



THE APPLICATION OF SUSTAINABILITY PRINCIPLES IN HOUSING

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Abstract: The many advantages and benefits of environmental, economic and social, which can be derived from sustainable planning have a great impact in supporting the trends and efforts to protect the environment and preserve the natural resource base for future generations as well as economic gains at the level of the individual and society and the application of these features gives a wide range through which to deal with them In the planning of contemporary sustainable cities, noting that these features can be felt in the Arab Islamic city, achieving those environmental gains, economic and social, which can not be ignored and can be employed in achieving sustainability Environmental contemporary cities. The problem of research is the neglect of environmental influences in the planning of residential communities as a result of the current scientific and technological progress, which reflected the natural and urban environment resulting in many problems of pollution of all kinds and this has a negative impact on the life and health of the population and also highlights the problem of excessive consumption of energy, Significant economic costs and depletion of natural resources. It is noticeable in contemporary planning for residential use that human beings are no longer viewed environmental, social, and economic issues except through specific and interrelated views. The aim of the research is to understand the concept of sustainability and its applicability in housing planning in general, focusing on sustainable housing that is compatible with the environment and social and economic aspects according to the concept of sustainability. The Millennium Village of Greenwich / London and Al-Jamia District in Baghdad / Iraq were selected as a model for studying the schematic and design reality of their respective residential units and the environmental consequences resulting from this reality.

Keywords: Environment, Sustainable and Residential Communities.

تطبيق مبادئ الاستدامة في الإسكان

الخلاصة: إن العديد من المزايا والفوائد البيئية والاقتصادية والاجتماعية التي يمكن أن تستمد من التخطيط المستدام لها تأثير كبير في دعم الاتجاهات والجهود المبذولة لحماية البيئة والحفاظ على قاعدة الموارد الطبيعية للأجيال القادمة وكذلك المكاسب الاقتصادية على مستوى من الأفراد والمجتمع وتطبيق هذه السمات يعطي مجموعة واسعة من خلالها للتعامل معها في التخطيط للمدن المستدامة المعاصرة، مشيراً إلى أن هذه الميزات يمكن أن يشعر في المدينة العربية الإسلامية، وتحقيق تلك المكاسب البيئية والاقتصادية والاجتماعية ، والتي لا يمكن تجاهلها ويمكن استخدامها في تحقيق الاستدامة المدن المعاصرة البيئية. إن مشكلة البحث هي إهمال التأثيرات البيئية في تخطيط المجتمعات السكنية نتيجة للتقدم العلمي والتكنولوجي الحالي الذي انعكس على البيئة الطبيعية والحضرية مما أدى إلى العديد من مشاكل التلوث بجميع أنواعه وهذا له أثر سلبي على حياة السكان وصحتهم، ويسلط الضوء أيضاً على مشكلة الاستهلاك المفرط للطاقة، والتكاليف الاقتصادية الكبيرة ونضوب الموارد الطبيعية. ومن الملاحظ في التخطيط المعاصر للاستخدام السكني. أن البشر لم يعد ينظر إلى القضايا البيئية والاجتماعية والاقتصادية إلا من خلال وجهات نظر محددة ومتراصة. والهدف من

البحث هو فهم مفهوم الاستدامة وإمكانية تطبيقها في تخطيط الإسكان بشكل عام، مع التركيز على الإسكان المستدام الذي يتوافق مع البيئة والجوانب الاجتماعية والاقتصادية وفقاً لمفهوم الاستدامة. تم اختيار قرية الألفية في غربنتش / لندن ومنطقة حي الجامعة في بغداد / العراق كنموذج لدراسة واقع التخطيط والتصميم للوحدات السكنية الخاصة بها والعواقب البيئية الناجمة عن هذا الواقع.

1. Introduction

Sustainable plans should work to balance the environment, the economy and social values so that these new places meet the work and life needs of the local population and their interests, as well as local concerns of the world, considering the interests and goals of society within the global environmental, economic and social system.

