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Sustainability of Housing Patterns and their Impacts on Urban Open Spaces; Case of Study Tripoli, Libya

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Abstract:- This paper is a brief of masters degree thesis which examines the housing patterns in Tripoli and their sustainability to determine how they penetrate urban open spaces. Within this framework, selected housing areas and public space relations will be analysed in terms of sustainability that has become commonly discussed recently. As far as Tripoli is the city that exists for thousands of years and it has different impressions and culture mixture and ethnics through its historical background and its geographical importance in the world, these researches deeply encourage and interest the author to emphasis the relationship between this urban open space and housing settlement patterns in scope of sustainable urbanization in Tripoli. This relationship and design patterns shape our life and response harmoniously and accordingly in returns. This thesis obviously analyses the main Tripoli square with its close street surroundings. It is aimed to develop the housing patterns with their urban open spaces in Tripoli to encourage interaction for humans and create diverse and welcoming environment for all locals and foreigners. Furthermore, it is concentrated on the main urban open space in Tripoli center 'Martyrs square' which is the core of the city and set as launching point of the thesis and case study with its housing settlement relation nearby. It is thus inevitably focused on investigating the district to maximize the quality of life standards initiating a masterpiece of sustainable architecture design development.

Keywords:- *Sustainable Housing Design, Urban Open Spaces, Urbanization Development, Human Well-being Environment, Tripoli housing development.*

I. INTRODUCTION

'Many studies claim that public open space is one of important urban environment elements which give a positive contribution to quality of life' (Nasution A, Zahrah W, 2011, Elsevier)[1], and 'The ultimate object of design is form' (Alexander C., 1973) [2].Therefore, these researches deeply encourage and interest the author to emphasis the relationship between this urban open space and housing settlement patterns in scope of sustainable urbanization in Tripoli. This relationship and design patterns shape our life and response harmoniously and accordingly in returns. This thesis obviously analyses the main Tripoli square with its close five street surroundings. It starts with the main square which was originally constructed by the Italian colonial rulers on the site of the old bread market and it was expanded on several occasions during the 1930s. It features the Red Castle Museum (*As-Serai al-Hamra*), which hosts Libya's Antiquities Department and the National Museum with a collection of Phoenician, Greek and Roman artefacts. The museum also exhibits many historical statues and monuments. On the other side, a wide avenue leading towards the seafront with two tall pillars. On top of the pillars are an iron-cast, miniature wooden ship; the other one features a horseback rider. In addition, in 1960s the square got expansion and development to create space for large demonstrations and events due to population growth. In 2011 war, the square was the focal point for political protests, and overall it is the main socializing point for important events. Today, it lies surrounded commercial shops, public buildings, residential area, exhibitions, and much more various products and functions with view of city harbour. Other recognized structures include the national museum and a big fountain in the square with many palm trees, which is often served as gathering point for locals.

Fig. 1, 2. Tripoli Martyr's square in 1930s and in 1970s. (Resource; Ebay.com & Pinterest websites)

1.1 Problem Statement

Around the Tripoli city center, there is lack of sustainable urban open space where people meet each other in scope of socialization in relation with housing pattern design. It is considered as low- levelled criteria in terms of relationship between residences and urban open areas. Consequently, it becomes neglected by its vitality and brightness.

There are also improper walking targets that people visit for walking encouragement, nor being walking comfortable in harmonious natural urban design flow. As far as these is a rapid increase in world population in overall, 'the lack of clear pedestrian's pathways in the housing units and the urban open spaces, and the mix between the cars traffic and pedestrian movement, does not improve comfort of aesthetic enjoyment of the central area' (Alzklaa N, 2016).

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[1]Abdulla A., Gamal M., Selim G. Understanding Walkability in the Libyan Urban Space: Policies, Perceptions and Smart Design for Sustainable Tripoli, Dec.2016. Nottingham Trent University, and University of Leeds.

[2] Alexander C., (1973).Notes on the Synthesis of Form.Harvard University Press, Cambridge, Massachusetts. Library of Congress Catalogue Card Number 64-13417.

1.2. Aim and Objectives

In this thesis brief, it is aimed to discuss sustainable housing patterns in relation with sustainable urban open space to afford development for the selected site for humans to create diverse and welcoming environment that encourage individuals to enjoy being in Tripoli main districts among sustainable urbanized environment. Precisely, there will be determination of various housing patterns in Tripoli. These various housing pattern will be set as case studies of this thesis. It concentrates on investigating the case studies to maximize the quality of life by focusing in the sustainable pillars which refer to social, ecological, and economical aspects.

