to show the layers together. Figure No.2 shows a group of layers that have been uploaded. The stage of coding and cartography is based on the principle of classification (sorting similar or close features into groups) and coding (to represent features in graphical forms that express reality).

Information processing by Geographic information system (GIS):

The land use layer:

Directed, positioned with the aerial photo then change the way of displaying, classifying and redistributing the marks for each of the classifications of the land uses layer so that the conditions of our country and the conditions of preserving vegetation cover and water bodies have been taken into consideration. by excluding the areas of water, wetlands, dense forests and agricultural lands from the appropriate areas for placing the green urban development project on them by giving them a score of 100. These areas fulfilled the conditions, as a result, the total scores for them will have a negative value, and they are excluded from the analysis (Sauser, C, 1974.p.56),And As well as the unwillingness to choose residential areas with high density, and it was given a score of 50 Thus, it gets a lower score, which reduces the suitability of those areas, Residential areas of low density are not rejected, but the areas suitable for urban development are open barren areas and semi-open and vacant areas

The natural element is taken into account within the design of the proposed project by placing gardens, swimming pools and green spaces on its land. The degrees are distributed by the research team, in line with the conditions for the location of the facilities and the specificity of the conditions of the State of Iraq.

.**Finding a Natural Earth Model:** A set of points of known height were obtained from the DEM through which the natural land surface can be modeled, and thus obtaining a Raster expressing the natural land surface model that was used in the spatial analysis processes, as shown in Figure (4).

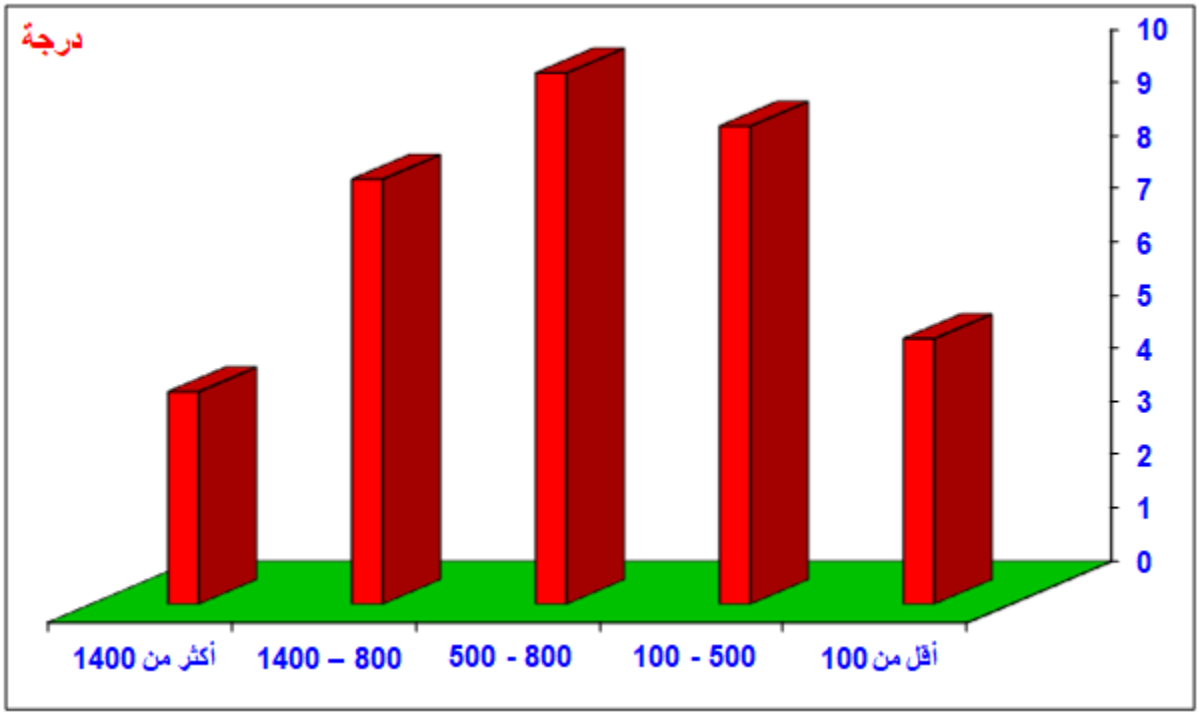
Table (3) shows the distribution of scores on the classifications of the hieght layer

