

Application of Sustainable Urban Design Strategies for Open Spaces in Rawdah District (Riyadh, Saudi Arabia)

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Abstract - Sustainability and resource conservation are among the most modern and common concepts at present. Sustainability is a political approach, and a way of life continuous, dynamic and evolving rather than a design problem that needs some magical solutions to be implemented on the ground. Residential areas face problems in the urban design of streets and the distribution of movement paths. This study aims to develop a policy and general framework for sustainable planning Balanced and fair urban planning and the application of its concepts within the residential neighborhoods in Rawdah district, Riyadh, Saudi Arabia. The study also aims to conserve the environment and resources and reduce pollution, as well as trying to set standards for the design of outdoor spaces, population movement, and the sustainability of the built environment. In addition, it aims to draw a general framework for each of the sustainable planning strategies and policies to distribute the movement paths well, equitably, and safely. The study concluded with a set of results and recommendations, which summarized that the process of sustainable planning is an integrated process that complements its aspects. It is not possible to think of the sustainability of any of them apart from the other. They are paralleled by the sustainability of costs, planning and other aspects of life. So there must be a holistic view, and the development of harmonious policies of sustainable planning in various aspects of life.

Key Words: sustainable planning, planning strategies, Riyadh, Saudi Arabia, urban planning, Sustainability.

1 - INTRODUCTION:

As sustainability aims to enable all people in all parts of the world to meet their basic needs and enjoy a better life without compromising the ability of future generations to meet their needs, it is a comprehensive development concept to serve current generations without compromising the lives of future generations. The environment which achieves sustainability is a sustainable environment and because there is no sustainable environment without sustainable urbanization, achieving sustainability in urbanization has great importance on the environmental, economic and social level. These efforts are important to improve both the bio environment, through good planning for each of the external and internal spaces, green spaces, pedestrian corridors and networks transportation that meet the conditions of sustainability to serve the area for a long time without depletion any of its physical, environmental or biological resources. To achieve each of the goals set, it is necessary to have strategies that specialize in solving problems and applying sustainable concepts on the ground. Since the design process and the required improvements cannot be achieved overnight through one aspect of the design, an integrated process had to be supplemented its aspects are complementary to each other. The role of the designer is integrated with the various executive bodies and authorities responsible and the population (Lynch, 1990).

2. THE PROBLEM STATEMENT:

The main problem discussed in this research is the lack of application of the concepts and applications of sustainability in urban planning in Al-Rawdah district, Riyadh, Saudi Arabia. The streets were planned without taking into account the residents and their needs.

3- STUDY OBJECTIVES AND STUDY STRATEGIES:

The study seeks to develop a set of strategies to achieve the objectives of this study.

The main objective of this study can be identified in:

Drawing up for sustainable, balanced, fair, equitable, efficient and effective planning for the open spaces and implementing its concepts on the Alrawda district.

The most important objectives set can be summarized in the following:

1. Conserving the environment and resources and reducing pollution.
2. The most appropriate and sustainable use of the land.
3. Having well and appropriate design for open spaces.
4. Plan, design and manage the movement network around and within the open spaces well, equitably and safely.

4- STUDY AREA ANALYSIS:

4-1 Location:

The study area, which will be taken as a model for implementing sustainable planning strategies, is located in the Al-Rawdah district of Riyadh in the Kingdom of Saudi Arabia. The site was chosen within the streets of a residential area with the availability of many services. Several services are available on site which requires street redesign to add comfort and safety to users.



Figure 1-Saudi Arabia map



Figure 2 – Riyadh City



Figure 3 – Rawdah District (google map)

4-1-1 Location analysis:

The study area is located in a residential area north of Al-Rawda neighborhood. The site includes two schools, a mosque and a government clinic in the middle of the residential houses. The streets of the area are wide and not designed to provide comfort and safety for users. Transportation can be provided in this area according to sustainability applications and to maintain the attractiveness and sustainability of the site. Most residents prefer to go to these services on foot. But some obstacles facing them, including:

- There are no trees and plants to shade and reduce the air temperature.
- There are no special paths for pedestrians or cyclists.
- There is not enough night light.
- No umbrellas.
- Unavailability of car parks.
- The lack of aesthetic elements in the place, which discourages residents from walking.

