

Received 25 April 2019; accepted 27 June 2019.
Available online 1 October 2019

Urban Pocket Parks Promoting Quality of Life and Mitigating UHI Impacts – A Case Study of “Al Zawya Al Hamra” District

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ABSTRACT

The generality of the Egyptian cities and especially the Cairo region cities experience increasing signs of environmental stress. This stress is pronounced notably in the form of poor air quality, high density, traffic overcrowding, neighborhoods lacking basic facilities and services, increasing population and decreasing percentage of urban open green spaces. This research aims to reach for Egyptian Suitable Pocket Parks design guidelines which would help to mitigate the impacts of urban heat islands, promote the public health in the city and increase the green areas for more social interaction and user's satisfaction that goes for a large environmental, social and economic benefits. The Study aims to answer the following two main questions: How is it possible to use pocket parks as a greenery method in a city with very limited resources to mitigate the impacts of Urban Heat Islands and promote the community's quality of life? And what are the perfect design guidelines of pocket parks in the Egyptian case? The study implements the case study method through studying “Al Zawya Al Hamra” district which is one of the highest dense over populated districts in Cairo city.

The key findings of this paper disclose a 3d model for a proposed pocket park in one of the district's neighborhoods. Most of the interviewed residents in the action area context expressed their high satisfaction after watching the space model before and after designing the pocket park. With proper community participation through the whole design process, the proposed design framework of pocket parks in the Egyptian case was enhanced and refined.

KEY WORDS: Pocket parks – Urban heat island – Quality of life – community participation - Al Zawya al Hamra.

1 INTRODUCTION

The densification of cities produced a change in the people's way of life in the industrialized world. Working in offices and physical inactivity may be related to the increasing proliferation of life style diseases such as obesity, diabetes and heart related illnesses. It has been suggested through many studies that urban green space can have a remarkable effect on human health. However, public green spaces in Cairo city suffer on many sides, not only from scarcity, but also from distorted distribution and poor quality especially on the management wise. For instance, the person share from green spaces in Cairo city doesn't exceed 1.2 m² / person. This average is considered very low compared to WHO and worldwide metropolitan cities standard rates. This very low percentage is still expected to decrease even more due to scarcity in vacant land with the recent urban densification around Cairo city (WHO, 2012).

Climate change has become a global phenomenon which affects metropolitan cities dramatically, this change has led to the emergence of high rise temperature rates in urban areas more than its surroundings rural areas. This phenomenon is as “Urban Heat Island”, which has become many governments point of interest, in order to achieve thermal comfort for their citizens. Urban heat island (UHI) is a heavily populated area that is suggestively warmer than its surrounding rural areas. Heat is created by energy from people, cars, buses, and trains in metropolitan cities like Cairo, Hong Kong and London. Urban heat islands are created in places that accommodate diverse activities and with high populations (US-EPA, 2012).

Due to the previously mentioned, quality of life in the city is affected on a wide scale and stress related disorders begin to appear heavily such as diabetes, heart disease, obesity, depression and mental fatigue. This is where open green spaces become a solution for many problems.

The remarkable benefits of urban green spaces in relation with public health in high density urban areas have been indicated in several recent studies (Schipperijn, et al., 2013). None the less, the health related effects of individual green space units (e.g. City parks, small parks as pocket parks, boulevards, green corridors, green streets, rooftop gardens and private gardens) are poorly understood, and particularly with respect to pocket parks there is a research gap. If pocket parks are a possible resource for public health interest, they could be included in a city planning process, as they can be more easily incorporated into the dense city fabric than larger urban green spaces. They may, subsequently, also improve the quality of the city green infrastructure by performing as stepping stones between other types of urban green spaces (Peschardt, 2014).

Last but not least, Interaction with green spaces offers a variety of social and health related benefits for city residents, ranging from stress reduction, quicker health recovery, and the reduction of Attention Deficit Disorder in children to decreasing crime and air pollution. Creativity and man power in sustainable communities are considered as a renewable resource, which recognize the potential for healthy living conditions. Urban planners, governments, and city dwellers are only just beginning to appreciate the remarkable benefits of urban green spaces and make use of opportunities for improving quality of life in urban communities (Barton, 2009).

1.1 The Problem Statement

The urban fabric in most of the Egyptian cities especially Cairo city is very compact and tight, causing a large UHI and affecting the local microclimate through the rising temperature rates all day long.

The characteristic tendency towards the warming of urban surfaces is aggravated during hot days and heat waves, which reinforces the air temperature increase, particularly in poor ventilated outdoor and indoor spaces in high density urban areas of residential and commercial buildings with poor thermal isolation. This resulting in a high consumption of energy used for cooling (i.e. refrigeration and air-conditioning), subsequently increasing the energy produced by power plants, which leads to more emissions of heat-trapping greenhouse gases as well as other pollutants such as sulfur dioxide, carbon monoxide and particulate matter which also affect the public health. Furthermore, the increased energy demand means more costs to citizens and

governments, which in large metropolitan areas may stimulate considerable economic impacts (Pérez and Peña, 2010). Statistics explored that 30 million of Egyptians are suffering from chronic and dangerous diseases, so Egypt has the highest prevalence rate in the world of diabetes, cardiovascular, hepatitis, and kidney, and 47% of Egyptian mortality due to heart disease (Cabinet of Egypt, 2014).

Unfortunately, there are very limited open green spaces in Cairo city, due to the unique urban morphology featuring high density, which results in urban parks scattered along throughout the city and not able to enhance the local micro-climate and not contributing to the improving the quality of life. Subsequently, residents of many districts in Cairo city suffer a great lack in open green spaces, as the green share rate in some areas of the city may reach 0.1 m² per person which is far behind the standard rates (Abd El Salam, 2009).

1.2 Methodology

The methodology is composed of the following parts:

a) Theoretical Analysis:

Theoretical analysis mainly aims to tool up the research with required theoretical background.

The theoretical analysis covers the following:

Defining some major concepts in the research, such as UHI and urban pocket parks. Illustrating the relationship between quality of life and pocket parks.

At the end of the theoretical section national and international projects and studies concerned with the designing of pocket in high density urban areas will be analyzed. This section is concluded with the proposed conceptual theoretical framework that elaborates the design criteria needed to design a successful pocket parks serving local urban environments and enhancing their quality.

b) Practical and Analytical Study:

The analytic study tests the theoretical framework formed in the previous step. The study is applied to selected urban area (i.e. Cairo city). The first step involves choosing suitable case studies in order to ground the theory in actual practice. The second step involves choosing the appropriate techniques for gathering the needed data, thus ensuring validity. The findings, proposed strategies, and actions are presented in the final part of this research.