Degree	**Height (field)**
5	**Less than 100**
9	**500 – 100**
10	**800 – 500**
8	**1400 – 800**
4	**1400more than**
0	**NO DATA**

Source: From the outputs of the Arc GIS 10.8 programs for the year 2021 AD

Height condition: The height layer has been reclassified into five domains and the distribution of degrees out of 10 which is specified for this as follows, Table (3).

Figure (4) shows the distribution of degrees on the classifications of the height layer.



Source: According to the data in Table (3).

The values of the distribution of degrees were set by the research team, in a manner that suits the nature and conditions of the research area. According to the nature of the research area, it was found that the height of 500-800 meters is the most appropriate for urban development, as it achieves a better view, an acceptable cost, and a better climate, and the height from 800 meters to 1400 meters is desirable in summer residences, It gives a more beautiful view and a more appropriate climate, with the possibility of carrying out construction operations at a higher cost (Ratcliff, R.U. 1975.p.89), With altitudes greater than 1400 meters, construction operations become difficult and costly, and the resulting layer is shown in Figure (4).

The slope layer: This layer shows the suitability of the tendency for urban development, taking into account the structural, architectural, economic and aesthetic factors.

Because of the importance of this layer, it was given a weight of 20 degrees, as the lowest slope is the most suitable for engineering development As for the large slope, it is less suitable for engineering development due to the slope of the roads, the increase in the amount of excavation and backfilling, and the cost of retaining walls, and on the one hand, the flat land is less suitable regarding aesthetically .By testing a range of values, a range of slope 5-15% was obtained that achieves the aesthetic appearance and at an acceptable cost (Produfoot, M.J., 1975.p.89), Thus, a degree of 20 is given. As for a slope

greater than 20%, it is less suitable from an economic, architectural and constructional point of view. Therefore, it is given a degree of 8.

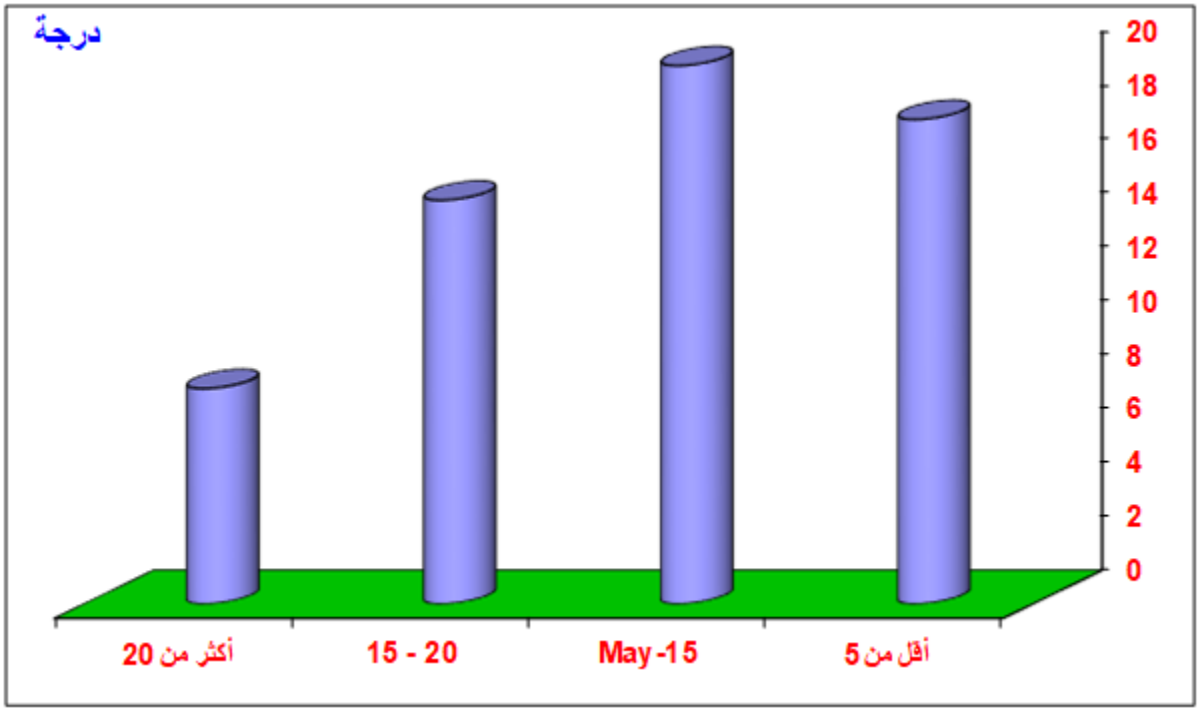
Table (4) and Figure (5) show the scope and degree of the slope.