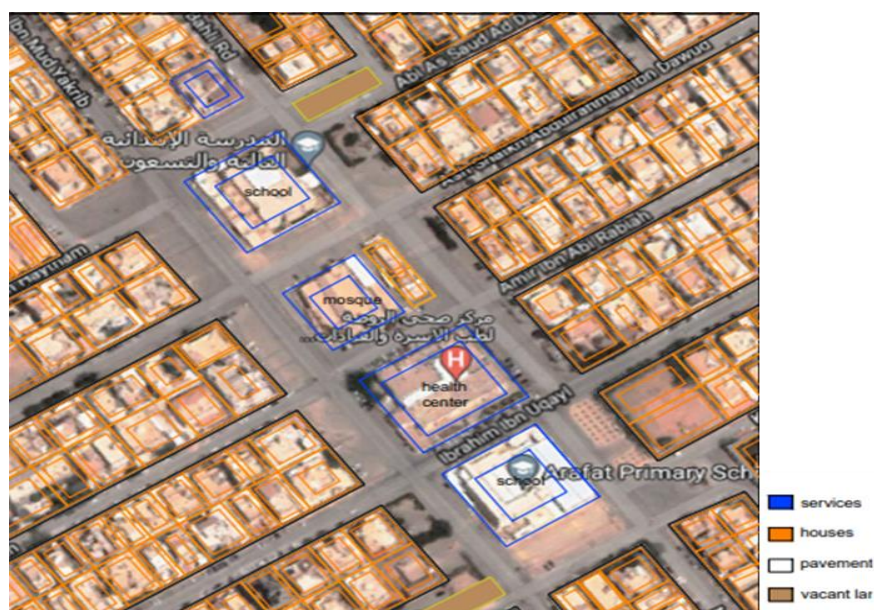


Figure 4 - part of study area in Rawdah district (google map , analysis by researcher).

5- DEVELOPMENT PROPOSALS:

Through the analysis of the majority of study area, and after visiting the streets there by the researcher, proposals to upgrade these urban streets will be addressed, and those have been categorized proposals to the following topics:

5-1 Movement networks:

- Redesigned the streets and converted into three lanes for pedestrians, cyclists and vehicles.
- Designing safe and private lanes for pedestrians and cyclists to cross
- Attention to the erection of pedestrian barriers to ensure that pedestrians do not encroach on vehicle lanes, and to ensure that pedestrians cut off the road from the places designated for that.
- Paying attention to the islands of the streets in terms of planting them with appropriate trees and maintaining them so that drivers do not obstruct vision and cause road accidents.

5-2 Empty urban spaces:

Some urban spaces in the study area suffer from a poor organization in the constituent elements as a result of not being originally designed and planned (Lynch, 1990). Therefore, it was necessary to develop some perceptions and suggestions to contribute to the development of solutions to these problems:

- Re-planning and developing each empty space to make good use of the space by adding green areas, services, or playgrounds for kids.
- Develop visions for coordinating the spaces confined between residential buildings, and it is possible
- That this be done by encouraging community participation to ensure that the residents themselves
- Maintaining care and maintenance of what is being implemented.
- Ensure that pedestrian and cyclist paths are provided to access these spaces in a safe manner so that vehicles do not require riding to reach them.
- These spaces will form elements of attraction and add an aesthetic element to the area.
- These spaces will encourage residents to walk and not ride cars to meet their daily needs, as they will contain elements such as pedestrian chairs for comfort.
- Containing these spaces plants, which will help shade the area and reduce the air temperature.

5-2-1 Provide the spaces with appropriate furniture:

Most of the urban spaces suffer from a significant lack of furnishing elements (such as seats), and their design, styles, and colors do not suit the place where it is located, so that you find the same design and not in several places. So it is important to take into account the following matters in order to upgrade the urban spaces:

- Thinking of new styles and forms for all furnishing elements.
- Providing sufficient numbers of seats to suit the volume of movement and the demand for vacancy and putting it in a way that does not impede movement.
- The seat material should be resistant to atmospheric factors and proportional to its location and surrounding activities.
- Provide shade for both sitting places and pathways
- By means of trees or by umbrellas and pergolas.
- The material for making umbrellas and pergolas must be resistant to atmospheric factors, and it is preferable to be made from natural materials such as wood.
- Carry out the necessary periodic maintenance work.



