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Exploring Human Movement Behavior in The Central Garden of Zuwara City– Libya

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Abstract— **Urban spaces provide a suitable place to social communicate, as these urban spaces provide a variety of physical and social benefits. Human behavior is the sum of the psychological, physical, physiological and verbal activity of a person who deals with and interacts with his environment. It represents all kinds of activities that a person undertakes while dealing with and adapting to the environment and includes several aspects: cognitive, movement and emotional.**

The paper aims to determine the effect of human movement behavior in the central garden of Zuwara. the methodology used is qualitative research, through personal observation of the behavior of the visitors, monitoring them using video camera, recording comments and signing them on the tracking maps. and the interviews were used to gather opinions of the users about the reasons for the behaviors used within the garden, and explore the users' satisfaction with the garden's components, services and the ease of movement within it. The results showed some unplanned movement behaviors in the garden, such as walking on the grass instead of walking in the paths designated for that. The study presented a set of recommendations for the study area, along with a proposal that includes the visitors' requirements and some services that contribute to increasing the efficiency of the garden.

Index Terms: **Garden, Human Behavior. Movement Behavior, Urban Spaces, Zuwara, Libya**

I. INTRODUCTION

The connection with nature and high-quality life for urban residents is growing as a result of the rapid urbanization, the spread of buildings and the increasing of urban population. urban spaces can be an outlet for residents of all ages that they can practice their activities for recreation. Urban spaces are considered the most important element of urban formation in the city and are very important for people to communicate and to carry out activities that cannot be carried out within the housing unit for their recreation and physical and psychological comfort [1]. On the other hand, gardens are the most important part of urban spaces, and their main benefits are driven by the residents' demand for recreational services. Accordingly, urban spaces in general and gardens in specific are open places that can be used by all people regardless of their personal, social or cultural differences. This paper aims to determine the effect of human movement behavior in the central garden in Zuwara to develop the necessary suggestions for the requirements of users in these spaces. Due to the nature of the aim, the research strategy is qualitative research and the methods used are observation and interviews to gather opinions about the satisfaction of the users of the garden. the human behavior in the garden is recorded by using behavior mapping, video record, photos and field notes. These methods help to study the users of the garden, what people do, which areas most frequently visit, their movement through the garden, what most attracted them and how these features affect their social behavior.

II. URBAN SPACES

Urban spaces are spaces representing the three-dimensional park, in which objects and events occur, and has a location and direction in this space in order to perform a specific purpose or situation [1]. Sociology has paid more attention to the physical places of the city and the daily interactions of the people more than the possibility for a debate or a speech, therefore, public space is measured according to its accessibility, both physically and psychologically [2]. This is confirmed by Tonnelat, (2010) who stated that the success of public space is determined by its ability to bring together two main and necessary qualities in which all the rest depends: accessibility and communication, each of these measures can be declined in various degrees, from exclusive to open to all, and from communitarian to anonymous [3].

Public space generates community unity and that public spaces are not just empty voids. Typically, they are filled with both soft and hard landscape elements to help shape their character. What is put into public spaces is just as important as the space itself [4]. Abd Elaziz (2017) claimed that urban spaces should support the possibility of gathering and create a feeling of belonging

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where people can feel safe and can enjoy art and nature. They should consider achieving sustainability, accessibility and flexibility [5].

Although people are the most important and only users of the built environment, those who are responsible for designing, producing, and making decisions about the built environment, often don't take into consideration the impact of their decision on public urban spaces. Also, the design and urban planning processes, in general, focused on the built environment more than its concern for the moral aspect represented in human behavior in general and the movement behavior in particular, and the role provided by these spaces, which require an understanding of this behavior, which had an impact on the emergence of negative effects represented in the changes resulting from it on the built environment in those urban spaces

A. *Benefits of Urban Space*

Urban space plays an important role in improving the physical and psychological health of residents, maintaining good social relations, and improving the overall quality of life, within the range of cultural ecosystem services relevant to urban parks, recreational ecosystem services are particularly important and widely acknowledged for securing mental and physical wellbeing. They believe that urban parks provide several "intangible" benefits to human health and well-being; measuring these benefits mainly co-produced by the spatial interactivity between residents and urban parks is vital for urban green space management [6].