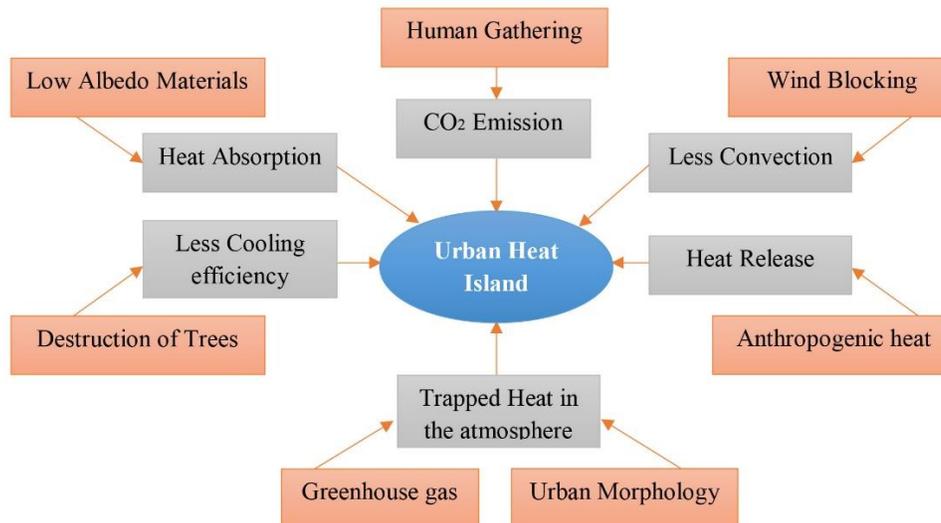
2 LITERATURE REVIEW

2.1 Urban heat island

The urban heat island effect is defined best as a metropolitan area in which its temperature is particularly higher than its surrounding regions. It mostly takes place by the heat generated out of its structures and affected man-made materials and heat produced from human activities like industrial areas inside the city and the traffic made by bypassing vehicles; the urban expansion which leads to land adjustment and modification. In general, it is characterized by warmer inner city climate as opposed to cooler vegetated rural areas; this opposition in temperature is what creates an urban heat island (Cancino, 2010). In a city with one million or more populations, the average air temperature can be from 1.8 to 5.4°F (1 to 3°C) warmer than its surroundings, this temperature variation can be as much as 22°F (12°C) on a clear, calm night. Though the effect is

often reduced as city size decreases, even smaller cities and towns will produce heat islands (Conrad, 2012).

Figure (1) Causes of the UHI



Source: Nuruzzaman, 2015

Cover of land changes such as urbanization may promote the effect and consistency of the UHI (Gaffin et Dell'osso, 2011). Health problems form a risk as a consequence of the tropospheric ozone formation and heat stress stimulated by the UHI. Higher temperature raises power plant pollution and the greenhouse effect as a result of the increased demand for electricity for air conditioning. In addition, the UHI may result in water ecosystems failure due to the increase of water temperatures. UHI may also increase the air pollution, for example by increasing surface ozone concentration which leads to several negative effect on human health (Chun & Guldman 2014).

During summertime, the effects are greatly increased and more devastating, particularly in the tropical and dry regions (i.e. Cairo city). It causes disturbance to the people especially those living in the urban center. People with low tolerance capabilities tend to feel heat stress which results in illness and sometimes death fatalities. Furthermore, the more heat in an urban area, the energy demand increases to provide comfort to people and cooling the buildings. This energy demand will increase the cost of expenses of the people as well as the government. In summertime, the energy demand will increase by 2-4% for every 10C temperature increase (Shalaby, 2011).

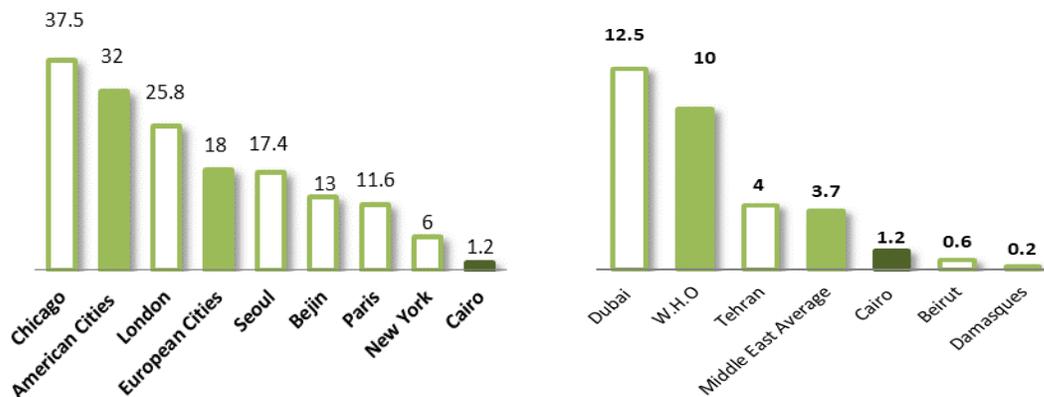
2.2 Quality of life

Through many disciplines, the idiom “quality of life” has been used frequently, ranging from health and environmental sciences all to social sciences. This is due to its complex nature encircling various elements that affect human way of life. The broad nature of this concept has resulted in different scientists embracing different definitions and exploring it from different ways. As an example, from the social sciences point of view, the effects of different variables such as leisure, wealth, safety, employment, housing, education, family ties and community involvement on quality of life have been highly researched (WHO, 2008).

Lack in green areas is one of the most important reasons for quality of life degradation in Cairo City. Cairo City suffers from major defects in the distribution of green areas, and there is no clear gradation in the sizes or distribution of green areas in most neighborhoods of Cairo City (if any Green areas). The high density of Cairo and the low share per person of the city's total area (33 m² per person) sets a ceiling for the ambitions of increasing the green areas which requires creative solutions for this major problem.

As per the international rates, the standard green and recreational area share per person should be (18 m²/person) according to Simonds, (10 m²/person) according to Wright Paul, (12 m²/person) according to the UNEP, (16 m²/person) according to the European Union and (11-13 m²/person) according to the local planning standards for the new cities.

Figure (2) Green Areas Share per person worldwide



Source: UNEP, 2012

This problem has resulted in a very low rate for the share of green areas per person in Cairo City compared to other metropolitan cities in Middle East or worldwide (only 1.2 meter per person). So as per the international and national rates for green area share per person, Cairo city is found to be far behind which should be tackled in that way, trying to improve the quality of life (El Zaafrany, 2004).

So, clean air and balanced heat are important to human well-being. Quality of life in urban settlements is negatively affected by the overheating in these areas. It is important to mitigate the impacts of UHIs on quality of life different levels such like economic, social, environmental and psychological perspectives of quality of life (Gaffin et Dell'osso, 2011).

