Sustainability Indicators In Green Residential Buildings (Jawaher Dijla Residential Complex), Baghdad As A Model

Munaf Mundher Abdulhussein[a,*] ,
Prof.Dr.Nada Khaleefah M.A.Alrikabi[b]

[a]Urban and Regional Planning Center, University of Baghdad, Iraq.
Email: Manaf.Monzer1200a@iurp.uobaghdad.edu.iq
[b] Urban and Regional Planning Center, University of Baghdad, Iraq.
Email: Dr.n.khalifa@iurp.uobhdad.edu.iq

ABSTRACT

The pressure on the environment as a result of the increase in the size of the population, especially in urban cities, where this increase was accompanied by the need for housing as well as the need for services and activities led to the emergence of many vertical residential buildings represented by residential complexes within the urban fabric of the city of Baghdad within the methodology of urban dictation policies in the regions The empty spaces in the city and its exploitation to fill the housing crisis, and the fact that it will occupy a large number of residents as a result of the multiplicity of floors and dwellings, that these buildings must be subject to the standards and requirements of sustainability in their spatial location and in their functional performance in addition to their urban structure in order to adapt to local environmental conditions and improve the life and health of its residents In a better way, achieving prosperity at the level of generations, and encouraging the trend towards sustainability in residential buildings instead of traditional construction to reduce environmental problems, as the modern style of buildings directed to apply the foundations and requirements of sustainability and was not limited to buildings only, but also included sustainability in the urban environment in order to create a healthy environment for the population And improving the environment by designing green seating areas and recreational areas in addition to movement paths to encourage walking and cycling to reach nearby services instead of using vehicles that harm the environment. Orienting buildings, solar radiation and wind, as well as mechanisms for collecting waste, rationalizing energy use, and other mechanisms for achieving sustainability at the level of buildings, which were mentioned in the theoretical framework. Therefore, this research dealt with and shed light on the study and analysis of the residential complex (Jawaher Tigris) in order to know the indicators that it achieved on the level of sustainability and its impact on the built environment.

Keywords: Sustainability, Green Buildings, Sustainable Cities, Sustainable Residential Buildings, Built Environment.

1- INTRODUCTION

The continuous increase in population over time and pressure on buildings, including housing, activities, and services within the urban environment of the city, as well as failure to follow sustainability standards in traditional buildings, has led to pressure on the environment and increased damage resulting from it, such as pollution, gas emissions, energy, and resource depletion, which harm health Humans, in addition to the behavior of the population in using traditional means of transportation and relying on non-renewable energy, all of this leads them to an unhealthy environment and threatens their health. In order to solve these problems, attention is directed towards the concept of sustainability at the city level in general, and then buildings in particular in order to achieve a healthy environment. Where this research will be concerned with identifying the most important concepts related to a green and sustainable city and achieving the requirements of sustainability in residential buildings, as follows:

1-1 The concept of sustainability and urban sustainability:

The term sustainability in general is broad and has many aspects and more than one definition, but the general description of this term remains that it refers to the current ability to meet the needs of the current population without compromising the ability of future generations to do so, as there is a great contradiction between what is required of the land and what can be for the earth to provide [1]. Sustainability is a concept associated with preserving the environment with the aim of achieving the foundations of environmental, social and economic sustainability through continuity in the life of the population in a manner that provides the current need and provides for the shortage in the future and in a way that meets the needs of the population in the present without compromising the ability of generations to meet their needs [2]. Urban sustainability is defined as the best use of resources, ensuring balance and justice between successive generations, protecting the natural environment within the city, economic stability and self-sufficiency, providing well-being for urban community members and meeting their needs, and that one of the goals of urban sustainability is to develop the urban environment while ensuring the right of future generations to contribute to this development. and benefit from its gains [3]. As urban sustainability focuses on reconsidering urban development in all its environmental, social and economic fields, and the policies and practices pursued by urban development in cities. [4].