Many authors believe that urban spaces can provide a valuable place to socialize with neighbor such as, [4], [7], [8], and [9]. who classified the benefits of urban space to four major categories which are environmental, social, health, and economic benefits, they clarified that public urban spaces can provide a variety of physical and social benefits to individuals and communities; they mitigate air pollution, reduce noise and alleviate urban heat island effects; they provide places where people can engage in physical activity such as walking, and also can serve as interesting destinations that can encourage people to walk to reach them. Sherer (2003) summarized the benefits of urban space as follows [7]:

- Improve people's physical and psychological health,
- Strengthens communities and make cities more attractive places to live and work.
- Create important social and community development benefits.
- Offer recreational opportunities for unprotected youth, low-income families.
- Public parks and recreational facilities have been linked to reductions in crime.
- Community gardens increase residents' sense of community ownership and stewardship, provide a focus for neighbourhood activities,
- Trees absorb nutrients and act as natural air conditioners to keep cities cooler.
- Parks often become one of a city's signature attractions, a prime marketing tool to attract tourists, agreements, and businesses.

B. *Principles of Urban Spaces Design*

The way spaces look and feel today relates basically to how they were designed in the first place, because every involvement in space has an impact upon its overall quality, the importance of design skills remains essential [10]. The principles of assessing the functional and social efficiency of urban spaces have been summarized as follows [11]:

- Clarity of the site and ease of vision and accessibility.
- It should be prepared for the use of the people and provide them with the conditions of comfort.
- Provide aesthetic characteristics, richness, diversity and taking into account the technical aspects of the elements of space
- Provide a sense of security and safety for users.
- Enhance human belonging to the place and meet the emotional aspects of users.
- Provide the appropriate spaces for the establishment of different events, and activities for different ages and people with special needs.
- Provide protection against negative weather factors.
- Choice of materials and processors with great durability and ease of maintenance.

C. *Urban Spaces Design Considerations*

Most researchers on parks and physical activity have largely focused on three factors related to the public urban space, and these are proximity, attractiveness, and size, with less attention paid to perceptual characteristics of the surrounding built environment that involves the urban spaces and through which people must move to reach the public urban space. These characteristics not only moderate the influence of the three afore-mentioned public urban space factors on physical activity, they may also have a direct effect on residents' engagement in neighborhood physical activity [8]. The key issues in making places more responsive for people is understanding and use of a place in the urban space. This is because of the following list [12]:

- It affects where people can go, and where they cannot; the quality can be called **Permeability**.
- It affects the range of uses available to people: the quality can be called **variety**.
- It affects how easily people can understand what opportunities it offers: the quality can be called **legibility**.
- It affects the degree to which people can use a given place for different purposes: the quality can be called **strength**.
- It affects whether the detailed appearance of the place makes people aware of the choices available: the quality can be called **visual appropriateness**.
- It affects people's choice of sensory experiences: this quality can be called **richness**.
- It affects the extent to which people can put their own stamp on a place: can be called personalization.

The urban structure consists of two components: Physical environment which gives the architectural form its own character, and human and all related activities and behaviours within this. In other words, the physical components and humanitarian activities are the main determinants of the personality of the subject [143]. The components of urban spaces have been classified to five dimensions: Horizontal Level (Flooring): Vertical level (walls): Space ceiling: Furniture or interior preparation: and Activity [13] [14].

Recreational services cover a wide variety of activities, such as walking, jogging, running, picnicking, and aesthetic experiences [6]. Good urban park should have good seating areas, shades and other amenities and facilities for people to benefit from. These elements make parks attractive to all genders at all ages. An efficient park as well should be visible and easy to access. Also, parks play an important role in the aesthetics and quality of the urban environment [15].

The physical components of urban spaces can be classified to: Plant elements; Seating elements; Sitting spaces: Shading elements; Lighting elements, Complementary elements [16] [17].

III. PEDESTRIAN MOVEMENT BEHAVIOUR

Human behavior defined as the sum total of psychological, physical, physiological, move, and verbal activity that occur by a person as he deals and interacts with his environment. It is all kinds of activities that occur by a person during his dealings with the environment and his compatibility with it, and it includes several aspects such as knowledge, movement, and emotion. Human behavior is characterized by flexibility and the ability to change and modify according to circumstances, and the ability to reach goals, fulfil desires, solve problems, and the ability to think properly and benefit from mistakes [18].