Figure 5 – Sample plan 1 of the design proposal and a 3d shot show sample of providing the spaces with appropriate furniture – dimensions in meter - (researcher).

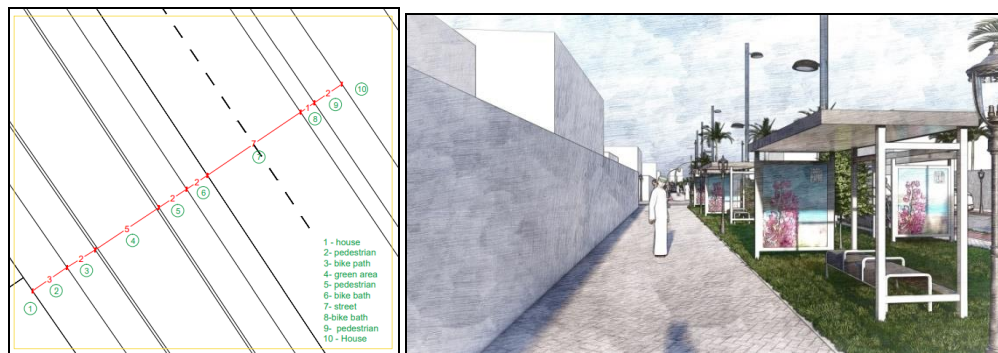


Figure 6 – Sample plan 2 of the design proposal and a 3d shot show sample of providing the spaces with appropriate furniture – dimensions in meter - (researcher).



Figure 7 – Sample plan 3 of the design proposal and a 3d shot show sample of providing the spaces with appropriate furniture – dimensions in meter - (researcher).

5-3green areas:

5-3-1 Functions of plants and trees:

5-3-1-1Aesthetic and Architectural Functions:

Trees and plants are used as aesthetic and architectural elements in the design and coordination of urban space. The aesthetic and architectural functions can be summarized in the following points:

- One of the most important aesthetic functions of trees is the unity factor, as it can link and unite between the different elements that make up the landscape. Trees in private gardens and public, streets and squares can cooperate to form a green network that connects
- The elements present in the void, although they do not appear clearly from the level of the earth, they are visible when looking from a high place.
- It can be to put trees in one of the entrances to the squares or the streets to serve as a gate or a specific entry.
- The urban designer often encounters a void for this void no what when with him, the designer is forced to plant some of its dimensions to give specificity It is difficult to define that void with structural elements.
- Trees with their formations in broad squares or streets can represent what looks like gardens where these areas are provided with benches and people are shaded by these trees.
- Trees with a circular structure can be used in the form of a cover for the void (field or street) So that the void appears to be covered for pedestrians visually.
- Trees can be placed on both sides of the road in equal dimensions so that they are consecutive
- One or more trees can be placed at the end of a street to serve as a lock for the end of the perspective or a point Attract.



Figure 8 – Sample plan 4 of the design proposal and a 3d shot– dimensions in meter - (researcher).

5-3-1-2 Engineering functions:

- Reducing glare or light reflection by absorbing rays on the total vegetative plant.
- Absorbing a large part of the sound waves resulting from traffic and noise of the cars.
- Reducing the percentage of air pollution.

5-3-1-3 Climatic functions:

- Shade trees, windbreaks, and plant canopies are an example of this. For example, it was found that Walls covered with climbing plants have a temperature of 5 degrees Celsius lower than their non-vegetated counterparts.
- Planting deciduous trees in an urban environment performs the function of an air conditioner is natural because it prevents the scorching rays of the sun in the summer and provides the warmth of the sun in the winter after its leaves fall off.
- Coniferous trees such as cypress are the best windbreaks all year round.