1.3. Hypothesis

When the thesis is conducted,

A. The strategies of sustainable housing patterns will increase quality of life and afford doing some activities such walking to and around urban open areas in this precious and historical district which increase the quality of life, and decreasing carbon emissions correspondently and create sustainable urban open spaces.
B. It will attract tourists and locals to go in a trial trip to discover the historic city center with its flexible connectivity and sustainability in a harmonious mixture atmosphere between Libyan and Italian beside the Ottomans architecture style.

1.4. Method of the Thesis

Questionnaire and non-participant observation were the main methods for this research. This means that visiting the site and taking deep looks of details and photos were appropriate as a methodology, beside, obtaining necessary data such plans and site plans from Google search, second data photos from scientific journal articles, governmental documents, Tripoli future vision plan 2010, and from architecture offices and friends in Tripoli. Furthermore, the questionnaire process was appropriate as well for data collection to make the thesis results more scientific.

II. LITERATURE REVIEW

2.1. Main Definitions

The main definitions of this thesis consist from couple of two, which are Housing Patterns and Urban Open Space. These main two definitions vary in many scholars and countries because of their values and expression philosophy to define them. Housing is the shelter that take humans take to protect their selves from rain and to have privacy and so on, whereas, pattern is the regular way in which something happens or is done (Oxford Dictionary). However, housing pattern is phenomenon of housing shapes that designed according to its geography. Therefore, in this thesis, I concentrate to modify the existed case of study and find the proper development housing pattern design in relation with urban open space that best matches it. This can afford decent dwellings for citizens and connects them around the city with high quality of services.

On the other hand, Urban Open Spaces is defined in USA as any undeveloped or largely undeveloped land within an urban area, and the value of land and other natural resources protection as well as the value of history or landscape. Japanese define it as it is composed into two parts: public green space and private green space. Moreover, the Author Alexander defines open space in Architectural Pattern Languages 'Any place that makes people feels comfortable, has a natural basis, and can look into a wider space, can be called an open space'. Overall, it is the space that includes the natural environment in the city, such as green spaces, water elements, but also artificial grounds such as squares, roads, recreational facilities, parking lots, and landscaping.

2.2. Housing Patterns

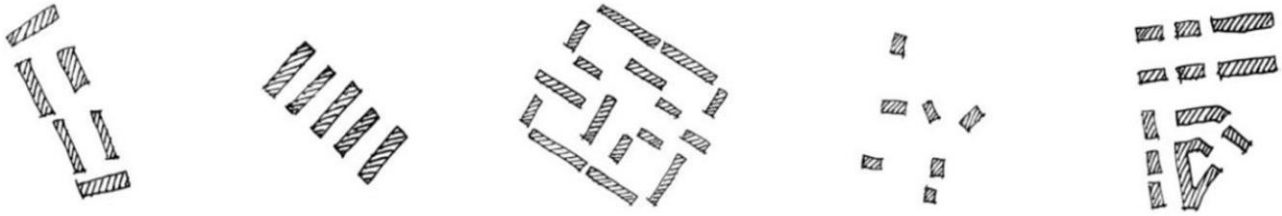

Fig.3. (H. W. Hu. 2019). Common Housing Patterns

Beside the first well known core implementation of Howards, Clarence Perry, and Le Corbusier's ideology, and the development through history, according to the Author (H. W, Hu 2019), Housing patterns are divided into five types: enclosure, determinant, group, distributed, and hybrid. These housing patterns helped to examine the different urban settlement morphology in different periods. However, these patterns could apply to sites accordingly to natural principals that better fit them in terms of whether, wind, sun orientation, culture, density, and others impacts. However, according to urban patterns in Tripoli main district that it is more recognised as Hybrid settlement pattern. These hybrid patterns were constructed by Italians during the colonial rule in early 20th century. As it is mentioned previously, Italians has set their urban planning technique in Tripoli main district with enormous functions that still vital, well recognizable today, and stylish. In Style, moreover, around Tripoli it is clearly seen that both Italian and Ottoman styles are common that the Italian rounded arches are close the Ottomans pointed arches. Therefore, the Libyan style is more influenced by these both Ottomans and Italians culturally and architecturally.