The principles provided by sustainable planning are:

- 1- Sustainable planning works in a balanced manner with nature.
- 2- Provide a dynamic environment: Location, shape, density and proportions should be appropriate to create physical spaces that meet the activities of the population and encourage social cohesion by facilitating access to different land uses and increasing the sense of place to protect physical properties.
- 3- Achieving a location-based economy: it does not cause the consumption of natural resources.

The concept of sustainability is the attempt to provide the best results for man and the natural environment in the present and in the future. It concerns the economic, social, institutional and environmental aspects of human society and the natural environment. It is a means of organizing civilization and human activity to become a society, its members and its economy able to meet their needs and express their maximum energies while at the same time preserving the biological diversity and natural order with the natural continuity planning for that long time span, [1].

The ultimate goal of the concept of sustainability is the element of equity. Justice can be referred here to the human generations that have not yet born or to those who live today and who do not find equal opportunities for access to natural resources and how to use them efficiently and optimally, which protects and protects the environment from pollution. This objective is crystallized in several dimensions that overlap among them to three dimensions that are critical and interactive dimensions, namely economic, social and environmental dimensions. Focusing on addressing them will make tangible progress in achieving sustainability, [2]. These dimensions of sustainability are summarized briefly and as shown in Figure 1:

1. Economic dimensions: Economic sustainability is clearly demonstrated through the development of development strategies that reconcile development requirements with the need to conserve natural resources and the environment.
2. Social Dimensions: Social Dimensions Sustainability is concerned with the social dimension as part of the social, psychological and cultural concerns of the human environment and seeks to achieve great progress.
3. Environmental dimensions: The poor management of the environment and its impact on health and productivity was the main objective of the emergence of the concept of sustainability, which is concerned with achieving ecological balance and preservation of the environment, whether natural or built.

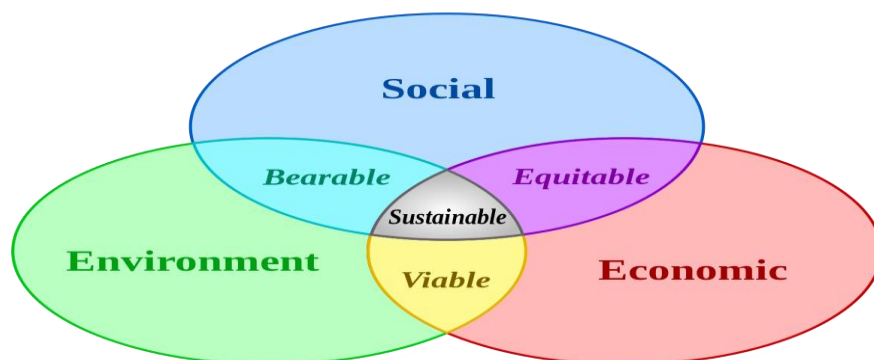


Figure 1: Relationship between dimensions of sustainability[3]

There are many levels of sustainability in the other development areas, and studies indicate the possibility of dividing the system of sustainability on two levels: First: the urban level, which deals with its scale through the physical and natural environment as well as infrastructure services. The second level is the level of the building that deals with the internal environment of the building. Hence, the environment and the sustainability formulas are directly related to the urban planner and the city plan, and the integration of the work between the two levels will result in a designed and integrated environment through the gradual levels from the city scale to urban unity,[2].

Since his presence on earth, man has sought to provide shelter that meets all his physical and spiritual needs and is in keeping with his environment and culture. The meaning of housing is multifaceted by the multiplicity of housing culture among different peoples. Therefore, the meaning of housing must be the same human orientation for different peoples, because housing is ultimately a human result that forms and interacts with its inhabitants reflects its personality and style in life, Society in which he lives. If we consider the concept of housing and the environment in Islam, we find that there is continuity between the two concepts, just as housing in the Islamic concept is part of the human dimension of its existence, the environment and preservation is part of the system of faith of the Muslim and then the presence of man on this land, Where God means that the pattern of living and housing and construction is compatible with the environment and part of the sustainable environmental system in the universe, [4].