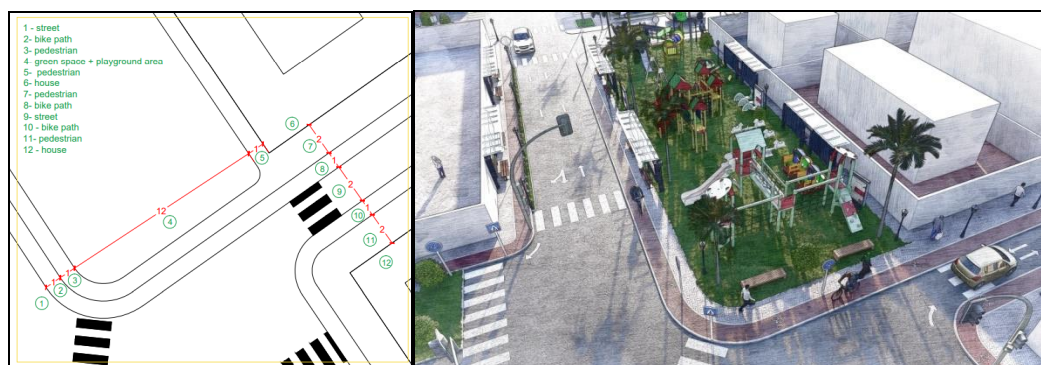


Figure 9 – Sample plan 5 of the design proposal and a 3d shot– dimensions in meter - (researcher).

5-4 Increase water elements:

Water elements have an important role in improving the mental image of the place. Likewise, it gives psychological comfort to the users of the void because of its ability to link the void with nature. It also has climatic treatments of hot spaces (Khalifa, 2004). The water is either static, as in artificial and natural ponds, or moving, as in fountains and waterfalls.

5-4-1 Still water:

It is represented in natural rivers and pools of water, whether natural or artificial. This type of still water (in the case of industrial ponds) needs a periodic change so that it does not turn into stagnant water and algae grow in it.

- The appropriate depth for it, according to the purpose of use, is not less than 50 cm in public places.
- Children are not encouraged to go down in it, and the depth should not be exaggerated to ensure safety.
- The floors of these water bodies need to be treated as they can be easily seen in the case of water.
- Static, colored rocks and gravel can be installed to give it a natural effect.

5-4-2 Moving water:

It is represented in the fountains and falling waterfalls where the water rushes to the top atmospheric, significant to soften the atmosphere or flow at natural or artificial levels, and has the effect of joy and movement in the void. It also has a sound effect the shape of the water outside can be controlled according to the pumps and the water outlets, provided that the water does not become or cause mist. Fountains are one of the most important elements of urban design in pedestrian areas to give the interaction of pedestrians with the elements of the environment.

Fountains have many common shapes, which can be divided as follows:

5-4-2-1 Ponds with fountains:

- Fountains emerge from under the water's surface, causing the water to erupt in the form of a spring in which the water outlet is latent. The water flows in a way that suggests that it comes out from the ground. In the event that the fountain is not operated, the fountain looks like a pond of still water, and in this case, it is possible to cover the surface of the pond with some aquatic plants.
- Fountains outside the surface of the water spew water in the form of a high column, and in this case, it is above the surface of the pond, and in the event that it is not operating, the fountain may appear water outlet visible in a bad manner.
- Many small aperture fountains that spray water parallel or perpendicular rows.

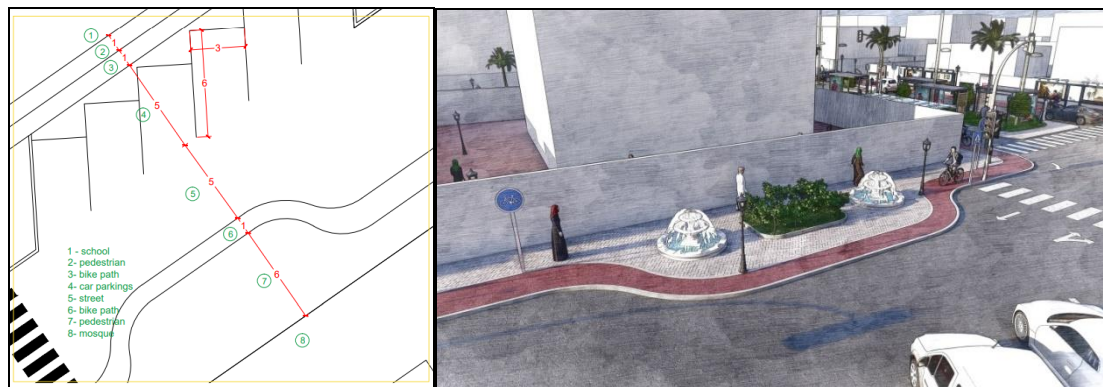


Figure 10 – Sample plan 6 of the design proposal and a 3d shot– dimensions in meter - (researcher).