2.3 UHI mitigation strategies

Many expertise of various professional fields such as urban planning, architecture, transportation and resources management, are drawn to urban heat island mitigation strategies. Both global and local climate are directly affected positively by these strategies. The mitigation strategies have many advantages, particularly in the reduction of energy demand, water and air pollution including greenhouse effect, as well as encouraging cooling in urban areas.

2.3.1 Greening measures

2.3.1.1 Green walls

Green walls are columnar ecological systems that generates a microclimate around a building that can essentially help to lower a building envelope temperature and ameliorates its energy competence. Vertical gardens also known as green walls composition have an extensive other benefits. From here there are many advantages to be explored such as the protection of a building envelope from ultra violet radiation, capturing pendent particulate matter and the protection of walls from graffiti and many other effects that would help raising the building envelope temperature (Giguere, 2009).

2.3.1.2 Green roofs

A roof of a building that is partially or completely covered in vegetation and a growing circumference, planted in a soil mixer over a waterproofing membrane system to keep and maintain the building structure with no damage.

Green roofs provides shade created by planting and as a result of evapotranspiration the amount of heat transferred from the roof to the building insides is reduced, as well as cooling the outside ambient air (Önder ,2014).

2.3.1.3 Urban pocket parks

Boosting the city's total vegetation index is the urban pocket park major purpose. To this end, there are numerous spaces in which pocket parks can be concentrated or placed, particularly located in dense urban areas and are designed for heavy use by the population. Vegetation and water features which may be located in a pocket park provide a cool climate which may help the population to use these spaces more often (Health Scotland et al., WHO, 2008).

2.3.2 Sustainable urban infrastructure

2.3.2.1 High albedo materials

Large urban areas are covered mostly with asphalt due to the spread if asphalt covered areas such as school yards, roads and parking lots. Most of the city's urban area is pavement which can take up to 45% of the surface area, which absorbs lots of solar radiation. These surfaces temperature can reach 80°C, thus amplifying the heat island effect (USEPA, 2008).

So, the suitable selection of pavement materials can help greatly in mitigating UHI. The usage of brighter, porous and lower in density can greatly help mitigation of UHI, this materials area called cool pavements (DPP, 2008). These cool materials help directly in the enhancement of thermal effort in daytime and alleviate UHI during nighttime, this happens when the cool pavements enhance water evaporation, reflecting more solar energy and remaining cooler than conventional pavements (USEPA, 2009c). In addition, these materials indirectly aid in the reduction of energy consumption, air pollution and greenhouse emissions, meaning the materials contribute to more alleviation of UHI (USEPA, 2011).

2.3.2.2 Urban Planning

Urban morphology can create urban canyons where heat and pollutants remain trapped. Urban planners should take into consideration certain parameters for thermal comfort based on the existing climate and city morphology, which makes the design of cities more integrative. Such as, combining vegetation with water installations, the used urban fabric during the city planning, discouraging the use of cars and building new green spaces and protecting the existing ones) (USEPA, 2008b).

2.3.2.3 Water bodies

Increased amount of water bodies has high heat absorption capacity which reduces urban temperature particular in day time, also their evaporation and increased wind speed help reducing the temperature. Serving as heat buffers, small water bodies such as fountains, temper temperature fluctuations which generates microclimates (Giguere, 2009).

2.3.2.4 Permeable surfaces

If water can infiltrate the used pavements in urban areas, it will be expected to reduce the surface temperature to a reasonable context. The water penetrated in the pavement will cool it down, thus cooling the temperature. When the water is allowed to penetrate a pavement or vegetation surface and reach a substrate layer that facilitates deep infiltration, the surface temperature cools. A long used permeable surface is a layer of gravel on top, which allows the water to infiltrate to the soil beneath (Nuruzzaman, 2015).

2.3.3 UHI mitigation strategies evaluation matrix

The increased attention to UHI studies have helped to develop ways to mitigate the effect of UHI, mainly strategies related to vegetation and trees (i.e. Pocket parks, green roofs, green walls) and pavement cooling strategies (Ralph et al., 2008).

A comparative matrix with regard to the four dimensions of quality of life (Administrative – Environmental – Social – Economical) has been conducted by the researcher, presented the advantages and disadvantages of most effective strategies to reduce UHI effects which has evaluated the mentioned strategies. So, it resulted that pocket parks tends to have the greatest advantages among all the previously mentioned strategies which would provide valid solutions to the research problems in the Egyptian case. Furthermore, in quality of life perspective, pocket parks appear to act as a key solution to upgrade and promote quality in many ways.

Table (1) UHI Mitigation Greenery Strategies Comparative Matrix, The

	Administrative	Environmental	Social	Economical
Green Roofs	Advantages	<ul style="list-style-type: none"> - Improved fire-proof properties of roofing. - Creation of consistent compositions. - Apertent of Using governmental buildings. 	<ul style="list-style-type: none"> - Improved micro-climate. - Urban heat island effect reduced. - Thermal insulation-related properties. - CO2 absorbed, oxygen produced. - Dusts and impurities contained in air reduced. - Biodiversity maintained 	<ul style="list-style-type: none"> - Noise-level reduction ranging from 20 dB to as much as 50 dB (Azkorra, 2015). - Improved aesthetics and amenity. - Can be used for lunch break and socializing. - Living standard improved. - Psychological advantages for people in urban areas.
	Disadvantages	<ul style="list-style-type: none"> - Roof tending and maintenance. - Possibility that plants will puncture insulation with their roots. - Possibility that water vapour will condense in thermal insulation and pockets containing water will form - Weight (up to 500 kg/m2). 	<ul style="list-style-type: none"> - Limited Choice of Plants. - Unwanted wildlife and insects. 	<ul style="list-style-type: none"> - Energy-related needs of the building reduced - Reduced quantity of rainwater drained by rain discharge system. - Recovery of green areas within the housing development space. - Higher property value. - Provide Income
Green Walls	Advantages	<ul style="list-style-type: none"> - Onsite Wastewater Treatment as Several water recycling systems can be applied to green walls, which can be re-used non potable purposes. 	<ul style="list-style-type: none"> - Reduction of the Urban Heat Island Effect. - Improved Exterior Air Quality - Trapping a layer of air within the plant mass. - Reducing ambient temperature via evapotranspiration and shading. - Creating a buffer against wind during winter months. - Increased Biodiversity: Green walls can help mitigate loss of biodiversity due to the effects of urbanization. 	<ul style="list-style-type: none"> - Space saving: Green walls take up very little footprint in the garden but provide maximum number of plants. - Insulation Saves Power as the small cavity between the green wall and wall surface remains at a relatively constant temperature. - Local Job Creation: Green walls draw upon several disciplines for their design such as installation and maintenance. - Green walled buildings has great Marketing Potential
	Disadvantages	<ul style="list-style-type: none"> - tends to require more maintenance since water won't infiltrate into the soil. - Limited varieties of vegetables and Fruits. 	<ul style="list-style-type: none"> - Aesthetic appeal: Green walls are very trendy. - Acoustic benefits: Green walls help to absorb sound waves so they are perfect to use as a screen between properties. - Improved mental health and wellbeing of society. 	<ul style="list-style-type: none"> - the sustainable time of vertical landscaping is short since most of the Climbing plants are short-living
Pocket Parks	Advantages	<ul style="list-style-type: none"> - Contribute to the maintenance of existing facilities and acquisition of new ones. - reinforce a positive link between local authorities and communities. - Pocket parks are cultural assets and a lasting legacy to future generations (Armato, 2017). 	<ul style="list-style-type: none"> - Physical fitness, social adjustment and mental and moral improvement. - play spaces designed for the present population of the society - Human Health, Internal Tourism and Reducing Crime. - equip people with the skills and self-confidence to tackle new challenges. - offer children a safe place to play and learn. - Empower local residents to make decision; that affect their community. 	<ul style="list-style-type: none"> - handle the problem of land rarity in high density urban areas. - Energy Savings by adjusting temperature which lower the power demand. - increasing land and Property Value. - promote green tourism and the local economy. - require a very limited land area to be set up.
	Disadvantages	<ul style="list-style-type: none"> - High cost of maintenance. - Local authorities terms and conditions 	<ul style="list-style-type: none"> - might attract and invite unwanted visitors as homeless people or thugs 	<ul style="list-style-type: none"> - funding problems. - Ownership varieties. - Network of pocket parks must be planned to work together, one is not enough.