1-2 The sustainable city

The concept of a sustainable city is a set of basic goals integrated with each other to form a city that enjoys the advantages of reducing the use of non-renewable resources, achieving sustainable use of renewable resources, and

maintaining local and global levels of the ability to absorb waste. In order to achieve these goals, there is an integration between both the natural and built environments. Finally, a sustainable city is one that can achieve well-being for its residents while ensuring the ability to maintain and improve ecosystem services. A sustainable city can also be defined as a city that seeks in its priorities to achieve goals that lead to ensuring the availability of sufficient resources such as reuse, social welfare, in addition to to equality and economic development for future generations, and thus it works to meet the future needs of the city based on the correct assessment, and to meet the needs at the present time [5].

1-3 Green City:

The term and concept of a green city is intended to express a sustainable, environmentally friendly city in which ecosystems are balanced by balancing the absorptive capacity of resources through raising the efficiency of resource use, reducing energy consumption, and reducing pollution and environmental waste in a manner that supports ecosystems and recycling so that it allows the ecosystem to renew itself and protect itself. environment from pollution .Green buildings are a new method of design and construction as a result of the environmental and economic challenges that cast a shadow over the various sectors of the era. They are designed to contribute to reducing the environmental impact and at the same time working to reduce costs, especially (operating and maintenance costs), and they also contribute to creating a safe and comfortable urban environment for humans [6].

1-4 Green Architecture

The concept of green architecture has been linked to the concept of sustainable architecture. Green architecture is defined as a process of designing buildings according to standards and a style that takes into account the environment and reducing energy and material consumption in a manner that is consistent with nature. Thus, it raises the building within the scope of quality and efficiency standards in terms of focusing on the design elements of the building and taking them into consideration. Consideration such as guidance, ventilation, and the use of clean energy alternatives such as solar energy and wind engines, in addition to the element of lighting and building materials, which ensure the reduction of heat, insulation, humidity, and efficient air distribution in a manner commensurate with environmental standards within the spatial location and the natural conditions of the area in which the building is located. Therefore, green architecture is An architecture that guarantees design within a holistic thought, so that the buildings are of high performance in achieving comfort for their occupants in a manner that integrates with the surrounding environment during the life cycle of the building and reduces negative environmental impacts [7].

1-5 sustainable green buildings

With the rise of the culture of the population, the provision of housing to meet protection from climatic conditions, and a sense of comfort, which represents a basic physiological need for a person, whose absence represents a threat to the health and life of the population, negatively, in addition to the lack of a sense of security, and thus will affect social relations, as we find that the lack of feeling comfortable, Including thermal comfort, it creates a danger to the human being, and this will go beyond his physiological problems to his social relations, and from the foregoing, sustainable housing can be defined as that housing that meets all the real needs of its residents and achieves efficient use of resources in order to create a safe, comfortable and environmentally friendly environment, and the design of this housing It means taking responsibility for the sustainability of the materials used in its construction, which allows future generations to have the right to provide decent, healthy housing that meets their physical and psychological needs, as the importance of housing for humans becomes clear, and society and the importance of providing it with means of well-being and healthy living, provided that it is not at the expense of energy consumption and the negative impact on the environment [8].

Through studies prepared in the field of green buildings, the common basic principles of green buildings that must be recognized and adopted to achieve a sustainable environment can be identified: Protecting energy and natural resources, Recycling and manufacturing

Reliance on renewable energy sources. Where the concept of energy and its protection is embodied in all kinds of energy that we need to manufacture the product or the energy needed to convert raw materials into products or to process, invest and manufacture raw materials [9].