5-4-2-2 Industrial waterfalls:

These waterfalls are created either in the form of basins above the other, and the water pours from the design specified for it, or for the water to slide over the rocks of the upper basin to the lowest height according to different sizes and heights, and when he falls in the pond, he makes a beautiful purr. If colored lighting is used behind these projections, the natural gradient can be used for floor levels on the site, especially when there are clear contour lines in the implementation of waterfalls. Some prefer the circular shape in the construction of basins on top of each other so that the water flows from the edge of a basin to the middle of the lower basin, or if these basins are built in the form Not geometric, semicircular, or shaped like shells of different sizes.

5-5 Special considerations that must be taken into account to serve those with special needs:

(Meshur, 2013)

- The width of the corridor for the passage of wheelchairs must not be less than 120 cm for the passage of one chair and for the passage of two chairs at a time, and 180 cm for the passage of two chairs.
- The total slope of the lanes designated for wheelchair users shall not exceed
- For mobile devices and crutches from 12:1, it is preferable to be in the range of 1:20, and it is also desirable that the slope ratio of pedestrians and external hiking roads be in the range of 40:1 to 50:1
- The floors of the corridors and sidewalks should be of durable, non-slip materials.
- It is taken into account that the corridors have a flat surface and a fixed slope, and that no part of them protrudes from the other, such as manhole covers and manholes or tiles protruding from each other, and the height of the inscriptions in the floors should not exceed 5 mm, as well as the level difference of 20 mm.

- It is taken into account to give the corridors, especially at the intersections in the sidewalks and gardens, a textured texture to help the visually impaired to feel the range of movement on roads and sidewalks.
- Slopes should be used for any difference in the level more than 2 cm.
- The width of the ramp for the disabled shall not be less than 150 cm.
- It is recommended that the regression ratio be within 1:20 (5%) and not more than 1:12 (%) 8.
- The level of the road surface and the pavement must be connected to the slopes and treated well and finished with different materials and colors from the rest of the pavement
- Taking into account the absence of places and corridors, the height of the ceiling at the lowest point of which is less than 220 cm.
- Not installing seats and furniture items for the streets and open areas in the walking line of the disabled, especially the blind.
- Standardize all drawers' heights, and avoid open drawers.
- Giving color differences to the menu and the sleeper for the drawer.
- Paying attention to the installation of balustrades at appropriate heights for drawers and according to their width.
- Allocating special parking spaces for the disabled to ensure the descent and ascent process.
- The places of cutting the street must be perpendicular to the sidewalk.
- Allocating lanes for the disabled between car parks to reach the sidewalks.



Figure 11 – samples of proposal show some considerations that must be taken into account to serve those with special needs (researcher).

6- DESIGN MODEL FOR DEVELOPMENT PROPOSALS IN THE STUDY AREA:

6-1 The following plan shows a two-dimensional plan of the study area before making the proposals with pictures of some places:

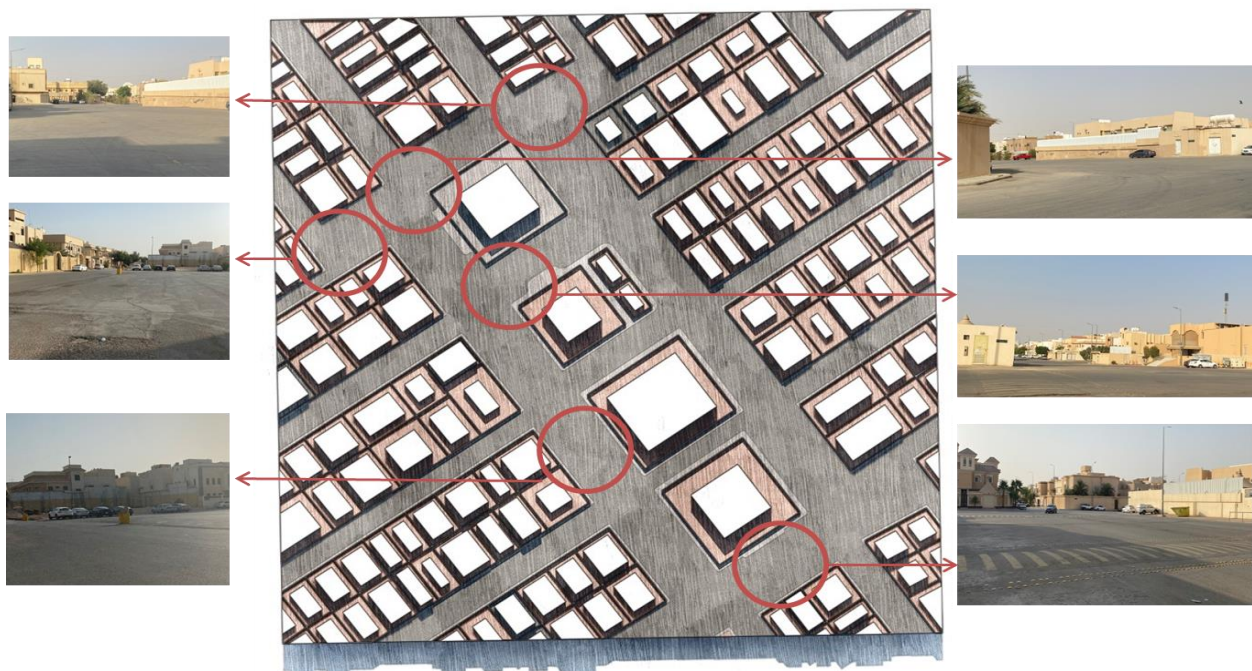


Figure 12 –plan of the study area before making the proposals and pictures of some places (researcher).

6-2 The following plan shows a two-dimensional plan of the study area after making the proposals with pictures of some places:



Figure 13 – proposal plan of the study area and 3d shots of the same pictures in the previous figure (researcher).

6-3 3D shots of the design proposal for the study area:



Figure 14 – 3d shots of proposed design for the study area (researcher).

7- CONCLUSION AND RESULTS:

To improve urban spaces, the existing situation should be studied. It is good and analyzed to build users of these places and see the latest findings based on the desire of design in this field and then the application on the ground. For this, several strategies have been proposed about the major problems of traffic and the overlap of vehicular traffic in many cases with

pedestrian traffic. Organizing the spaces in the open spaces has a significant impact on obtaining the greatest desired benefit from these spaces. It has been proposed to develop plans to develop the spaces confined between the residential buildings in the residential neighborhood, because of the great environmental and social impacts that this has. The provision of garden furniture has a significant impact on the success of any urban space if the shapes and colors are carefully chosen, and distributed, and coordinated according to sound engineering foundations. And most importantly, The study and dealt with when designing and developing urban spaces is green areas and different types of trees to choose what works and plant them according to the nature of the use of the space. Water elements have a special dynamic that should not be overlooked. It is important in urban spaces to take into account people with special needs and to provide the space for them by providing it with ramps and the necessary furniture according to international standards.

To achieve each of these goals, an integrated set of strategies and policies must be implemented actively and they can represent by all of the following:

7-1 First Objective: Preserving the environment and resources and reducing pollution, through:

1. Protection of the ecosystem.
2. Following active programs to expand the fields of planting trees and plants, protecting and improving elements natural resources in the area, and educating individuals.
3. Take the issue of yard cultivation and setbacks seriously, and obligate residents and owners to implement Municipal laws related to this.
4. Paying the pollutants affecting the community and charging the cause of the pollution costs

7-2 Second Objective: The most appropriate and sustainable use of the land.

Based on the foregoing, we can say that the study concluded that sustainable planning for the uses of the land includes directions for physical planning, modified plans, planning for uses, the various locations, and the development of policies related to them, as well as the concept of sustainability (environmental sustainability, economic and social). As for the most important strategies that can be followed to achieve this goal, they can be summarized in the following:

1. Reconfigure neighborhoods, residential areas, and business centers to meet the requirements of population and the fulfillment of the conditions of sustainability.
2. Reducing the overcrowding of residential areas, increasing their greening, and raising the level of cleanliness, calm, and security.
3. Slow the traffic through the residential areas to increase its attractiveness.
4. Focus on making the current setbacks of the buildings become green walkways that transmit movement towards the green areas surrounded by buildings.
5. Reducing dependence on vehicles through good land-use planning, which reduces reliance on individual vehicles, thus reducing the distances traveled by the vehicle and improving the quality of the environment.