Source: The Researcher

2.4 Urban pocket parks

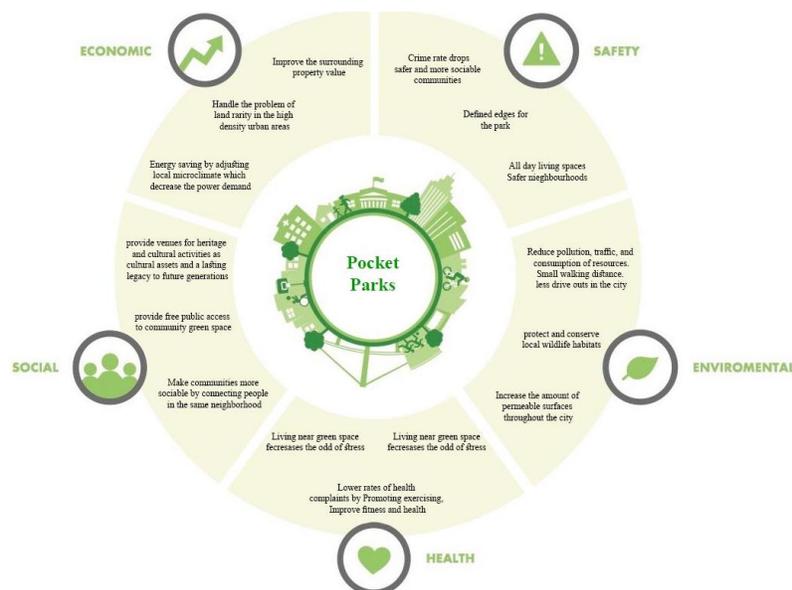
A pocket park creates the atmosphere of a manmade warm space which is considered as a small oasis for the community. Some portray pocket parks as vegetated areas placed within the dense buildings of an urban area (Northampton shire city council, 2011). More specific definitions were made by various independent studies and project (City of Copenhagen, 2009), which caused a general wonderment concerning the actual meaning of a pocket park. Pocket parks have different function depending on the surrounding community and its location, thus having a specific identity. It is appropriate to install playing equipment, plating vegetation, place water bodies, seats and art inside the parks in order to serve its purpose (OCRR, 2012).

2.4.1 Pocket parks benefits

Pocket parks supply a chance for interaction, learning and exchanging opinions, by presenting various possibilities in improving the local community's social, economic, public health and environmental perspectives. These parks are also valued for their support which influencing the aggregate ecosystems of the surrounding environment (Abd El Aziz, 2017).

According to the National recreation and park association (NRPA) issued research brief for mini parks in 2011 and the Kronkosky charitable foundation (KCF) issued research brief for pocket parks in 2016, a well-designed pocket park can be effectively beneficial on the social, environmental and economic levels.

Figure (3) Pocket Parks Benefits



Source: NRPA, 2011

2.4.2 Pocket parks features

It is the local community's responsibility to determine the pocket park uses and design, as parks has various appearances and characteristics (Blake, 2014). Pocket parks, according to their purpose and locations become various and their features may vary from seating to playground equipment. Other characteristics like site, dimensions of the park, walking distance and the requirements of the local community and users define the parameters for the park design (Abd El Aziz, 2015). Pocket Parks may contain one or many features such as flowers or trees, seating,

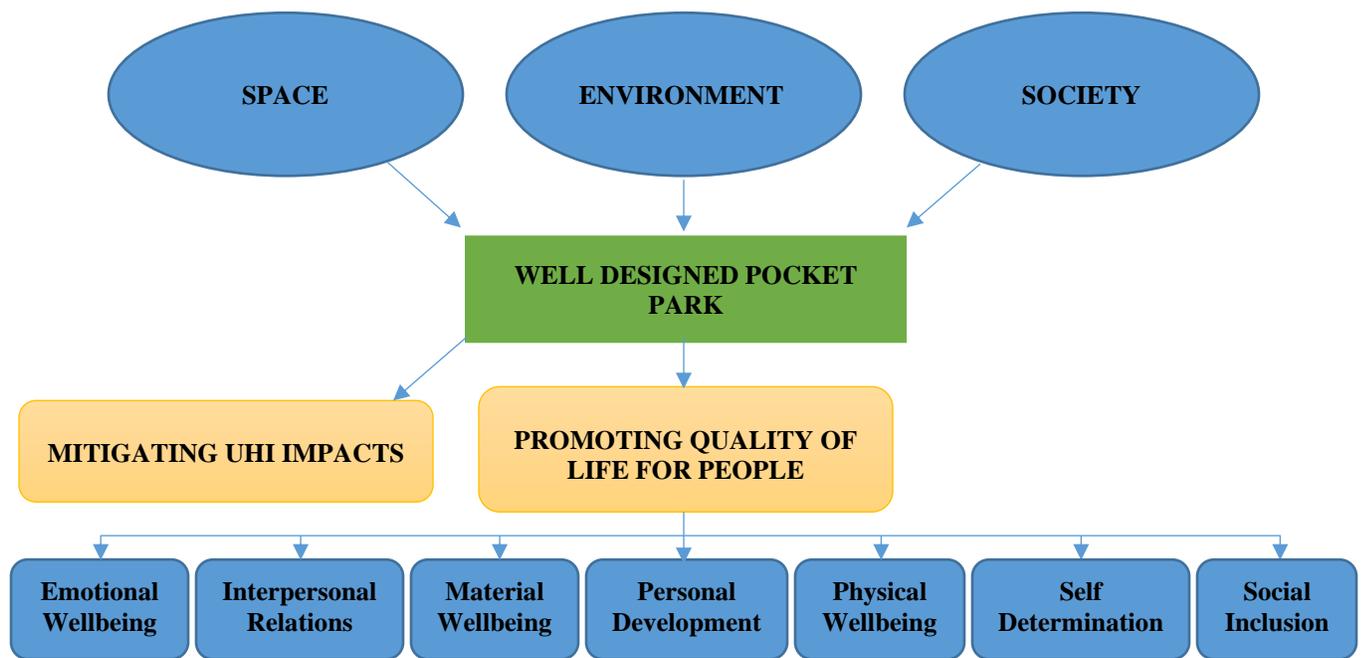
play areas, gazebos, picnic tables, lighting units, water features, defining walls, art sculptures, colorful plantation, shade trees.