2.1. Case Study (Jawaher Dijla Complex)

The spatial location of the study area is the Jawaher Dijla residential complex in the city of Kadhimiya, which is located within one of the municipalities of the city of Baghdad, which is the municipality of Kadhimiya, as it is located to the north of the capital, Baghdad, and 5 km in its western side, between longitudes (44° 18 30" , 44° 20 10") to the east and latitudes (33° 24 10” , 33° 20 40”) to the north and along the banks of the West Bank. The western side of the Tigris River. The residential site of Jawaher Tigris is characterized by its distinctive location on the river bank on the side adjacent to the side of Rusafa in the city of Adhamiya. The spatial location in relation to the religious importance of the city of Kadhimiya is due to its containing the shrine of the two Kazimian Imams, peace be upon them, where the residential complex is 700 meters away from the shrine. The spatial importance and characteristics of the city on the residential complex, where the activities and events are characterized by their connection to the religious function such as markets, shops and hotels, in addition to the presence of green and recreational areas and parks, the reality of the river’s edge towards the residential complex. The following figure shows the spatial

location of the residential jewels of the Tigris in relation to the municipalities of the city of Baghdad

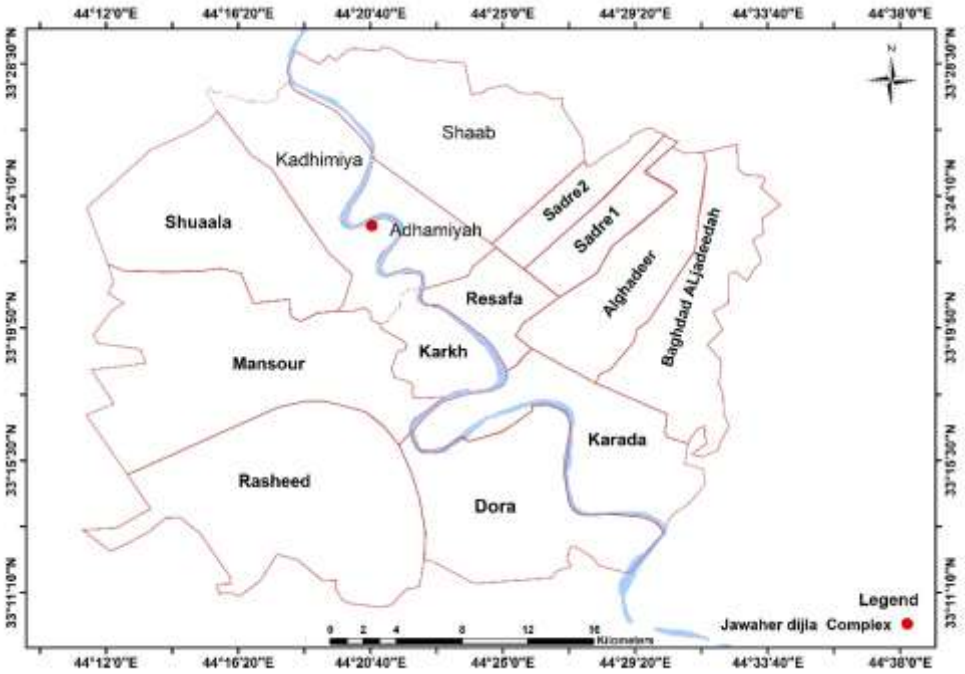

Fig. 1. A map showing the location of the study area (the residential jewels of the Tigris) in relation to the municipalities of Baghdad

Source: Author based on the data of the Baghdad Municipality Department, Baghdad, for the year 2022

The map in Fig 2, it can be seen the residential location of Jawaher Dijla in relation to the municipalities of the city of Baghdad, where the location of the study area is located within the municipality of Kadhimiya and adjacent to the municipality of Adhamiya, where it is separated from it by the river's edge.

Fig. 2. A map showing the location of the study area (Jawaher Tigris Residential)

Source: The researcher based on field survey data and producing maps using ARCGIS 10.8.