2. Case Study

The Millennium Village of Greenwich / London and Al-Jamia District in Baghdad / Iraq were selected as a model for studying the schematic and design reality of their respective residential units and the environmental consequences resulting from this reality.

2.1. Millennium Village

The Location of Millennium Village is Greenwich Peninsula, London, United Kingdom, zero length line, its climate is cooling, humid and its Construction date was at 1997-2005, and the project is still ongoing. In 1997, the Millennium Village Development Challenge was held near the Millennium Dome. The project was built on architect Ralph Erickson. The development project was part of the entire development of the peninsula, in which architect Richard Rogers laid out its master plan and also included the eco-park, recreational and commercial areas and offices. Although the residential community in Greenwich is modern, the designer tried to introduce the spirituality of the place and identity that characterized the traditional residential communities in a modern design that responds to the requirements of the age in the multi-purpose planning and social levels of the Millennium Village, which is easy housing one of its most important planning components and architectural features, Both in terms of its architectural form or the strength of its color expression through boldness of the color use of facades and architectural elements, Figure 2.



Figure 2: The Millennium Village of Greenwich / London [5]

The designer developed a set of planning goals that directly influenced the general layout of the site and the architectural designs and structural details, [6]. The most important of these objectives are:

1. Directing the general outline of the skylight and the pedestrian paths, not the cars.
2. Revival of the principle of the village in a modern fashion that is compatible with the lifestyle of the twenty-first century.
3. New approaches to housing design using smart systems
4. To rationalize the construction phase by building off-site construction materials (pre-fabrication).
5. Establish the basis for creative future ideas for sustainable design in subsequent projects.

In order to achieve environmental sustainability in the Millennium Village project, a set of environmental objectives have been identified in the field of energy, water

and waste, which will be rationalized and reduced in proportion to the usual housing designs.

1. Reduction in basic energy use by 80%
2. Reliance on energy from renewable sources such as sun and wind by 10%.
3. Minimize potential energy by 50%.
4. Reducing the need for water by 30%.
5. Reduction in on-site waste by 50%.
6. Use of recyclable materials at 80%.
7. Do not cause the emission of carbon dioxide.

The project was characterized by social sustainability in terms of diversity in housing styles, where the designer used to diversify the use of balconies, varied packaging, stark colors that reduce the irregularity of buildings. Achieving social sustainability was one of the most important dimensions of sustainability that the project sought to achieve, by adopting innovative ideas in design, construction and development of choice in residential styles. This great diversity of standards was intended mainly to provide sustainable housing communities where people would like to live.

The energy strategy was based on a holistic approach to reduce the need for energy required for heating and cooling using high levels of insulation and exploitation of the slope of the site to the south and directing the openings in this direction to benefit from the thermal gain. The gradual formation of building blocks allowed the permeability of the sun rays to the covered courtyards and inside the spaces in most residential units. The power plant of the project supplies power and heat using biomass energy, which increases production efficiency and reduces pollution. Energy savings of 65% were achieved in the first phase of the project, based on previous strategies and the use of energy efficient equipment.

The idea of "family growth" was one of the most important orientations of the design idea because it encourages the residents to stay in their homes without the need to change the house with the growth of the family because the house has the possibilities of modification and addition depending on the family growth and development needs. For Structural System, one of the main objectives of the design was to reduce the construction time by 25% and the cost of construction by 30%. This has been achieved using iron structures and recast system based on global safety standards and minimizing construction waste. The structural system also helped the flexibility of change and modification and addition in the housing unit.

The Millennium Village Project was adopted as an evaluation system ECO Homes developed by the UK's Building Research Foundation (BRE), to ensure that the highest efficiency of environmental performance can be achieved through well-thought-out design rather than high capital dependence, and the UK's first sustainable development project gets an "excellent" degree for its environmental performance. He was awarded the Sustainability Award for Best Residential Design by the Royal Society of British Architects, [7].

2.2. Al-Jamia District in Baghdad / Iraq.

It is one of the areas of Baghdad in the side of Karkh which has been selected as a sample studied in terms of planning and design of the residential units composed of them, Figure 3.