The characteristics of pedestrian paths appear in the factors that encourage movement such as, clarity of the target to be reached and the ease of reaching it, the excitement and attracting witnesses. On the other hand, factors that prevent movement such as the presence of danger in reaching a place, accordingly, the design of the space, its shape, and its natural and built-up components are the main factors that help direct movement inside a space, for example, movement in the flat ground will be safe, easy, clear and easy to see for various directions and moving elements, while movement in the directions of inclination to the bottom requires less effort in movement from the inclinations upward [15]. Pedestrian movement defined as a mobility model that has the volume of preserving the most direct relationship and interaction with the city, such as the interaction with other pedestrians, in the possibility of participating in the trading activity and cultural one along the paths, and enjoying the natural and architectonic environment. Spatial configuration plays a principal role for the pedestrian mobility; it affects pedestrians when they have to take the decision about what route they select for their trips. Therefore, the spatial configuration could encourage or discourage the selection of a path about which pedestrian can to arrive to the opportunities, also, the effect of spatial configuration on pedestrian mobility has created a new concept in planning studies, the concept of the natural movement [19]. Pedestrian path also defined as the path provided for pedestrians in order to provide services to walkers, because people in pedestrian paths, often do the walking activities to get to somewhere, exercise, relax and enjoy beauty scenic, accordingly, pedestrian path needs improvement of smoothness, security, comfort of the pedestrians, and safety which considered as major issue [20].

Public space as any outdoor, publicly accessible area in which all kind of movements can take place. A common movement which happens daily and mostly unconsciously is walking, and walking can be perceived as the most basic and routine form of movement, also, walking is characterized by certain steps and rhythm and people tend to walk more rapidly when they are in hurry, but this shifting in speed, can also be the result of specific spatial configurations [4]. Two phenomena relate to way finding are; route choice and spatial search, route choice indicates the process by which an individual selects a route from a set of known routes, where route choice does not involve active spatial exploration because the environment is known or the individual is satisfied with a currently known set of routes. Spatial search is a wider concept which includes the processes used by an individual to choose between alternative courses of action in spatial context [21].

The scale and form of a space will influence pedestrian behavior and the type of social communication that may happen within that space. Physical distances that bring people into close proximity, or separate them, are important design considerations. They are settings for beneficial active social communication, or allow a certain degree of privacy, require careful thought as to the degree of possible eye contact, and appropriate within the scale and layout of the setting [9]. Pedestrian density, including conflicts at intersections and potential gathering spots, plays an important role in easiness of moving from one destination to another. Other aspects also contribute to difficulty of ease movement including physical obstacles such as trash containers, light fixtures, flag poles, parking, water hydrants, telephones, benches, etc [17].

Three different types of movement within the public space are integrally connected to the social activity are: necessary activities, optional activities and social activities, it is within this type of activities, human movement in public space observed that pedestrian accessibility to public spaces is usually analyzed in terms of time or distance of trips along the pedestrian network. This network and its configuration are a key factor to collect the pedestrian flows at different scales in the city [21] [22]. Consequently, a planning process that analyses these structural implications on the city could plan public spaces with better criteria that could provide more accessibility and a greater use of public spaces [19].

Based on the Time saver standards for landscape architecture, paths should be accessible to all types of walkers, and sometimes to emergency vehicles, and fire-fighting equipment. They explained that, landmark features and visual signs can suggest a purpose and expected behavior to the pedestrians. These may include

walkway width (e.g., wider walkways suggesting greater importance), formality (e.g., curve-linear walkways suggesting a more relaxing experience), paving material (e.g., expensive or highly articulated materials suggesting greater importance), and the presence and quality of auxiliary features may suggest the main purpose of the walkway. In addition, the scale and form of a space will influence pedestrian behavior and the type of social communication that may occur within that space [17].