Table (4) shows the distribution of degrees on the slope layer classifications.

degree	The field (slope %)
18	**Less than 5**
20	**15 – 5**
15	**20 – 15**
8	**More than 20**

Source: From the outputs of the Arc GIS 10.8 program for the year 2021 AD.

Figure (5) shows the distribution of degrees on the ratings of the slope layer



Source: Based on the data in Table (4).

-Surface water modeling.

The design of any facility needs to know the watercourses in order to avoid the risk of flooding and rainstorms, so the surface water was modeled using the GIS system to determine the watercourses that should be excluded from the optimal sites (Mayer, H.M, 1975.p.122).

View direction:

The view orientation matrix and the distribution of scores for each category were both calculated.

The preferred direction is the south direction, Table (5).

Figure (5) shows the distribution of degrees on the ratings of the slope layer

Direction	**degree**
North	**0**
the Northeast	**1**
the East	**2**
southeast	**3**
the South	**3**
Southwest	**3**
the West	**2**
North West	**1**

Source: the outputs of Arc GIS 10.8 program for the year 2021.

- Setting a campus distance for a group of layers: Due to the absence of the Iraqi standards for the required campus values about the group of classes studied, it was logically chosen by the research team, after reviewing multiple criteria used for evaluation and application of classifications and weighting for those standards in other countries and their alignment with the conditions of a country Iraq (Ludlaw, WH, 1964.p.862), in order to fulfill each of the following conditions

a-The distance from the archaeological areas, the sanctuary of the archaeological areas, is 2.5 km.

b- Distance from the roads (less than 500 meters).

C- The distance from the main roads is less than 2.5 km.

D- The distance on the highways is less than 9.5 km and greater than 500 metres.

E-The distance from the rivers (the sanctuary of the rivers is 300 meters).

F-The distance from the faults is greater than 150 meters

- Setting the weights and conditions necessary to perform the processing using GIS:

In order to find the visible area, the layers that represent the required conditions were re-classified with markings in order of importance so that the total scores of 100 were then collected for the conditions that were taken into account (ten conditions were studied), which are:

1. The requirement slope is 20 degrees .
2. Fluxes, which must be avoided when choosing a site, with a degree greater than 4 to avoid the risk of flooding, 20 signs.
3. Classification of the lands Its marks were distributed according to the desired type of land use, 15 degrees
4. The height conditions is 10 degrees .
5. The distance from the rivers, the sanctuary of the rivers, is 300 meters, to protect the water resources, 10 marks.

6. The distance from the archaeological areas The sanctuary of the archaeological areas is 2.5 km to protect the historical monuments 7 degrees
7. The distance from the roads is less than 500 meters, so there is no need to study a road project (the least expensive): 5 degrees .
8- The distance from the main roads is less than 2.5 km, about 5 signs.
9- The distance from the highways is less than 9.5 km, and greater than 500 meters to avoid noise 5 signs.
10- Slope direction is 3 degrees .