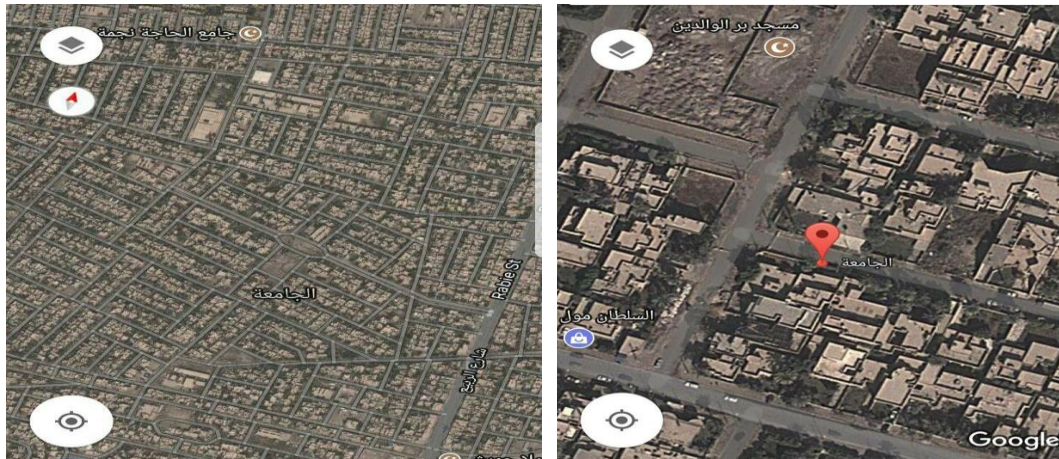


Figure 3: Location of Al-Jamia District / Baghdad [8]

The survey conducted in this area highlighted some of the planning and design aspects of the existing housing units as well as ways to avoid some negative environmental phenomena, which can be avoided through the adoption of environmental regulatory more effective and aesthetic and service and at the same time more highly optimized Environmental sustainability. These observations have been addressed through the following points:

1. The wide, straight streets are not suited to the local environment as they are exposed to direct solar radiation and therefore do not achieve the required planning sustainability.
2. In order to achieve sustainability in the residential area, the overlapping of the land uses (residential, commercial, etc.) is observed, but in this locality we observe the clear separation between the uses of the land.
3. Sporadic housing units, which negatively affect the social interaction between the inhabitants of one locality.
4. Lack of planning for the existence of green areas and parks within the region, which have a significant impact and socially effective for the residents of the region, as well as from the environmental aspect as it works to temper the atmosphere as well as aesthetic and visual aspect of the residential camp, so achieve social and environmental sustainability of the existence of this planning.
5. The residential unit was exposed to solar radiation as a result of the western direction of the façade, which led to the use of elements such as curtains and materials such as aluminum and wood, which affected the visual landscape of the façade in order to reduce the sun's rays and to obtain thermal comfort – elements that are not designed within the design of the residential unit, Figure 4.



Figure 4: The front of the house is exposed to solar radiation and used for curtains

Directing some of the housing units to the south, which is not suitable climatically, forcing the designer to deal with this problem and create a breakers for the façade of the work of shadow and reduce radiation, in this case notes how to deal and overlap between planning and design in order to create a housing unit suitable for housing and not affect the visual landscape For the interface where it overlaps within the design is part of the whole, Figure 5.



Figure 5: The front of the house is exposed to solar radiation and used as silos

The windows are openings in the facades connecting the outside and is one of the weakest parts of the façade in terms of protection is gaining heat quickly, so it is preferred to be small openings and a few to reduce the acquisition of thermal and dazzling, and this is inconsistent with what we see in the housing units as in the picture above in terms of The number is also in size and this is not commensurate with the local environment, Figure 6.



Figure 6: The front of the house is exposed to solar radiation with multiple windows

3. Discussion

Through the field view of each of the Millennium Village in London as a global model and Al-Jamia District in Baghdad /Iraq as a local model, and through addressing the urbanization that serves the environmental interests in the village of Millennium and also the problems and primitive methods used to address some of the apparent environment in the university district, and following the study and observation in the case has been included some indicators that achieve through each of the economic aspects that serve the environment available as well as the planning and design aspects of housing units in each and that will achieve effective sustainability in housing service for people and in line with Activating environmental requirements. These indicators have been clarified in the following points:

A . Sustainability in housing both environmentally and economically.