The factors affecting the performance of urban spaces can be summarized as follows;

1. **Accessibility;** should take account of the followings,
   - Achieve connection with public transportation.
   - Provide enough gates and enough car parks.
   - Full access to all types of users.
   - Achieve visual and physical connection to the surrounding.
2. **Safety:** urban spaces to be safe, should include:
   - Provide an office to report any problem.
   - Attract many users to increase safety and discourage antisocial activates
   - Provide sub-areas, with more than one entrances.
   - Preserve sight lines, such as select and manage the plants to make the park clear.
   - Preserve landscape efficiently.
   - Use safe materials to minimize injuries.
   - Minimize movement intersections.
   - Provide lighting, and signs.
   - Fence should be attractive and transparent.
3. **Comfort:** urban spaces should consist of the following:
   - Provide sub-spaces for different numbers of peoples in groups.
   - Provide comfortable seats.
   - Design for reasonable walking distances.
   - Provide variety of sitting choices.
   - Provide privacy by the use of benches, trees and bushes in the site.
4. **Facilities and Activities**: facilities can be as follows;
   - Offer recreational facilities.
   - Separate activities related to gender and age.
   - Provide a variety activity for kids in all seasons.
   - Provide multi-function spaces.
   - Provide food services, toilets, changing rooms.
   - Organize small farms, sports, children's activities.
   - Create a flexible design to adapt changing needs.

IV. STUDY AREA: THE CENTRAL GARDEN IN ZUWARA – LIBYA

This study was conducted in Zuwara, it is a coastal city in Libya and situated 110 km west of Tripoli and 60 km from the Tunisian border. The geographical coordinates of the city are: Latitude 32 0, 56 / North, Longitudinal 120, 08/ East. Zuwara is located in the zone of steppe climate strongly influenced by the Mediterranean Sea, it consists of four landscape complexes formed by the elevated and flat dune areas, flattened sabkha and wooded land Figure 1

Figure 1: Zuwara map Source: google earth 2021

D. Description of the Study Area: Zuwara Central Garden

The garden is located in the middle of the city and away from the congestion of the city center. The total area of the garden is about 10,500m^2, it is bordered by 3 Streets and the fourth side from the south is a school. The streets surrounding the park are connected to the main roads of the city; the Southeast street goes to the entrance of the city and the football Stadium, the Northeast street connects with the ring road, the Northwest goes to the main Square, and the Southwest connects to the main road Figure 2.

Figure 2: The garden location

The garden is bordered by a low shrubs fence from the two main streets. As for the secondary street overlooking the parking lot, low iron fences are found due to the presence of sports fields. Thus, it is possible to enter the park through multiple entrances within the garden boundaries from the three sides. The design of the garden contains some main elements formed the whole picture are shown in Figure 3.

1- Main entrance
2- Cafe
3- Children playground
4- Basketball ground
5-Football stadium
6- WC
7- cafeteria
8- gathering areas
9-fountain
10- Book Box
11- meeting area
12- Cultural kiosk

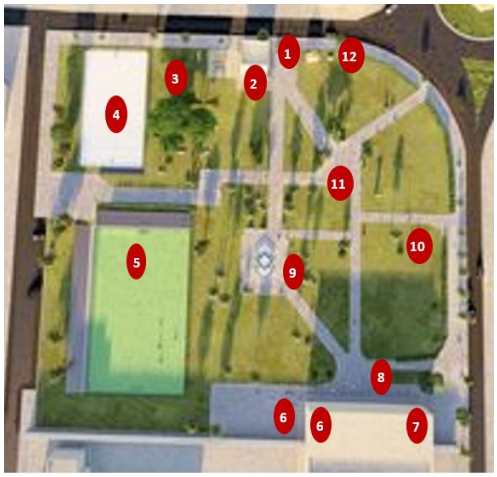

Figure 3: the location of the main components of the garden
Source: the 1st author

E. *On- Site Observation Analysis*

On-site observation provides direct access to the design characteristics and social phenomena of the garden and explore how these features influence human social behavior. The observing contains three things are; the design characteristics of the garden, people's behavior in or around its elements and observing the movement behavior.