2.2. Analysis of the buildings and the urban environment of the study area

Within the axes of this title, the reality of the buildings and the elements of the urban environment of the study area will be analyzed. At the building level, the residential complex consists of a group of buildings designed according to sustainability standards, which number 15 residential buildings, consisting of 9 to 12 floors. At the design level, the buildings are characterized by building materials suitable for the environment. Where the use of environmentally friendly materials in the manufacture of concrete, makes it durable for a longer period, and the buildings are equipped with glass facades that allow the entry of lighting and ventilation in addition to the property of sound and noise insulation, and provide views on two sides of the riverside, and on the other side the two repressive imams, peace be upon them, in addition to providing buildings With the central systems of protection and control, fire systems and electronic lighting, in addition to taking into account the direction, the wind and the direction of the building with solar radiation, and the following figure shows the shape of the buildings within the study area. See figure 3

Fig. 3. Residential Buildings (Jawaher Dijla Residential) [10].

Through Figure 3, it can be seen that the element of sustainability is strengthened in the buildings, represented by the green vegetation and plantings on the roofs of the buildings, and the glass facades that allow the sun's rays to pass through them and are considered one of the methods of sustainability in the design, since this element is specially made of recycled materials and is environmentally friendly and also provides a beautiful view. The building reflects positively on the comfort of its occupants, and at the design level, paint colors were used that reduce heat absorption and reflect sunlight, and the design of the openings allows for appropriate ventilation for one residential unit, where orientation, colors, windows, and openings were taken into account at the design level, and the surfaces of the buildings,

that is, the upper part, is provided with a green cover and recreational facilities. As for the urban environment of the residential complex, it is characterized by an abundance of gardens, entertainment places, and movement paths that encourage residents to walk to activities instead of moving by vehicles to reduce environmental pollution, in addition to that, the residential complex is provided with the services represented With a drinking water filtration station and service activities such as schools, a health care center and shopping activities that serve the residents of the residential complex. These activities and recreational areas designated for the residents of the complex provide them with ease of life within and within the boundaries of the residential complex, as it provides them with freedom and ease of movement within a healthy and sustainable environment within the urban environment. for the residential complex

2.3. Analysis of The State of The Urban Environment Surrounding The Study Area

The sustainable design of green residential buildings is concerned with several elements, and among these elements, there are two main elements: the study of the place where the location and nature of the activities and events surround the different dimensions of the place. On the other hand, studying the environmental impact, as it seeks to study the environmental impact of design by evaluating the site, energy, materials, the effectiveness of building methods, knowing the negative aspects, and trying to mitigate them through the use of sustainable materials, and the impact of the spatial location on residential buildings. Within this topic, the surrounding activities and events were analyzed. In the study area, as shown on the map in the following figure:

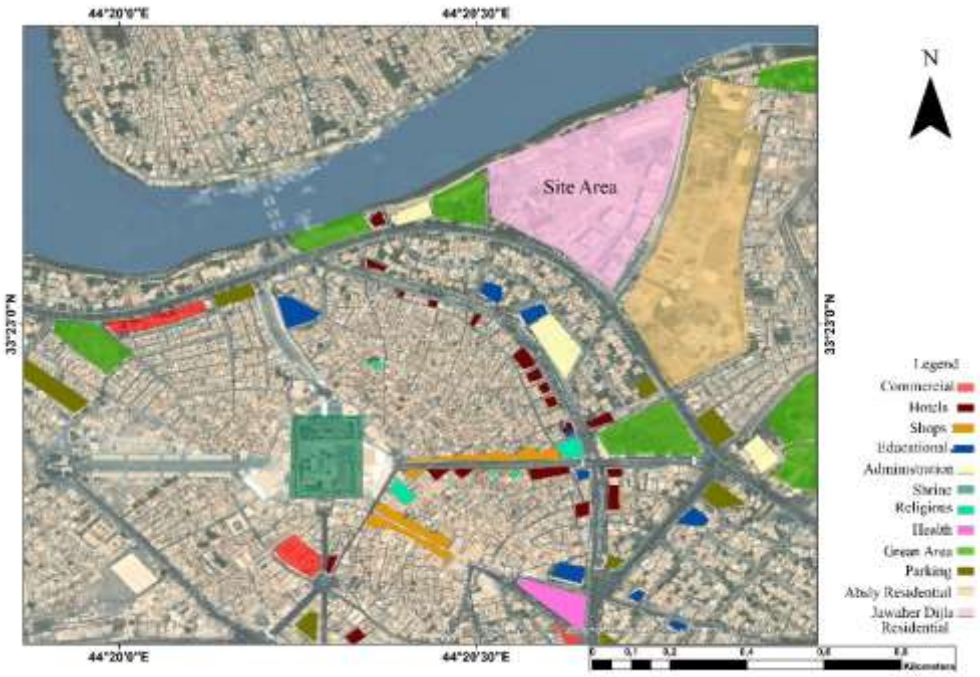

Fig. 4. map showing the activities surrounding the study area

Source: The researcher based on the data of Al-Kadhimiya Municipality and the field survey produced maps using ArcMap 10.8.

Through the map shown in Figure 4, the activities can be seen in the reality of the state of the area within which the residential jewels of the Tigris are located, which is the Kadhimiya region and the center of the city is the shrine of the two Kazem Imams, peace be upon them both. Religious activities for people to flock to and attract visitors, in addition to religious use, hotels, and commercial activities represented by markets and shopping that meet the needs of the population, in addition to education, health, and administrative use represented by service departments and car parks. In addition to the river, which is an important natural element, the city center is represented by the religious landmark represented by the shrine, and is surrounded by activities and events. On the side of the residential complex, Jawaher Tigris, relative to the river, there are recreational activities and green and recreational areas surrounding it, in addition to the fact that the complex itself contains green and recreational spaces within its urban environment. This impact on the environment has a positive form. The more the urban environment surrounding the residential buildings includes green and recreational places and open spaces, the helps in reducing the impact of pollution. In addition to the green and recreational activities surrounding the site of the study area overlooking the river bank, these green areas have a positive impact on improving the environment and its sustainability. The more environmentally friendly the activities surrounding the residential complexes, for example, open and green spaces and non-polluting activities, the more they will positively affect the site. And by studying the reality of the activities located near the residential jewels of the Tigris, and by relying on the data of the Kadhimiya municipality, and with the help of geographic information systems and the application of spatial analysis tools, as this method is considered one of the spatial analysis methods within the pattern of Proximity analysis, i.e. proximity and impact analysis, which is available within the GIS environment (GIS), and the aim of conducting a Zone Buffer effect analysis is to identify areas of known distances around the Jawaher Dijla residential complex, so that the scope of their influence is studied in relation to the activities and events that are located in the same place, or to know and measure the extent of this impact, as the researcher reached a map showing the areas The effect on certain distances surrounding the study area, and the aim of applying this analysis is to analyze the surrounding activities within the urban environment and their percentages, as shown in the following figure