2.4.3 Pocket parks design criteria - proposed theoretical framework

This section suggests a comprehensive framework for creating and designing a successful and prosperous pocket park within the Egyptian community context. It illustrates the quality of life concept value for all people.

Space, environment and society are key focal elements for a successful design to promote the quality of life in the intended case study context.

Figure (4) Pocket Parks Design Criteria



Source: The Researcher, 2018, After Galloway et al., 2006

2.4.3.1 Size

- Park size should be 300 to 600 m² range in case of a park created by local community.
- Park should serve a resident population of approximately 500-1000-person max.

(Abd El Aziz, 2017 – Blake, 2014 - Sinou, 2013).

2.4.3.2 Space Identity

- Functions of the park space should be climatic amelioration, noise screening, and providing space for leisure, facilitating social contact and encouraging social interaction.
- The concept design of the pocket park should include innovative and creative themes.
- The concept design of the pocket park should achieve the greatest play value possible
- Play areas should be divided according to age classifications (2-6 years) and (6-12 years).

2.4.3.3 Surfaces

Softscape:

- Cost should be minimized during the plantation selection process.

- Adjacent walls to the park should be availed to be a vertical garden or a paint wall.
- Climbers may be used such as bougainvillea spectabilis and Jasminum humile.
- Use of palm trees to be minimized due to its high cost.
- Groundcovers with edible, culinary and medicinal benefits should be used frequently.
- Deciduous trees only should be used across the park to provide shade and colorful atmosphere during summer times, sun light and warm in winter times.

Hardscape:

- Hardscape materials should be from high albedo materials with bright colors (e.g. white, beige, light gray).
- Interlock pavers or terrazzo tiles with Interesting patterns and rich textures finishes (e.g. antique, flamed, salted...) should be used due to their average prices to maintain the richness of the park and a low construction cost.

Furniture:

- Good shading with solid roof should be provided (e.g. gazebos, wooden Pergolas, hdpe tents) which also could present a main focal point in the park.
- Steel shading structures should not be used in the park as it could cause higher temperatures.
- Fixed and movable furniture should be used in good sets.

2.4.3.4 Environmental performance

- The designer should aim increasing and maximizing the amount of natural shade represented in the evergreen and deciduous trees.
- Designer should take into consideration the urban shades in the space by buildings.
- Environmentally friendly features are highly recommended to be used in the park design such as solar powered lighting units, recycled tables and chairs.
- Adequate artificial lighting should be provided during night time to give the impression of a live park and to avoid any illegal or anti-social behaviors.

2.4.3.5 Amenities & Activities

- Art sculptures could be used in for its low running cost and could make a good focal point.
- Considering a different uses and activities which would keep the park active and alive.
- Public art like graffiti and painting should be encouraged within the park design.
- A small event spaces should be considered during the design process.
- Lack trash receptacles in the park to be considered to avoid garbage spread in the park.
- Isolated or un-lighted parts in the park design to be avoided to ensure a safe park.

2.4.3.6 Users

- Design to consider determining the major uses of the park to be appealing and engaging to attract some different users of all ages (kids, teens, adults, etc...).
- Park design to provide a good and comfortable zone for social interaction.
- Park designer to determine the main theme of activity and purpose of the park such as (serenity, relaxing and meditating - encourage sitting - high playing value - etc...).
- Activity main theme to influence the park design concept directly, how it helps to improve the physical and mental health for the neighborhood dwellers.
- Designer to involve the local community in the design process.
- Designer to share preliminary concept and ideas with the potential users.

2.4.3.7 Funding

- Break down the element in the Pocket park and the likely cost of each one.
- Cost estimate should be set and prepared by the designer.
- Final Budget for park construction to be provided by the designer with a total number.
- Applying for grants or awards which can be granted by interested institutions or foundations.
- Writing to Local Business firms which can sponsor the establishment of the pocket park.
- Writing to local governmental authorities to ask for governmental support.

(Kronosky, 2011).

2.4.3.8 Setting up & management

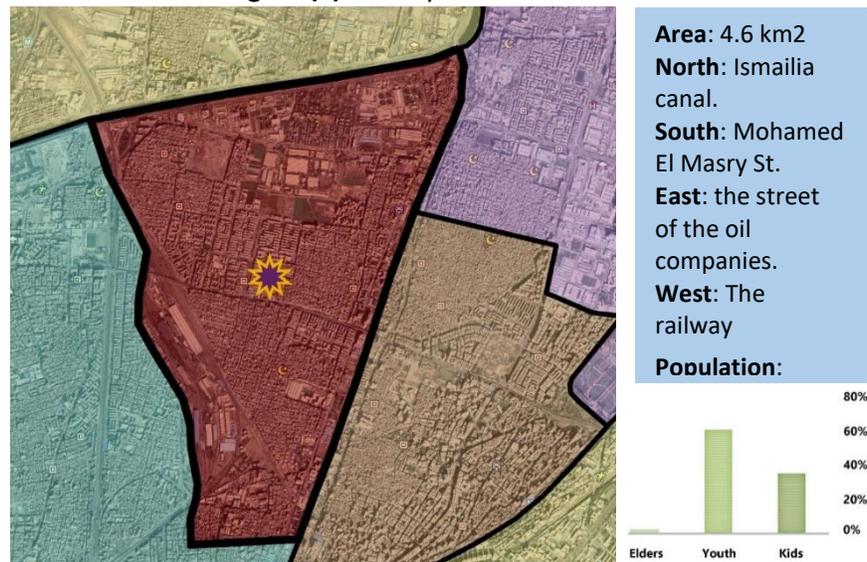
- Designer to survey the ownership of the proposed location for the pocket parks.
- Determining the land matters (leasehold, license, management agreement, etc...).
- Designer to talk to as many residents as possible, ensure their willing to help participate.
- Designer to survey the potential work hands and to involve them in the process.
- Before any plants go in the ground, a documented maintenance plan should be prepared.
- Designer to consider reducing the maintenance requirements through an easy constructed park design (plants with high tolerance, efficient hardscape materials, etc...).