As a result of summing the magnitudes we chose for the conditions, we get locations with a total of different degrees, the optimal location at a degree of 100%, and locations up to a total of 80% degrees are considered appropriate for the project, and with the number of project locations determined, the extent to which this location fulfills the required conditions is discussed.

[F_main] + [f_river] + [f_stream_t] + [f-athar] + [f-road] + [myaspect_t] + [myelevat_tt] + [myslopet_t] + [finaluses_ra] + [f-high]

- Setting several options for choosing the optimal location:

The areas that achieve a total of up to 80 degrees can be selected, given that it is possible to accept areas that achieve a total of 80 degrees according to the magnitudes chosen, and therefore these areas constitute alternatives for choosing the project location, and in the end, the areas located at a distance less than 150 meters from the fault lines in the study area, thus obtaining the final layer, which constitutes the sustainable model for urban development (Lang, Jones & Meghraj, LaSalle 2008, p. 78). We can find the areas that achieve a total score of 100%, which represents the optimal place that achieves all the required conditions, and these areas are from Iraq, and they constitute other alternatives to the project site.

- Final report:

An appropriate map for urban development was produced and directed towards new lands designated for urban growth, while preserving existing residential areas, and freezing urban development in areas not designated for urban growth in order to achieve sustainable development, Map (2). Therefore, the optimal location for the proposed urban development project can be selected from these identified areas, and then an environmental impact assessment report is drawn up that shows the project's environmental impact on the location chosen from the previous alternatives, (Simon, F, 1978.p.220), which were selected according to Terms reduce negative effects and increase positive effects.

Map (2) proposed areas for the establishment of green development in Iraq in 2021 AD.

Source: Based on the satellite visual data "Thematic Mapper" TM of the American satellite land sat 8/1/ 2021 AD for Iraq.

Obstacles of the green urbanization applications in Iraq:

Green buildings are uncommon to ordinary people as they live in underground houses or homes built from straw bales or recycled tires, with a lack of sustainable building materials and the availability of traditional building materials (Handbook" vol. 1, Spon Press and Taylor & Francis Group. Boston , London Words & Images 2008, p.89) that cannot be recycled, it emits toxins, pollutes the internal environment of the building and lack the technical knowledge of builders and manufacturers, and the reluctance of builders to build green buildings as a result of the lack of knowledge of green building. Therefore, the Iraqi Ministry of Environment developed a green building evaluation system to encourage green buildings. And established training courses for green building manufacturers to increase knowledge of the green building industry, in addition to the weak understanding of green building technology by the community and constructers, and the existence of systems for evaluating green building that are inappropriate with the climatic, social, economic and environmental requirements in some countries such as Iraq, and the absence or weakness of building laws and legislations for green buildings Compatibility with all societies and the weak provision of modern technologies for green buildings in the field of Renewable energy, insulators, recycling, rainwater, and sustainable materials, especially in the developing countries, and the conceptual weakness of green buildings by designers, manufacturers and society as a sustainable alternative to traditional buildings. There are economic obstacles. The most

important obstacles to green urban development in Iraq can be analyzed as follows:

1- The Infrastructure:

The Iraq's infrastructure includes health centers, drinking water and sanitation, roads, bridges, airports, ports, railways, communications, housing, electricity generation and distribution. Infrastructure projects are huge projects such as dams, highways, huge ports, large power stations or smaller projects such as secondary highways to connect with the large highways. Iraq suffers from the deterioration of its infrastructure due to the wars of the former regime and its policy that extended from 1980 until its fall in April 2003 and the subsequent occupation, breakdown of security, sectarian conflicts and terrorism, in addition to the financial crisis that Iraq was recently exposed to because of its economic policy which is based on a one-sided rental economy (Simon , F, 1978.p.230) And because of the drop in oil prices due to the outbreak of the Corona virus, which caused the country great losses and exposed its infrastructure to destruction, and here is a study of the most important Iraqi infrastructure networks:

-Transportation:

Transportation in Iraq includes railways, highways, waterways (sea and river), pipelines, ports, harbors, and airports. The total length of the main roads in Iraq is approximately 45,550 km, of which 38,400 km are paved roads. And 7.150 km is still unpaved according to the estimates of 2021 AD, and the largest street in the world is found in Iraq which is the road from Baghdad to Syria (Al-Waleed), in Iraq a there is a total of 113 small, medium and large airports, some of them are military airports and others are civilian airports and some of these The airports have unpaved lanes, Shatt al-Arab is one of the most important waterways in Iraq, but some areas of Shatt are unsuitable for navigation due to their insufficient depth in some areas. Approximately 1,000 kilometers from Shatt al-Arab are considered navigable using giant ships, the lack of sufficient ports in Iraq by the sea led to the first Gulf War. The port of Basra and Umm Qasr port are among the most important ports in Iraq. There are other smaller ports such as the port of Khor Al-Zubair and the port of Khor Al-Amaya. According to 2021 statistics, it owns 13 giant oil tankers, 14 cargo ships, and one passenger ship.

- Health centers:

The number of both types of hospitals (secondary and tertiary services) is 281, and their total ratio is 0.7 per 100,000 people, which is a very small ratio. As a whole, this leads to a poor level and quality of the services it provides.

- The power stations:

The Ministry of Electricity generates about 5,500 kilowatts of energy, while the actual need exceeds 10,000 kilowatts. This year"2021" budget allocated approximately one billion and 300 million dollars, which is the same amount that was allocated for the past year budget and the ministry needs according to its estimatesalmost two billion and 600 million dollars. Currently, in order to fend off the attack the ministryis facing, the ministry is resorting to the parliament's approval of allocating 500 million dollars to purchase the fuel needed to operate its stations from neighboring countries.

2- Traffic:

The traffic is really old problem, because of the successive wars on Iraq, forced deportation, increased rates of migration from the rural areas to the city and the high population density in Iraqi cities, and that most of the roads and streets in Iraq were designed and implemented after the establishment of the Reconstruction Council in 1950. Most of them were constructed in the seventies of the last century and were originally designed for a certain capacity, and the previous phase did not witness development projects, although it does not match the annual increase in the Iraqi population, but it remained a crisis confined to a narrow scope, and Iraq has about 8.5 million vehicles, which emit an estimated amount of pollution of 10.2 million tons.

3- The role of petroleum refineries in pollution:

The Iraqi environment has suffered significantly as a result of oil and gas operations, which led to anenormous pollution of the various elements of the environment (water, air and soil), through