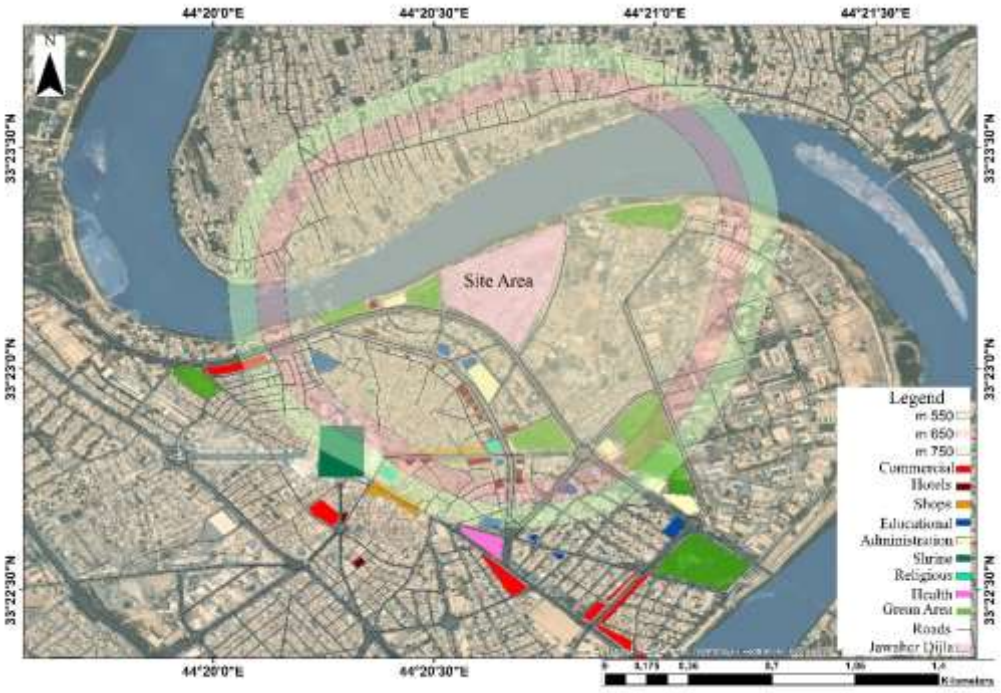

Fig. 5. map showing the analysis of the influence zones surrounding the Jawaher Dijla residential complex
Source: The researcher based on the data of Al-Kadhimiya Municipality and the field survey and producing maps using ARCMAP 10.8.

The application of the analysis of the areas of influence shown in the map, which shows the relationship between the scope of influence of a certain distance around the Jawaher Dijla residential complex, and between the activities located within these distances, which gives a vision about the activities surrounding the study area within the urban environment and the extent of its reflection on the environment and integration with the sustainability of the site. Three classifications of distances, which are (750,650,550) m as numerical values varying from the nearest value to the farthest from the residential complex to know the nature of the activities that are located near the residential complex, where the following percentages were reached, which are shown in the following chart in the figure 6:

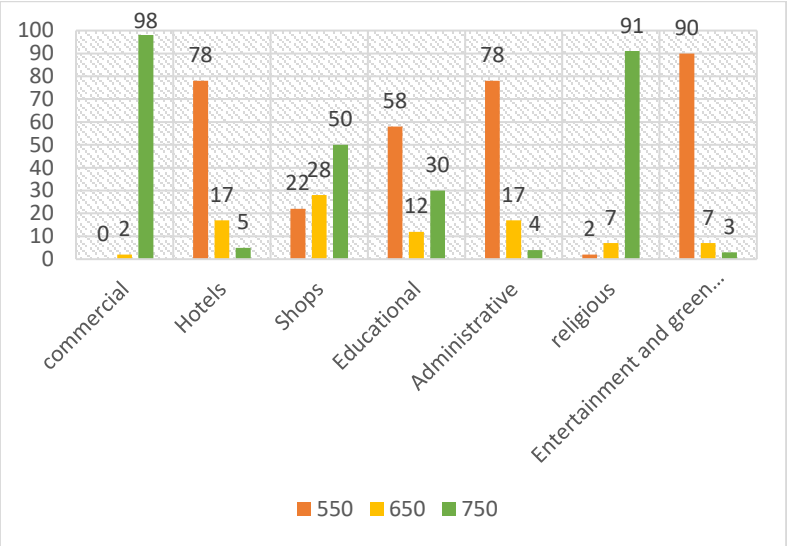

Fig. 6. A graph showing the percentages of the distribution of activities within the area of influence analysis of the Jawaher Dijla residential complex Source: The researcher based on the analysis of influence zones using ARCMAP 10.8