3 Method

3.1 Study Site: Al Zawya Al Hamra District

El Zawya El Hamra has started as a well-planned neighborhood back in 1900 of the last century and currently has become one of the most crowded informal housing districts in Cairo city. It is located between Al Sahel district and Hadayek Al Qubba district. Informal housing has started in the district after the collapsing of many houses in Al Turgoman and Al Faransawi in Bolaq Abo Elela in order to accommodate the homeless families.

Figure (5) El Zawya El Hamra District

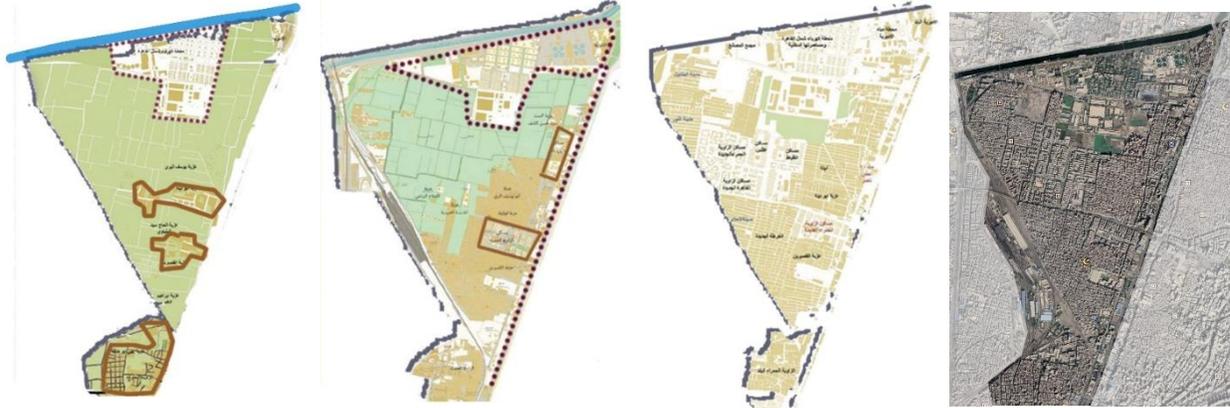


Source: The Researcher, 2019 - Egyptian Government Gate, 2017

3.2 District Planning History

District planning was started in 1900 back in the last century when the area was mostly agriculture lands. After the revolution of 23th July, the general plan of Cairo city was settled including the establishment of two areas for governmental formal housing, Al-Zawya Al-Hamra and Nasser housing projects. It was the start of a large demographic breadth and internal migration. With no governmental housing projects or any planning for the urban growth. That led people to expand informally and by necessary the vanishing of the green agriculture lands.

Figure (6) El Zawya El Hamra District– Urban Development 1900 to 2019



Source: GAID

3.3 Land use pattern analysis

Main land uses in the district are (residential, mixed residential, commercial, handicraft and industrial) uses. The location of mixed uses is concentrated mainly on Port Said Street. Which provides walking distances up to 1 km alongside the district. All the district dwellers have access to mixed use development.

Figure (7) El Zawya El Hamra District, Land use Study

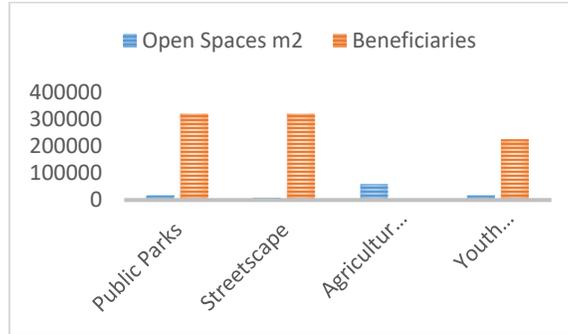


Source: WCHA, 2015

3.4 Existing Open Green Spaces

The district currently provides different types of open green spaces (Ismailia Canal, Agriculture pockets, streetscapes, residential green spaces, youth centers and public parks).

Figure (8) Available Open Space with Beneficiaries



Source: The Researcher, 2019, After WCHA, 2015

The provided open green spaces area is 48560 m2 regardless of the agriculture pockets which is no benefit to the district dwellers as a recreation area, this area is not enough for the district dwellers. As one of a very populated high densities of Cairo city districts, Al Zawya Al Hamra comes as one of the lowest green area share per person in Cairo city districts with approximately 0.1 m2 for every resident.

Figure (9) El Zawya El Hamra District, Existing Available Open Green Space



Source: The Researcher, 2019

That leave the district with extinguish need for away more Green open spaces and recreational areas to raise the share of green areas per person which consequently will improve the quality of life of the whole district.

3.5 Action Area – ElAmiriya Elbalad

The residential area of ElAmiriya lacks for services and suffers from marginalization and the most deteriorating urban situation in the district of El Zawya El Hamra. The area generally suffers from infrastructure problems. The following map indicates the locations of potential pocket parks that could be maintained within the neighborhood in the aim of upgrading the urban environment and improving the quality of life.

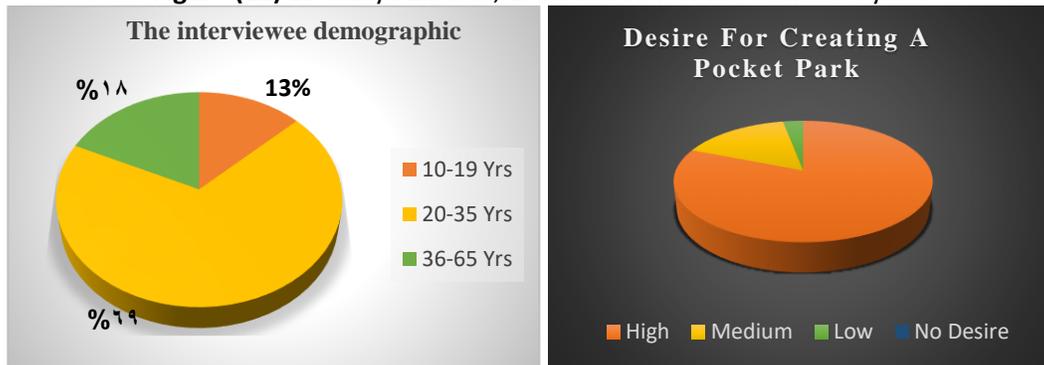
Figure (10) ElAmiriya Elbalad - Potential Pocket Parks Locations



Source: The Researcher, 2019

According to site survey, Inventory and on site interviews with many local residents in ElAmiriya, potential locations for creating a pocket park have been pinpointed and marked. Also, people have showed a remarkable desire for creating pocket parks in their neighborhood which would contribute to the neighborhood greenery and improve their perceived quality of life.