Most sustainable design principles reduce costs over the lifecycle of a building, especially in large residential development projects. The concept of sustainable development always emphasizes the economy of infrastructure and materials used to make housing affordable and affordable to its residents. Sustainable housing is an economic building that conserves natural resources and exploits what is possible on the site to save energy, use water resources, lighting, renewable energy, reuse materials and resources, and treat nature as part of it. Some indicators of sustainable housing economy can be included:

1. Sustainable housing depends on renewable sources such as solar energy, which contributes to the maintenance of non-renewable energies in the building, and reduces the volume of equipment used, especially when the solar design is integrated with the building and not separate from it.
2. Sustainable housing seeks to achieve the efficiency of the use of materials and water whether in the construction or operation or maintenance of the house, which reduces the consumption of these resources, and efficiency includes the orientation towards the principles of recycling and reuse, which reduce the cost of building starts.
3. The design of the dwelling includes the use of sustainable durable materials, which avoids the cost of consumption of perishable materials and needs to be changed and disposed of, which can destroy other systems of the environment, and helps to rationalize the costs of maintenance in the medium term And distant.
4. Rationalization in the cost of future changes as the functional efficiency of sustainable housing through the appropriate design for the needs of family members with different ages and all future variables, which helps to reduce the cost of future changes, [9].

B . Housing sustainability in terms of planning.

The planning of cities and residential neighborhoods that are compatible with the environment should not be a plan that concentrates on private transportation, but on the principle of public transport and passageways and the lack of orientation towards extended urban planning Sprawl Encourage the redevelopment of existing sites and the reuse of constructed buildings and rehabilitation to suit new uses.

Sustainable architecture at the level of urban design should be designed on the basis of the principle of encouraging the use of public transport, instead of the thousands of private means of transport that move in these areas every day causing air pollution and traffic jams and requiring a lot of parking places to allow the integration of public transport systems with the traffic system and transport in the residential community. The integration of planning with public transport means less reliance on private transportation, which leads to the expansion of urban communities at the expense of open areas and green spaces for roads and parking.

The increase in the number of private cars leads to increased greenhouse gas emissions, air pollution and the depletion of non-renewable fossil energy resources. The trend must be towards environmentally friendly public transportation such as buses and electric trains, and a re-examination of the street, as reducing the street display brings many environmental and economic advantages.

As modern trends of development of housing communities call for a multifaceted development that encourages the interplay of residential, commercial, administrative and recreational spaces, giving people the opportunity to live near and work their places of work.

This creates a growing sense of community and community as well as the possibility of creating 24-hour event areas that will provide security for the region. The development of residential areas must take into account the social homogeneity, employment opportunities, quality and level of schools, necessary services, shopping and business activities, recreational activities, access to workplaces which collectively constitute self-sustaining communities that reduce the need for transportation and thus reduce of fuel consumption and environmental pollution.

The multi-use development of sustainable housing communities seeks to achieve the following principles and As shown in Figure 7, where No. 1 is based on the design idea on the separation between the movement of sails and cars with emphasis on the specificity of residential areas, and No. 2 shows the gradient in privacy and degree of containment between the street and the square and then the field, which is the center of assembly and public events, of the population, where the design idea depends on the movement of the sapling and the creation of areas that fall into the containment.

- High residential density and multiple uses of spaces and sectors.
- Integration between land use and transportation planning with emphasis on public transport.
- Exploitation of open areas (streets, gardens and intersections) to activate social communication and enrich the ecosystem and the formation of natural environments intertwined with the residential sectors.
- Develop strategies to reduce pollution and deal with waste.
- Provide the requirements of people with special needs such as slopes and the lack of degrees and barriers to entry, [10].