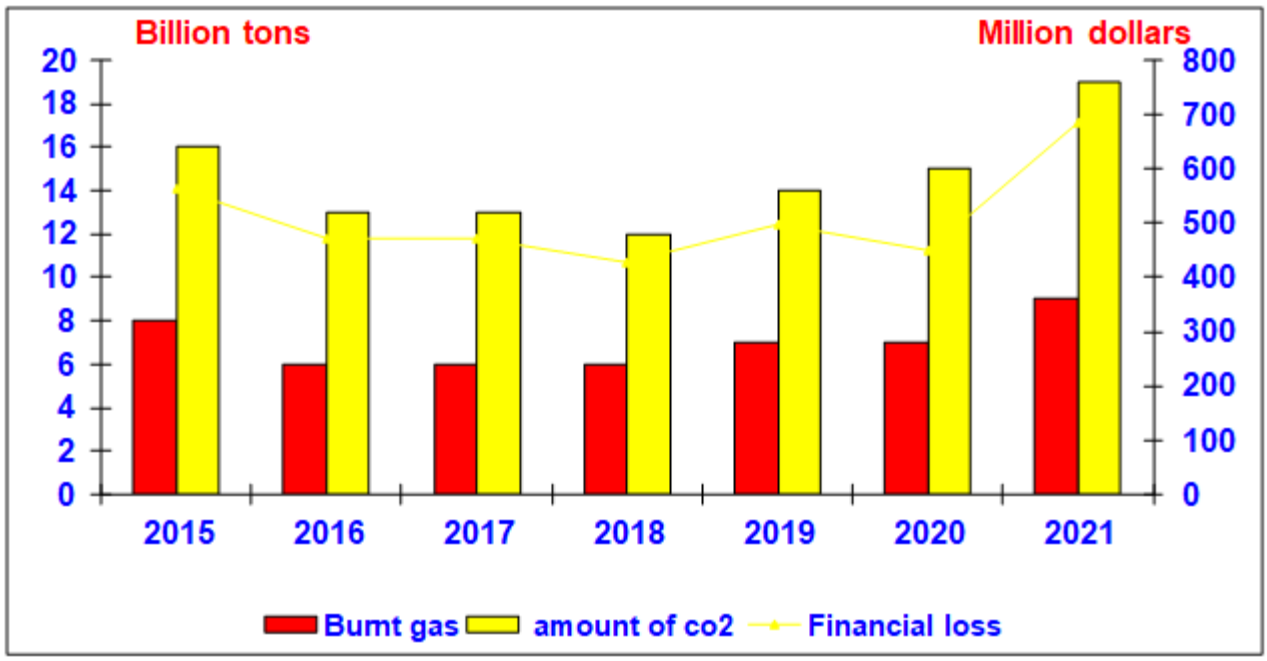
drilling oil wells, whether exploratory or productive, and the water, mud, acids and materials left behind them. Various chemicals can leak or combine with the elements of the environment causing pollution. By studying the figures in Table (6) and Figure (6) it is concluded that the development of the rates of burnt gas produced from Iraqi petroleum refineries, which amounted to 7.9 billion m^3 in 2015 and increased to 9.6 billion m^3 and this is attributed to the petroleum extraction rates. The amount of pollutants resulting from CO2 reached to 19.23 billion tons in 2021 AD, and the size of financial lossreached 686.6 million dollars in 2021 AD. Regarding oil transportation problems, Iraq owns 13 giant oil tankers, and 14 ships transporting goods and petroleum materials, transportation of the oil resulted in the leakage of many environmentally harmful substances into the Gulf waters, which harmed the fisheries and led to the death of large numbers of fish.

Table (6) Amounts of carbon dioxide produced and financial loss resulting from the petroleum refining operations in Iraq during the period 2015-2021.

years	**Burnt gas cm^3 /year**	**Amount of co2 in billion tons**	**Financial loss in million dollars**
2015	**7.9**	**15.8**	**564.3**
2016	**6.6**	**13.2**	**471.4**
2017	**6.6**	**13.2**	**472.9**
2018	**6.0**	**12.0**	**428.9**
2019	**6.9**	**13.9**	**498.9**
2020	**7.5**	**15.1**	**450.9**
2021	**9.6**	**19.2**	**686.6**

Source: Based on OPEC data for several years in 2021.

Figure (6) Amounts of carbon dioxide produced and financial loss in Iraq 2015-2021.



Source: based on data of table (6).

A lot of people believe that the implementation of green building requires lots of financial investments and their marketing is difficult. The studies of the Iraqi Ministry of Environment concluded that:

-the Green building does not need to higher cost.

- It turns out that the Green building save more money by reducing the energy and water consumption in as well as the operations and maintenance costs in the long term.

- The Green design features of the buildings and the internal environments can improve the worker's productivity and the health and well-being of occupants, resulting in major benefits for businesses.

Table (7) shows the proposed plan for the establishment of green cities in Iraq until the year 2050 AD, as it is obvious from the table that the number of cities expected during the study period will rise and that its establishment is a necessity and there is no alternative to it. The study period was 10 cities in the year 2050 AD, and this was attributed to facing the severe climatic changes that the country is witnessing.