Figure (11) ElAmiriya Elbalad, Local residents interviews analysis



Source: The Researcher, 2019

3.5.1 Potential pocket parks locations evaluation

According to the theoretical framework determined Criteria, the marked locations have the possibility to create pocket parks. However, not all those locations are fulfilling the required criteria equally which would require an evaluation to select the most suitable location according to design criteria.

Table (2) Evaluating the Potential Pocket Parks Locations in the Neighborhood

	Location No.1		Location No.2		Location No.3		Location No.4		Location No.5	
Area – (300-600) Recommended	201 m2	☐	357 m2	●	288 m2	☐	363 m2	●	609 m2	☐
Park Type	Bonus	-	Passive	-	Bonus	-	Bonus	-	Active	-
Current Land Use and Activities	Car Park / Storage / Fenced Land	☐	Street / Kids Play / Football / Domestic Chores	●	Street / Car Park / Play area / Garbage Box	☐	Loitering / Car Park / Kids Play / Football / Construction Remains	●	Billiard Table / Car Parking / Loitering / Vendors	●
Surrounding Land Use	Residential Handcraft	☐	Residential	☐	Residential Commercial	●	Residential Commercial	●	Residential Educational	☐
Expected Served Population (300-500 Person)	140 Person	☐	420 Person	●	300 Person	●	390 Person	●	480 Person	●
Accessibility	Very Good Access	☐	Weak Access	☐	Excellent Access	●	Very Good Access	☐	Good Access	☐
Exposure	High	●	Low	☐	High	●	Medium	☐	Medium	☐
Land Property	Private	-	Public	-	Public	-	Public	-	Public	-
Local Residents willing to participate	Low	☐	None	☐	Medium	☐	Medium	☐	High	●

Source: The Researcher, 2019

3.5.2 Selected pocket park location

After studying the different locations with a potential to create a pocket park, it turned up that location no. 4 is the most suitable locations to create a pocket park as it is also fulfilling most of the pocket park location selection criteria in the theoretical framework.

Figure (12) ElAmiriya Elbalad, Selected Pocket Park Location



Source: The Researcher, 2019

Three main tools that were used to gather data about the selected location, observation, interviewee and site survey. The site survey has been carried out in May 2019 in order to record and report the following:

- The physical state of the space with its surrounding urban context and environment.
- The conducted activities within the space.
- Behaviors of potential users and Regular maintenance for the space.

3.5.3 Space characteristics

An un-used space connected to two narrow streets is chosen to be converted into a pocket park. Space total area is 363 m² (Figure 7-31). For now, the space is used by kids for play times and playing football.

Figure (13) Selected Pocket Park Location, Surrounding Streets



source: The Researcher, 2019

The floors are a very poor interlock paver on the main street entrance and narrow streets entrances. The space itself is unpaved floors. The space lacks any type of furniture (seats, trash bins, etc...) as there is only one wall seat. No planting of any type detected in the space. Lighting at night times is poor. The main users of the space are children (up to 12 years old) playing and running around the wreckage in the space, and housewives gathering to socialize in the morning and evening times.

Figure (14) Selected Pocket Park Location



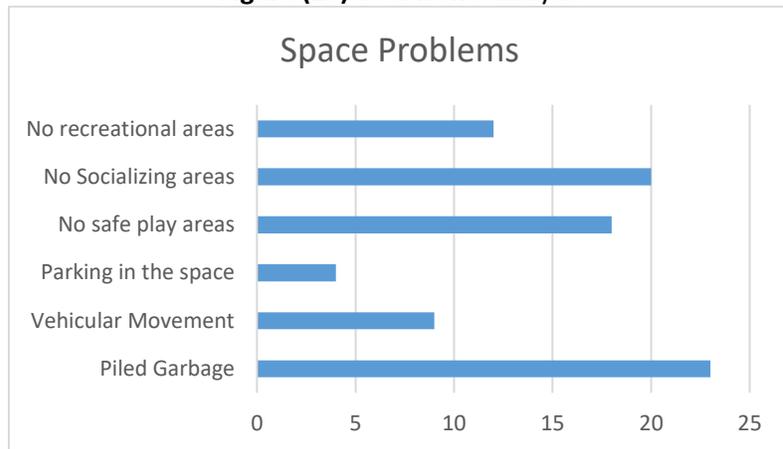
Source: The Researcher, 2019

3.5.4 Local community input before the pocket park design

Executed interviews in the selected location parameter has been conducted with 23 potential users, it has recorded a very promising results which by consequence will help the designer with a successful design. The questionnaire outcomes were as following:

- 1- Regarding the current problems in the space, residents proclaimed that the garbage keeping pile up is the most annoying problem for them. Also some old construction remains (sand, dry cement, crushed stone and concrete residue).
- 2- As the space is currently for pedestrian move totally, Residents expressed their concern about vehicular movement that may penetrate the space after upgrading, as they need to make sure that their kids are safe.
- 3- Other few residents who are owners of vehicles demanded to be able to park their cars in the space, but got convinced to keep the current situation going as they park their park in the outer main street parking.
- 4- Housewives welcomed the edible garden concept (mint, radish, lettuce, thyme, rosemary, etc....), actually it proposed genuinely by some of them as they may benefit economically. Also some asked for a plantation with good smells.