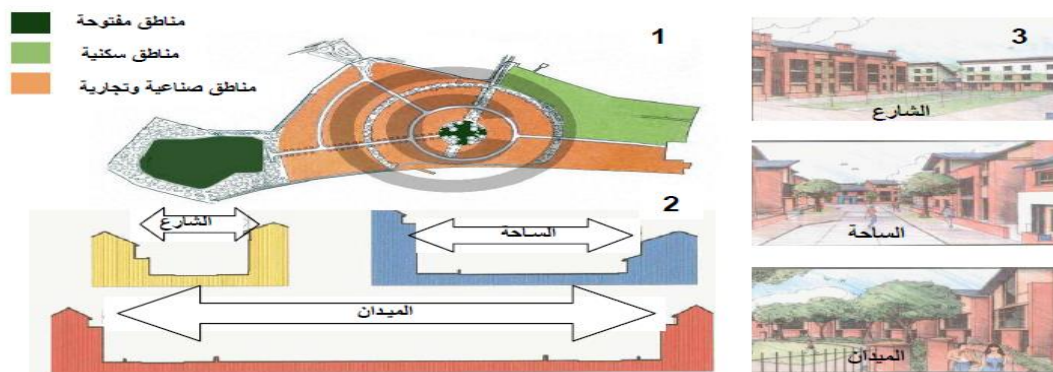


Figure 7: Sherwood Energy Village in the United Kingdom is an example of multi-use development in residential communities to achieve the principles of environmental, social and economic sustainability [11]

Finally, the Sustainable design of housing communities aims at respecting humanitarian standards and preserving the environment in design, so the design idea must be based primarily on pedestrian traffic, then environmentally friendly transport modes such as bicycles and cars based on renewable sources of energy for essential services, Electric and fast trains, and the metro, while the private car comes in last place in sustainable housing communities, as shown in Figure 8.



Figure 8: Design for pedestrian and environmentally friendly transportation in sustainable communities [12]

C . Housing sustainability in terms of design.

The geometric shape of the housing unit determines its exposure to external climatic conditions of air temperature and radiation. The effect of air temperature decreases with the ratio of surface area to volume S / V . The effect of radiation depends on the amount of surface exposure to radiation, which in turn depends on the relationship between the solar path with the geometrical shape of the housing unit and the introduction of the time factor, the geometric form has a fixed time exposure to the air temperature and is variable for the solar radiation. The appropriate shape of the housing unit is chosen according to the climatic privacy of the residential unit. The area which is the most important of temperature, humidity and solar radiation intensity and move the antenna that are variable from one region to another, so the

climate of these facts will be the primary key for the planning and design of buildings in general and residential units, in particular in the different regions.

The orientation of the residential unit is the main factor in improving thermal performance by reducing the effect of solar radiation in summer and increasing winter, and the guidance depends mainly on the paths of the sun rays and since the buildings are the main element of the urban unit, then guidance will determine the direction of the city as a whole. The importance of guidance and the degree of its impact on the thermal performance of the residential unit vary according to several factors:

1. Geometric shape where the square shape or near it is affected less than the rectangular shapes when the change of direction.
2. Nature of building materials.
3. The size of the openings.
4. The relative location of the residential unit of the neighboring buildings, the more buildings the more critical the less the importance of direction and vice versa.
5. color, where experiments have shown that when the color of the outer walls are white with sufficient thermal resistance and windows are shaded well, the change of guidance is not of little importance to the internal heat of the housing unit.

The outer shell has a great role in determining the thermal specifications of the building elements, where the outer envelope (ceilings and walls) is the boundary between the climatic conditions surrounding the building and the required thermal comfort conditions. Determining the characteristics of the building's shell or structural structure is one of the most important stages of thermal design. Sometimes leading to the dispensing of mechanical means, [13].