Through the graph and the apparent results of the analysis, the percentages of activities for each activity were calculated for the three distances, where we find that the commercial activities in the distance of 550 meters are equal to zero, i.e. there are no commercial activities within this area, and therefore the residential site contains a shopping center that meets the needs of its residents Within the limits of the distance of 650 meters, it is equal to 2%, and for the distance of 750 meters, it is equal to 98%, meaning that commercial activities increase as we approach the center, i.e. the shrine, while hotels reach the highest rate of 78% in the distance of 550 meters, followed by 17% in the distance of 650 meters. And it is 5% at 750 meters, and in the case of markets, the percentages vary between a distance of 550 meters and 650 meters, at rates of 22% and 28%, and it reaches 50% when approaching the center, i.e. at a distance of 750 meters. The highest percentage is 58% at the impact range of 500 meters, 12% at a distance of 650 meters, and 30% at a distance of 750 meters, followed by administrative activities represented by state departments and service institutions, where the highest percentage is estimated at 78% at a distance of 550 meters and 17% at a distance of 650 meters and 3% at 750 meters, while the religious use increases as the distance approaches the center to reach 91% at a distance of 850 meters from the scope of influence of the study area and less than 2% near the complex of the Tigris Jewels within the scope of the influence of the distance of 550 meters. Finally, recreational and green activities, where the highest percentage is 90% within the scope of influence surrounding the study area, up to a distance of 550 meters, and by 7% and 3% at both 650 meters and 750 meters within the scope of influence. From the foregoing, the results of the analysis concluded that The study area is the Jawaher Degla residential complex, in addition to its location on the river bank, surrounded by green and recreational areas at a high rate, and this integrates with the green cover

and recreational areas within the residential complex in terms of improving the environment and reducing pollution, in addition to other activities such as educational and administrative, which are located near the residential complex The urban environment surrounding the study area is free of polluting activities and industries harmful to the environment.

The differences between green buildings and traditional buildings is the concept of integration, where construction work takes place during its various stages, from the pre-design stage to the post-housing stage, with the aim of improving the characteristics of environmental sustainability. Two levels of design in terms of performance and cost saving. The materials are made of sustainable materials taking into account the direction, openings and paint colors, and at the level of the urban environment by intensifying the environmentally friendly green cover within the seating and entertainment areas, that is, the places where the population gathers and strengthening it with movement paths for walking and bicycles, as well as energy, waste recycling and water efficiency, and that By placing rainwater drainage and collecting it to irrigate crops and exploit the available resources.

2.4. Analysis Of Sustainability Efficiency In The Study Area

The achievement of sustainability in the Jawaher Dijla residential complex, according to the data reached by the researcher through field visits to the site and the relevant authorities, including the Baghdad Investment Commission, which is responsible for housing projects in Baghdad, where the components of the project, which is the Jawaher Dijla residential complex, were classified in terms of sustainability requirements and on the following levels:

2.4.1 The design and construction level:

During this level, the sustainability of the buildings was analyzed to the design elements in the design phase of the buildings, starting from the use of building materials that benefit economically and socially in addition to the main goal, which is the environmental, which ensures the protection of the environment and the health of the population for the longest possible period within the buildings, which are made of sustainable red bricks inspired From clay, that is, recycled, making bricks from natural resources, and it has several advantages, including low cost, low energy use in its manufacture (especially if it is manufactured in the same locations and not transported to long distances), in addition to ease of use, in addition to insulating concrete walls, which are among the benefits of these The material is the short period required for construction, through the speed in performing all construction works at one time, in addition to its properties in achieving thermal and acoustic insulation at a high level of performance. The local environment in terms of the characteristics of climate, humidity and temperature and under high-quality quality standards in terms of restoration and maintenance to last as long as possible, while imported raw materials were introduced in

addition to local raw materials in cases of lack of a local alternative, as sustainable materials were taken into account throughout the stages of their production, along with the use of High tenacity steel It is made of high-efficiency and environmentally friendly materials, in addition to the use of insulating glass in the building facades of the Jawaher Dijla residential complex, which is considered one of the sustainable building materials that have a low impact on energy emission in addition to thermal insulation properties. It is highly efficient, as a special coating has been applied to the glass facades of the buildings so that it allows visible light to enter the interior spaces of the building and the rooms, and thus will provide protection from ultraviolet and infrared rays, so that it acts as a barrier between the internal temperature and the external temperature, and thus prevents energy leakage .