F. *Main findings from the in-site observation*

The most important observations comments are summarized as follows:

1. The park site is easily accessible and available to all and has multiple entrances.
2. Only men and children use the garden while women use it for crossing only.
3. Most of the main components of the gardens are available in the garden, however, there is an absence of some components such as: outdoor WC, source of fresh water, and lack of games for children.
4. There is an interest in hygiene
5. The garden is comfortable for a variety of activities and a gathering of seating places.
6. Services for a variety of seating, lighting, and garbage bins are available, but they lack tables that can be used for a variety of purposes.
7. The garden lacks shading, so most visitors choose to sit under trees for protection
8. The non-facing position of the seats works for small groups, and large groups choose to sit on the grass and under the trees
9. There are no entertainment programs that help increase the number of visitors.
10. Although there are two playgrounds, it was noticed that they were used from a small group of people.
11. Although the walkways are designed in a way that connect most places in the park, most visitors use weeds as a walkway to reach their destination.
12. Despite the openness of the garden to the surrounding area with short vegetable barriers, it was noticed that some visitors climbed the only back South garden wall fence, separating the garden from the school.

G. *Human behaviour - Mapping Analysis*

The behavior mapping analysis was conducted in Summertime on Saturday 27/7/2019. The social observations were recorded on the afternoon from 4.30 to 8.30pm with suitable weather for staying outdoors, the mapping behavior divided to 3 stages. The first mapping observation was from 4.30 to 5.30 shows that 63 people visited the garden, 6 children and 57 adult male and no female (Figure 4). The second mapping observation was from 5.30 to 7.30 shows that 84 people visited the garden, 6 children and 78 adult male and no female (Figure 5).
The third mapping observation was from 7.30 to 8.00 shows that 12 people visited the garden, all of them are adult male, no children and no female (Figure 7).

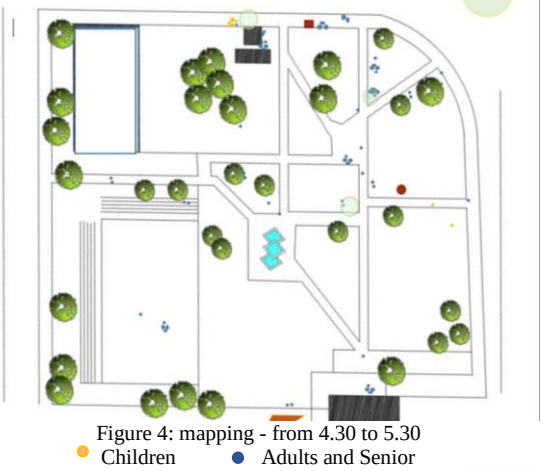

Figure 4: mapping - from 4.30 to 5.30

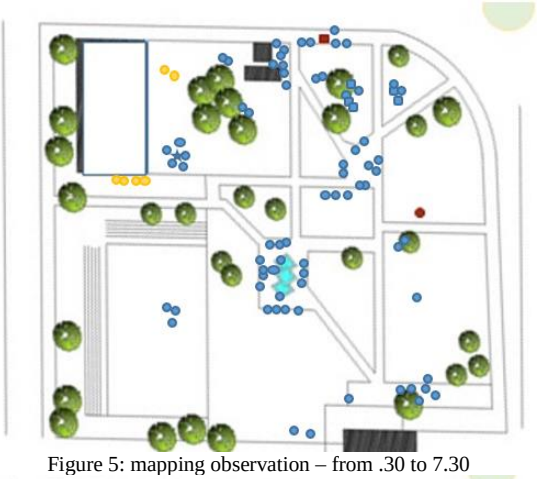

Figure 5: mapping observation – from .30 to 7.30

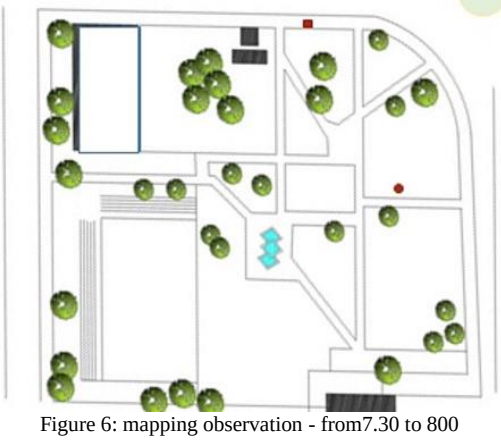

Figure 6: mapping observation - from7.30 to 800

H. Main Results of Observing the Movement Behaviors

- Although the garden open from three sides and people can enter from many entrances, but a strange behavior has been noticed, where some visitors jump over the back wall in the garden to reach the other side faster Figure 7.