7-3 Third Objective: Having well and appropriate design for open spaces. Through the following:

1. Having green spaces to be used for picnics and children's play, and includes facilities and necessary services such as small shops, children's schools, cafes, and playgrounds on the level of residential areas.
2. Create a dynamic built environment by optimizing and matching the relationships of location, shape, density, and mix ratios and the quality of development, to create spaces that meet the activities of the population and encourage the cohesion of society.
3. Designing spaces and open squares in an integrated manner with the surrounding buildings so that they do not get lost Land and setbacks are wasted and become just neglected and untapped appendages in most cases.
4. Improve the open spaces to create ecological balance and increase biomass to reduce pollution.
5. It is necessary to develop a network of green corridors and walkways that connect the open spaces.
6. Having dense tall trees and plants, so those residential areas away from the pollution and noise of the streets.

The study includes proposals for the relationship of built-up areas, roads, and green areas, and facilities so that the pedestrian walkways and their staircases wrap in the setbacks and around the buildings to lead to Green spaces for play and activities.

7-4 Fourth Objective: Planning, well design and managing the movement network equitably and safely.

To achieve the sustainability of transportation, the costs of establishing the transportation system itself and the cost should not increase. The operational costs of the system are accumulated for successive generations, but the costs of establishing, operating, and expanding the system are covered. Increasing the number of users, planning transportation routes and systems

is to realize the concepts of sustainable development, commensurate with land use and minimizing the main human cost, which is Time spent in transportation.

This goal can be achieved by following a set of strategies:

1. Reducing the need for transportation in general by reducing the demand for trips and providing different services in the same area, providing an infrastructure of communication networks and traffic in the same.
2. Reconfigure urban areas in general to reduce trips in transportation private, mixed-use development in public transportation centers and intersections, and reconcile between the use of land and public transportation to achieve a greater balance in the flow.
3. The transportation network be fair and efficient to assist all development and growth programs in
4. Different regions do not encourage development in regions at the expense of others and so that they provide easy streets Access, adequate parking, easy and convenient directions and traffic, private lanes pedestrian.
5. Encouraging alternative modes of transportation, including bicycles, and creating their lanes where buildings, streets, and bike lanes are related to each other. As well as providing walkways and facilities for pedestrians designed in a safe, attractive and comfortable manner.

8- RECOMMENDATIONS:

It can be said that the sustainable planning process for both transportation and land use is a process Integrated, with its different aspects complementing each other, so we cannot make sustainable transportation, for example Without being paralleled by the sustainability of costs and sustainability in planning. There must be a holistic view and development of harmonious policies of sustainable planning in various walks of life.

To achieve this, the study concluded by making the following recommendations:

1. The necessity of developing an effective and comprehensive general plan for the city as a whole in which an effective and flexible policy is followed. It has to be directed by the responsible and municipal authorities so that this policy is clear, announced, explained, and understandable to everyone who adopts it.
2. Continuous coordination between the various competent and responsible design authorities, such as the municipality and everyone else .The Ministries of Planning, Local Government and Housing...so that none of these parties lays down their plans , Its policies and development projects are separated from the rest of the parties, but rather coordination and mutual consultation take place between them all.
3. Planning must precede any development or growth of the region. These plans have to be flexible and reconfigurable based on developments and changes and meet the various emerging needs so that everyone adheres to the prepared plans.
4. When designing, the prevailing social values must be taken into account so that the places and spaces can be new ones to meet the work and life needs and interests of the population.
5. Preparing a comprehensive study of the interrelationships of green areas, road, and transportation networks.
6. The importance of providing a network of roads for pedestrians, green areas, and bicycles, and finding its lanes.
7. Allocating places for rest and providing various attractions for pedestrians to encourage them.
8. Gardens and entertainment venues that serve the area and the creation of special committees that deal with continuity of maintenance and cleanliness green places.
9. Raising the level of visual quality by improving the facades of external buildings and placing Laws related to and control of achieving this, and adding aesthetic external elements that increase the attraction of the population walking towards.

Finally, this system must be applied to the city as a whole, because such a system cannot succeed in the city as a whole if it is just applied in the study area. For example, and in isolation from the rest of the city, this system eventually becomes an integrated whole system and way of life. It should also be recalled the importance of placing restrictions on both design and materials used, heights, and the quality of development and development so that they all serve the planning policies established and agreed upon.

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