2.4.2 Energy and recycling:

The principle of efficient use of energy was used within the buildings of the Jawaher Dijla residential complex, by choosing the quality of insulating glass, which in turn works to reduce heat leakage, as well as the use of insulating materials in walls and ceilings, in order to benefit from them in air conditioning and heating. The buildings were also provided with steam and air insulators Many green buildings are insulated using recycled materials such as blown glass fibers. The insulation method helps to save energy costs, as it does not leak the cold air emitted from air conditioning in the summer and heating in the winter. The buildings are designed in a way that reduces the energy requirement for air conditioning. buildings, as well as reducing energy consumption in the summer and winter seasons, and the movement corridors inside the residential complex were provided with electric lighting that works on the smart system and the ability to operate and automatically close to reduce energy consumption, as the complex was provided with a high-efficiency electric generator kept within box insulators that provide energy to homes throughout Today, as for recycling, the principle of collecting waste from homes and disposing of it in large containers was used to be transported outside the residential complex. The residential complex is also equipped with a central station for desalination of drinking water, in addition to collecting rainwater within channels and to use it in watering plants, in order not to waste water and efficient use of water.

2.4.3 The Built Environment:

At the level of the urban environment of the Jawaher Degla residential complex, sustainability elements have been applied at the building level by providing the roofs of the buildings with green vegetation, in addition to the recreational areas at the top of the buildings, which provide a distinctive view, in addition to providing the complex with gardens and entertainment areas, and in finding movement paths that encourage walking and riding. Bicycles with the presence of services and activities that meet the needs of

the population without the need to rely on activities outside the residential complex, thus reducing pressure on city services and reducing pollution.

3. CONCLUSIONS

The Author reaches that the main considerations that must be taken into account in residential buildings are the design of spaces represented by green areas and movement paths for walking and energy and water efficiency, in terms of allocating rainwater drainage and using it for irrigation of crops and efficient use of resources, as well as the quality of the internal environment of buildings, and the impact of the building. As a whole, it affects the urban environment, so it aims to improve a better life for residents and reduce energy and resource consumption, in addition to reducing the impact of damage to the environment while promoting harmony with nature.

A green building is not a green-colored building, and it is not a building that is required to contain green trees. Rather, it is a methodology that is followed when designing buildings, which works to provide all conditions and capabilities to protect the environment in light of the local climate surrounding the buildings and within their spatial location, leading to green buildings achieving a balance between residents. The building and the surroundings, as a result of the design of the buildings, take into account the nature of the place in which it is located and the surrounding urban environment.

The spatial location of the buildings has an impact on the environment, as the sustainable design of residential green buildings is only done by studying the characteristics of the place and the different dimensions of the place so that it provides the residents with comfort when living in it, followed by the importance of making the appropriate design and taking into account the important foundations of the buildings such as guidance and preserving the natural environment and its compatibility with the design In order to achieve integration between the building and its built environment, and to provide activities and events within the framework of the urban environment that serves the population, and the application of sustainability standards within the residential complex, Jawaher Dijla, was limited to the design aspect and the urban environment. Ventilation and other things mentioned above, in addition to traffic corridors and green cover, but there are aspects of energy that lack the exploitation of natural resources, where solar radiation was exploited to light buildings using only glass facades, while the residential complex, despite its efficient design, lacks solar panels to generate electricity. Energy or wind engines, that is, in general, electrical energy sources have been relied upon for lighting and operation, and the researcher aims to feed the project with solar panels on the roofs of buildings instead of green cover, and thus exploit the natural resource in the production of lighting and reduce the cost.

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