Figure (15) Interviews Analysis

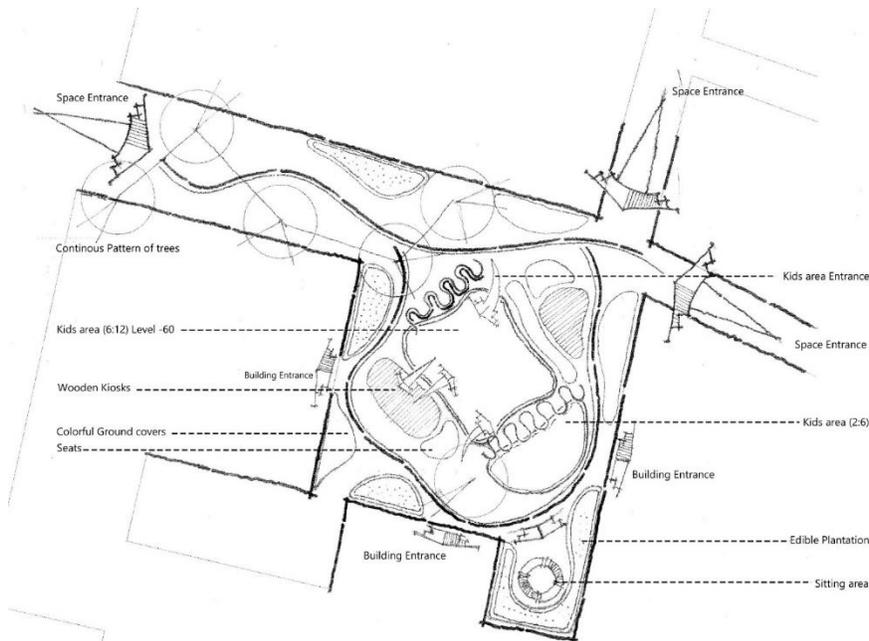


Source: The Researcher, 2019

3.5.5 Pocket park proposed design

The design was presented as 2d and 3d drawing to 3 groups of residents categorized by age.

Figure (16) Proposed Pocket Park Design Concept



Source: The Researcher, 2019

The park stands as a great sanctuary from the surrounding stressed over crowded urban environment. Inside the park, the hustle, smells, and heat of the neighborhood are being fainted by the park’s variety of plantation and levels difference.

3.5.5.1 Design elements of the proposed pocket park

- **Location and size:** Size of the park is approximately 365 square meters, the park location provides easy and safe access by foot.

- **Walls and edges:** the park is surrounded by residential buildings walls on three sides. The location of the park gives the potential to access the park from 3 minor streets.
- **Hardscape:** Interlock pavers with light colors were used in the design for many reasons, it helps to reduce the construction cost generally as it is easy to install which may be constructed by local residents. Also rough basalt was used to identify the buildings entrances.

Figure (17) Proposed Pocket Park Design, Hardscape and Plantation



Source: The Researcher, 2019

- **Softscape:** To enhance the local environment and improve the life quality around the space. Four colorful trees are good enough as the buildings themselves are forming a good shade in the space. Different colorful ground covers with fragrant smell were used around the buildings entrances to give a sense of joy. Furthermore, small edible garden is placed in the design to be planted and used by local residents (mint, radish, lettuce, etc...).
- **Activities in the space:** A Large sand bid in the center of the space which could be used by a various age categories to add the greatest play value to the park. Many seating areas were added in the park design considering a different activity for different ages like (housewives gossip, teen studying, elders reading newspapers, etc...).

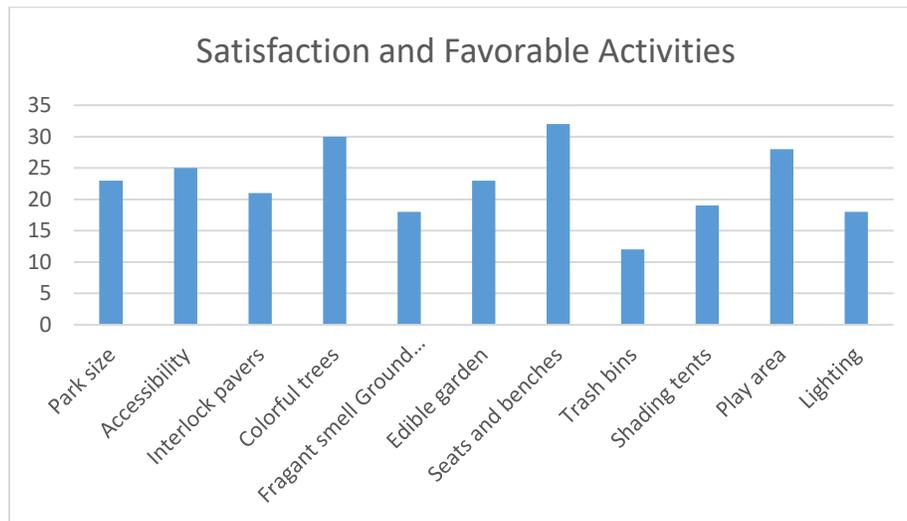
Figure (18) Proposed Pocket Park Design, Activities Through the park



Source: The Researcher, 2019

3.5.6 Local community input after the pocket park design

Design of the pocket park was proposed and presented to local residents in both 2d and 3d model, interviews have been conducted within a 250 m range around the selected location of the pocket park with 34 interviewees. The outcomes of these interviews have been analyzed and resulted in the following.

Figure (19) Interviews Analysis, Satisfaction and Favorable Activities

Source: The Researcher, 2019

4 Conclusion

This research aims to mitigate the impacts of UHI and promote the quality of life in the high dense urban neighborhoods through designing a successful pocket parks. A theoretical background was gathered to illustrate the impacts of UHI and a low quality of life that could be solved through many strategies. One of the most suitable strategies for the Egyptian case is pocket parks. Pocket park design criteria was explored all through the literature. The criteria included the size, location, accessibility, design, activities, environmental performances, landscape features and maintenance process. A neighborhood in a high-density residential area in Cairo City, ElAmiriya Elbalad in Al Zawya Al Hamra district has been studied for the potential locations that could maintain the creating of a pocket park, these locations have been evaluated according to certain criteria which has resulted in selecting the intended and proposed park location. A case study was tackled in the selected leftover space in the same neighborhood, a design for the pocket park was proposed and presented to local residents in both 2d and 3d model. The researcher has explored the local resident's satisfaction before and after the proposed design for the space through conducting interviews with different age categories.

5 Recommendations

Through the study findings, it could be determined that the high density and the scarcity of land in urban areas has been one of the main reasons that led to numerous urban problems in Cairo, including absence of green and recreational areas. Hence, the study suggests for the pocket park design the following recommendations:

- 1- The concept of developing those leftover space to become a pocket parks has been very welcomed by the local community.
- 2- Landlords should be involved in the process from the very begging.
- 3- From the begging, the whole project budget should be determined.

- 4- Funding methods to be clear before the going ahead with the project.
- 5- Seating areas and play areas are the most important elements for the residents and should be highly considered during the design process.
- 6- Pocket park, should preferably include plantation such as trees and green or flower beds.
- 7- Trees should not be always a shade trees (evergreen) and could be colorful deciduous trees which give the space more richness, as in high density urban areas, the space mostly will be enough shaded by the adjacent buildings.
- 8- Edible garden has been welcomed by the local housewives who showed a great concern to plant them and make a good use of them.
- 9- Hardscape paths should provide a suitable movement instead of movement on greens.
- 10- All site furniture (benches, tables, trash bins, etc...) should be fixed to the ground.
- 11- Shaded sitting areas for parents should be provided around playing areas.
- 12- Sufficient trash bins should be provided around the park to avoid garbage spread.

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