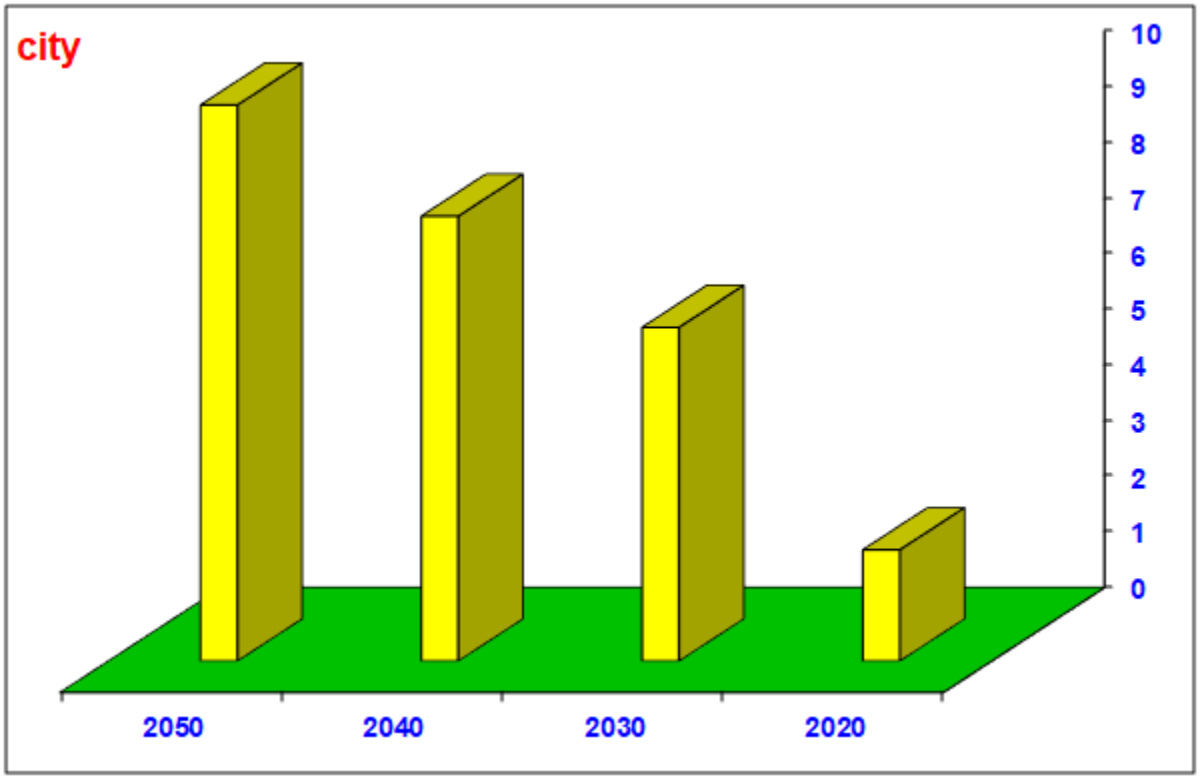
Table (7) number of the proposed green cities in Iraq until 2050 AD

Year	**Number of cities**
2020	**2**
2030	**6**
2040	**8**

2050	**10**

Source: the outputs of the Arc GIS 10.8 program for the year 2021 AD.

Figure (7) number of the proposed green cities in Iraq until 2050 AD.



Source: based on the data of table (7)

Climate interferes in the modern urban planning through some aspects, such as choosing the industrial areas, recreational areas, and residential areas. One of the most important climatic elements that are taken into consideration while planning is the wind; as it imposes the placement of the industrial areas and the waste collection places in the direction of their departure after passing through residential and recreational neighborhoods. The extreme climatic phenomena affect the pattern and the direction of urbanization, and even affect the shape of the building, as the impact of the wind varies in forming of dusty phenomena according to their characteristics, that are determined by their velocity and directions (Kamwa, Ghada Mohamed Ismail 2015, p.56); The wind has force and pressure on the surface of the earth that varies according to its velocity; When the wind speed reaches a certain speed, then it becomes an influential force that can move the particles of the earth's surface from soil, sand and others to raise them upwards, overcoming the force of earth's gravity, and in general the effect of wind increases due to the occurrence of dusty phenomena in the central and southern regions of Iraq when its velocity reaches 3 - 4.9 m/s during the hot season of the year, especially during the transitional months. Whatever the type or size of the building, the climate intervenes in the choice of its location and the choice of materials used to build and design it. Also, the important elements that are usually taken into account in this choice are temperature, solar radiation, wind and rain, it