Finally, the windows, which are openings in the facades that connect the inside and outside and are one of the weakest parts of the façade in terms of protection, acquire the heat quickly because of the high thermal conductivity factor of the glass material. The heat gained through the openings is equal to 20 times as much as the thermal gain through the wall built of natural materials (walls in traditional dwellings), so it is preferred to be small openings to reduce the acquisition of thermal and dazzling openings and close to the ceiling prevents the state of dazzling as in the openings of the traditional Arab Islamic city, while the openings are wide areas in contemporary housing and Subject to guidance considerations as the oriental and western orientation requires openings in small spaces to reduce heat acquisition. The protection of facades and openings is done through the following methods:

1. Tree protection: Semi-oval trees are more efficient in the shade of the facades in summer except for the northern and southern façades. Vertical trees are more stable in the shade of the northern façade. Vertical and semi vertical trees are more efficient in the shade of the southern façade. The façade is efficient at the east, west, and south- The angles of the sun rise as a vertical shading element. The shrubs have the effect of blocking all of the dispersion and direct radiation especially when they are adjacent to the walls of the building. Interest is integrated when the facades are shaded by climbers, but the effect of trees and shrubs is

greater. Plant protectors and climbers do not store and transport fallen rays by conductivity or radiation to the building. They are a buffer layer between the outside atmosphere and the building envelope.

2. Protection by bolts. It is a rise in the block of the building from the front line, which causes the shading of the façade. And in the study carried out by al-Jawadi in (effect of geometric form of urban space on shading). Find that the nuts and their depth are different according to the guidance and the best guidance when the surface is on the first floor and the first floor on the ground floor provides protection for the facades. Such as bolts used in some commercial streets, as well as protection when the structural structure of the façade line, which provides protection for the openings and the façade. The jalousies of effective shading in the commercial streets and in relation to the guidance, [14].

4. Conclusions

Through the field view of each of the Millennium Village in London as a global model and Al-Jamia District in Baghdad /Iraq as a local model, and through addressing the urbanization that serves the environmental interests in the village of Millennium and also the problems and primitive methods used to address some of the apparent environment in the university district, Some of the following points have been summarized in order to achieve sustainable housing:

1. Most sustainable design principles reduce costs over the lifecycle of a building, especially in large residential development projects. The concept of sustainable development always emphasizes the economy of infrastructure and materials used to make housing affordable and affordable to its residents.
2. Interaction with the site: sustainable design begins with a deep understanding of the location and what distinguishes the place from the other, making the design stems from the environment and does not destroy its ecosystem.
3. Communicating with nature: Whether it is within the city or in open spaces, communication with nature gives life to the designed environment that determines its degree of interaction with nature.
4. Reliance on the wide streets within the residential area causes exposure to direct sunlight, which increases the amount of heat gained and thus reduces the comfort of the residents.
5. Land use overlap in the residential area achieves sustainability rather than isolation.
6. The presence of green areas inside the camp achieves social and environmental sustainability.
7. The best orientation of residential units is to the north, ensuring environmental comfort within the dwelling.

5. Recommendations

1. Adopting the principle of aggregation of the residential units within the residential area with a network of streets heading towards the prevailing road to achieve sustainable housing. The adoption of climatic treatments for the facades, such as the use of sun breakers for shadow work and the mitigation of radiation, and that the windows are small and small in the case of the southern and western façades e Integration between planning residential and residential design to ensure a suitable social and health environment locally and reduce the cost of energy use of all kinds.
2. The Iraqi citizen should be forced to move towards the housing unit when he obtains it. Therefore, the researcher recommends dealing with the design in order to ensure climatic treatments to achieve sustainability.
3. Recycling and use: There is no waste or waste in the natural system where everything is recycled for other purposes according to closed circuits. Sustainable design therefore needs to rely on reuse and recycling instead of attrition.
4. Reducing environmental impacts: The environmental impacts of the building are studied through the assessment of the site and the energy involved in the degree of pollution caused by the materials, energy efficiency, materials and construction techniques through the use of sustainable non-polluting materials, whether in manufacturing, transport or construction and recyclable.
5. Participation in the design process: in cooperation with various engineering and technical disciplines from the early stages of design, with emphasis on the role of the community to be opinion in what was designed for him, where it is necessary to take the diversity of cultures and genres and traditions of people who will use the building, and this requires understanding of the needs of people Their expectations and their expectations for the environment built for them.

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