1.5. Urban Open Spaces

Among all periods of development, innovations, and visions, several different methodologies planning techniques have going past, which some of them are being used till today widely. These are the most logical and well achieved. Meanwhile, there is another theory of Small Public Squares which is mentioned 1970s functioned as meeting nodes (14m x 18m). 'These nodes are where paths crossroads in neighbourhoods and communities. These vital meeting points must be located in density areas through pedestrian and walk areas to generate identifiable districts and to encourage sociability, walkability, and connectivity among communities' (Alexander C. 1977). They should also be distributed properly throughout the community and surrounded by different function buildings that it becomes really vital activity nodes as functional as Public Urban Areas; see figure4. Moreover, among these activity nodes can be promenades which is a paved public walk of approximately 6m width with different functions in right and left sided. They centrally placed at the heart of every community, linking the main activity nodes that each point of them is within 10 minutes, and no matter how large it is. It has be dense enough with actions and different age groups.

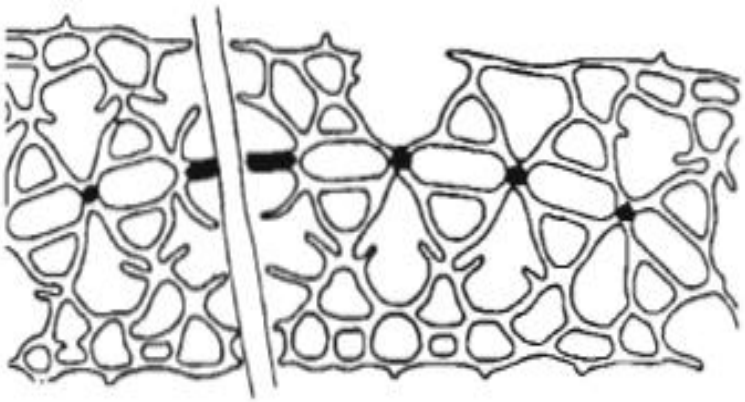

Fig.4. Small Public Squares Converge on Centres of Actions (Alexander 1977: A Pattern Language)

III. IMPACTS OF SUSTAINABLITY IN THE DIFFERENT HOUSING PATTERNS ON URBAN OPEN SPACE

3.1. Housing Patterns of Tripoli

There are several housing patterns in the built area around Tripoli. This part investigates them by determining their impacts on urban open space in scope of sustainable aspects. In addition, some of the housing projects that being constructed in Libya are implemented by both local experts and international qualified companies. This means that some sustainable criteria are visible and well considered, whereas, some of criteria in housing patterns are neglected. Beside this, most of the following case studies are located in main districts of Tripoli and taken from Google Earth. There are Ten case studies were determined.

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Cases	Case1	Case2	Case3	Case4	Case5	Case6	Case7	Case8	Case9	Case10
Pattern Shape										
Pattern Name	ADJACENT	DETERMINANT	DETERMINANT	DETERMINANT	HYBRID	ENCLOSURE	ENCLOSURE	GROUP	GROUP	GROUP

Table1. Thesis Tripoli Case Studies of Housing Patterns

3.2. Determining Sustainability Criteria on Selected Housing Criteria

1. Social sustainability
- Young
- Elderly:
_ Neighbour Relation
_ Social Public Areas
2. Physical sustainability
- Pedestrian
- Car & Parking Facility
- Children Playing Ground
- Bicycle Paths
- Water
- Energy
- Green
3. Economic Sustainability
- Workshops & Sales
- Maintenance
4. Block Organization
- Sun & Shadow
- Safety
- Density
- Building Quality
5. Housing Blocks and Public Space Relation
- Open
- Semi-open
- Closed

3.3. Impacts of Sustainable Criteria on the Urban Open Space

This section covers questionnaire for survey and interview to investigate the sustainable criteria on the urban open space of the selected housing areas. This questionnaire has two parts which indicate interview for architects and urban planners with open-ended questions, whereas questionnaire for the housing area dwellers which is closed-ended questions. Furthermore, the closed-ended questions were 40 questions which could be evaluated in tables in next part.

IV. EVALUATION

The two questionnaire parts have been asked to several architects and urban planners, and 200 dwellers. There were chosen 20 educated dwellers both mature and elderly from every housing area in the case studies, which sums up with two hundreds questionnaires in total, beside the interview with the architects and urban planners. Therefore, educated people were selected in this questionnaire whom are closer to help further about surveys and being more realistic.