is not the prevailing climate alone that interferes in the design and orientation of buildings Indeed, the detailed climate of the sites chosen for construction can make some subjects more habitable than others within the same type of climate, and the variation in the detailed climate from one place to another occurs due to the local factors such as the height of the land or the presence of sluices, vegetation areas, or industrial areas or nearby residences. (Energy Star 2006. p.44)

Conclusions

1- Urban climatology is considered as one of the physical geography branches, which is concerned with studying the climate impact on human activity. The studying the climate impact on the urban planning is one of the concerns and fields of this branch of geographical studies.
2- One of the most important reasons for the establishment of green building is to achieve sustainable development without compromising the quality of life for all the people of the earth, and this was provided by the Hanover Principles, which was announced in 1992 AD, and the depletion of resources and the increase of CO2. Data of the American Green Building Council showed that the annual direct effects of all residential and commercial buildings included 39.0% of the Total energy used.
3- One of the most important advantages of green building is the provision of resources for the life cycle of the building, starting from the green design stage, and low energy utilization, thus reducing the global warming, depletion of the ozone layer and causing damage to biodiversity.
4- The building is designed so that it does not need electricity to light it during the day; in most of the daylight hours, natural lighting is sufficient, thus saving about 20% of lighting expenses. In addition, the wastewater generated from the building is circulated by a special purification process
5- The best way to respond the environmental problems is the necessity to take the environmental considerations into the development plans and projects through what is known as the assessment of the environmental impact on the projects, which is part of the tasks in designing establishments and environmental planning.
6- The values of the rating distribution were set by the research team, in a way that suits the nature and conditions of the research area. According to the nature of the research area, it was found that the height of 500-800 meters is the most appropriate for urban development, as it achieves a better view.
7- The design of any establishment needs the identification of the sluices in order to avoid the risk of flooding and rainstorms, so the surface water was modeled using the GIS system to determine the sluices.
8- It was concluded from the study a rise in the number of cities expected during the study period and that its establishment is a necessity and there is no alternative to it. It proposed in 2020 AD the establishment of two cities, then 6 cities in 2030 AD, then 8 cities in 2040 AD, to reach during the study period 10 cities in 2050 AD.

Recommendations

1- The actual contribution to reducing the desertification, preventing its access to the Iraqi depth, protecting the fertility of Mesopotamia and the agricultural production, reducing the environmental degradation and protecting the biodiversity threatened by the climate changes and the rise in surface temperature.
2- Provision of job opportunities for thousands of Iraqi citizens from different governorates, stimulating the national economy, and learning to practice professions and other economic activities.
3- Creating a general situation of collaboration and a sense of a common fate, national responsibility and solidarity to implement a project for the public benefit.
4- Enhancing the capabilities of scientific research and developing capabilities in the fields of renewable energy, environment and engineering, and contributing to moving Iraq to the stage of effective adaptation to climate changes.
5- Opening investment opportunities in Iraq and benefiting from successful global experiences in the field of operation, combating desertification,

marketing, management, coordination, export and others.

6- Achieving prevention of diseases that affects the people caused by dust storms and dust, reducing pressure on national hospitals and clinics, providing treatment costs and easing the burdens of citizens who are victims of dust storms.

7- Iraq should play its required role in the field of combating desertification and adapting to harsh climatic changes in the region, in line with Iraq's obligations under the United Nations Convention to Combat Desertification.

8- Enhancing Iraq's experience in working with international agencies concerned with improving the environment and building a green economy.

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