Figure7: some users behavior, jump over the wall to reach the other side

- Although there are many pedestrian paths connected to all gates and spaces in the garden, it has been found that some people using different ways for their movement, by tracing their moves, it was found that most of them have chosen the shortest way to reach a gate or a space. These behaviors were identified in the map and documented with pictures Figures (8,9,10,11,12) as follows:

Figure 8: movement of children from the back entrance to the playground using grass instead of pavement.

Figure 9: Seniors having the same way to exit using grass instead of pavement

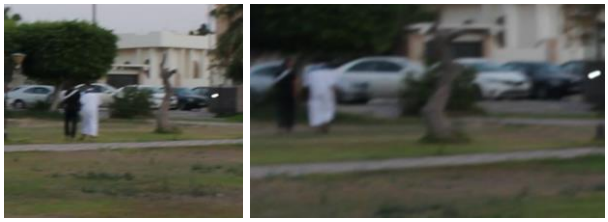

Figure 10: two men walking to the exit using grass instead of pavement.

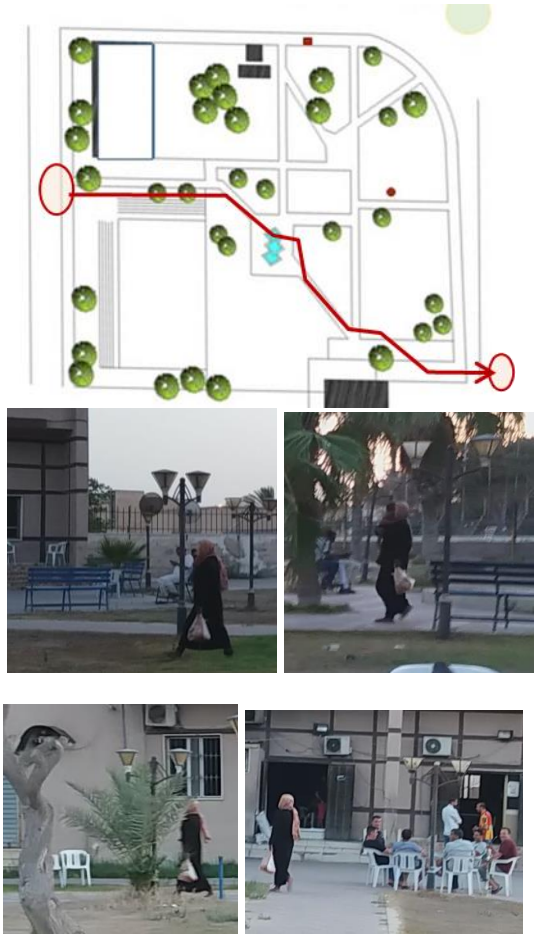

Figure 11: woman crossed the garden to reach the opposite side using walkway, but she moved to the grass because men are seating in the pavement way.

Figure 12: two women crossed the garden to reach the opposite side using grass instead of pavement.

I. Main Findings of The Visitors' Opinions

The most important views are summarized as follows:

1. The garden is considered clean, safe, comfort and can be accessed from all places in the city.
2. Although the garden offers the most needed components, the users demand many services: outdoor toilets, source of fresh water, increasing the children's play area and its games, and they also welcomed the presence of elements that represents the Amazigh culture.
3. visitors do not usually use the walkways designated for movement and walk on the grass because they always look for the shortest way to go out.
4. there is a lack of protection from the sun makes the time for most visitors near sunset.
5. Some people are jumping the wall through the school to get to the road quickly.
6. Existing paths are good and connected all the components of the garden, and relocating the walkways according to the preferred directions of movement will not help, because there will always be someone who needs a short cut and therefore, they will walk on the grass.
7. Holding some events such as festivities will increase the gathering, but the municipality usually holds public events in the municipal square.
8. An absence of women and families in the garden, because there is other space are designated for families, which are located on the seafront. As for this garden, it is common to be used by males.
9. Users are required to have other sources of energy and water.
10. There is an absence of sports games that encourage young people to practice sports.

V. RECOMMENDATIONS

The research findings suggest some general recommendations for designers and decision makers that could be useful in achieving the optimal use of urban spaces are as follows:

1. Meeting users' needs and satisfaction by providing a comfortable physical environment.
2. Providing awareness programs targeting the population and concerned with methods of preserving public squares and their maintenance and cleanliness.
3. Understanding human behaviors when preparing urban programs, to achieve compatibility with users' desires, cultures, behaviors and habits, and to translate their requirements into spatial requirements of dimensions and spaces.
4. Encouraging community participation and involving the people of the region in planning and design work, developing urban spaces, such as participating in decision-making or contributing to work through voluntary or physical aspects and other methods.
5. Enhance the activities and events that contribute to strengthening social relations.
6. Encourage planners and designers to incorporate aspects of the behavioral sciences into the design and decision-making process.
7. Planners and designers should identify and think critically about how the physical features and other features such as temperature, sound, smell and illumination may affect the users of public spaces.

8. involve the public users at an early stage of the design and decision-making process in order that their opinions can be fairly integrated into design alternatives.
9. Establishing the principles of public spaces that define the conditions and standards necessary to improve the social and functional performance of these spaces, and their approval by the responsible authorities.
10. Conducting studies that seek to establish a connection between the design and the fields of psychology and human behavior in order to use behavioral data in design activity spaces that Integrate with their function.
11. Presenting the design possibilities to the public in a coherent format that is meaningful.
12. Taking into account people with special needs, and preparing the space for them by providing it with slopes and the necessary furniture according to the international specifications.

Recommendations made for more effective performance for the Central Garden in Zuwara are shown in (Figure 14) and summarized as follows:

1. Create more gathering places designed for more effective group meeting.
2. Create a landmark reflects the city's culture, it can be a sculptor on the Southern edge, to be more effective place.
3. Upgrading the children play area with more interacting and educational games, also part of the Southern area can be used for quite children's games.
4. Reuse of the Southern wall edge as a wall painting, that can be used by visitors to memorize the city history and culture, this makes the area liveable.
5. Create different landscape elements for pedestrian paths along the garden to achieve the desirable activities.
6. Promote physical activities by designing paths for walking, running and cycling.
7. Organize sports events for children and youth in the existing place for sports playground to be more effective
8. Provide solar energy sources and power generators to be used when electricity is cut off, to increase the users' presence in the park.
9. Provide a water tank to be used for cafes, bathrooms and garden watering.

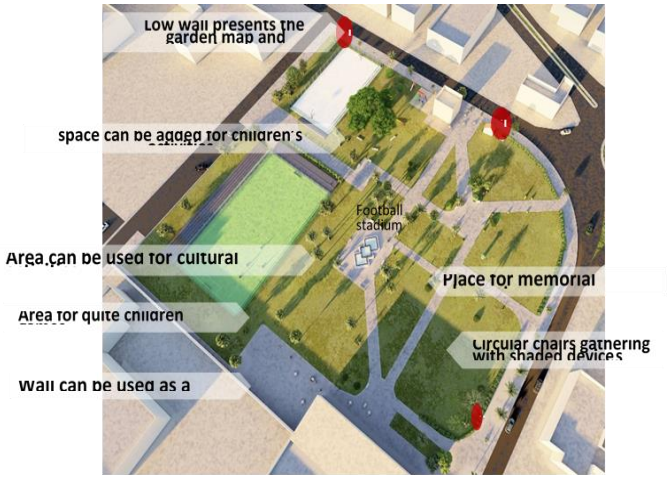

Figure 13 Recommendations made for more effective performance in the Central garden in Zuwara

VI. CONCLUSION

Human behavior usually appears in the form of cultured and learned behavioral responses, through individual learning from observation, training, and contact to different experiences. This research shows that human behavior and experience of public spaces can be influenced by the physical and ambient features of the built environment. This research presented a detailed study of the case study (Central Garden- Zuwara), explaining the characteristics of the city, and the nature of its inhabitants, then providing a precise description of the components of the garden and defining its features by comparing them with what has been concluded from previous studies. And then identified the most important human behaviors in general, and movement behaviors in particular, through the results of the personal observations and personal interviews with the garden's visitors to achieve the aim of providing a specific recommendation for the case study.

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