4.1. Close- Ended Questionnaire Part

Physical Sustainability Evaluation of Questionnaire										
Cases	**Case1**	**Case2**	**Case3**	**Case4**	**Case5**	**Case6**	**Case7**	**Case8**	**Case9**	**Case10**
Pattern Shape										
Pattern Name	Adjacent	Determinant	Determinant	Determinant	Hybrid	Enclosure	Enclosure	Group	Group	Group
Organized Pedestrian	Yes % 25 No %75	Yes % 25 No %75	Yes% 15 No %85	Yes %20 No %80	Yes % 25 No %75	Yes% 30 No %70	Yes % 30 No %70	Yes%20 No%80	Yes %10 No %90	Yes % 10 No %90

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Routes										
Adequate Ground Materials	Yes % 20 No %80	Yes % 55 No %45	Yes% 45 No %55	Yes % 35 No %65	Yes % 40 No %60	Yes% 55 No %45	Yes % 50 No %50	Yes%45 No%55	Yes % 10 No %90	Yes % 15 No %85
Enough Capacity For Car Parking	Yes%10 No%90	Yes %15 No %85	Yes %20 No %80	Yes %15 No %85	Yes %20 No %80	Yes %15 No %85	Yes %15 No %85	Yes%20 No%80	Yes %15 No %85	Yes %10 No %90
If your Family Own more Than A Car	Yes %85 No %15	Yes % 75 No %25	Yes%45 No %55	Yes % 40 No %60	Yes % 45 No %55	Yes% 50 No %50	Yes % 55 No %45	Yes%60 No%40	Yes % 80 No %20	Yes % 75 No %25
Existed Basement Car Parking	Yes % 05 No %95	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No %100
Reachable School for Children Near by	Yes % 20 No %80	Yes % 45 No %55	Yes% 35 No %65	Yes % 85 No %15	Yes % 60 No %40	Yes% 90 No %10	Yes % 70 No %30	Yes%65 No%35	Yes % 10 No %90	Yes %10 No %90
Children Access Safely to Schools	Yes %15 No %85	Yes %25 No %75	Yes %35 No %65	Yes %40 No %60	Yes % 35 No %65	Yes %85 No %15	Yes % 75 No %25	Yes%60 No%40	Yes %10 No %90	Yes % 05 No %95
Adequate Children Playing Ground	Yes % 25 No %75	Yes % 95 No %05	Yes %10 No %90	Yes % 05 No %95	Yes % 05 No %95	Yes %15 No %85	Yes % 10 No %90	Yes%05 No %95	Yes % 10 No %90	Yes %15 No %85
Children Access Easily To the Urban Open Space	Yes % 85 No %15	Yes % 80 No %20	Yes %75 No %25	Yes % 30 No %70	Yes %20 No %80	Yes %70 No %30	Yes %95 No %05	Yes%55 No %45	Yes % 70 No %30	Yes % 75 No %25
Elderly or disabled Finding Adequate Environ-ment	Yes %15 No %85	Yes % 20 No %80	Yes% 10 No %90	Yes % 10 No %90	Yes % 15 No %85	Yes %15 No %85	Yes %15 No %85	Yes%10 No%90	Yes % 05 No % 95	Yes % 05 No %95
Elderly Reach Out of	Yes % 40 No	Yes % 35 No %65	Yes% 30 No %70	Yes % 45 No %55	Yes % 40 No	Yes%60 No %40	Yes % 65 No	Yes%40 No%60	Yes % 20 No	Yes % 25 No

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The Housing Area in Comfort	%60				%60		%35		%80	%75
Disabled Moving Freely without Helpers	Yes %15 No %85	Yes %10 No %90	Yes% 10 No %90	Yes % 15 No %85	Yes % 10 No %90	Yes% 20 No %80	Yes % 15 No %85	Yes%15 No%85	Yes % 0 No %100	Yes % 0 No %100
Available Enviro-nment For Walking And Activity	Yes % 75 No %25	Yes % 55 No %45	Yes% 45 No %55	Yes % 40 No %60	Yes % 25 No %75	Yes% 45 No %55	Yes % 45 No %55	Yes%50 No%50	Yes % 60 No %40	Yes % 65 No %35
Access connection Among Housing Neighbors	Yes % 30 No %70	Yes % 30 No %70	Yes%45 No %55	Yes % 55 No %45	Yes %50 No %50	Yes% 55 No %45	Yes % 60 No %40	Yes%50 No%50	Yes % 25 No %75	Yes % 30 No %70
Adequate Bicycle Paths	Yes%15 No %85	Yes % 05 No %95	Yes %05 No %95	Yes % 05 No %95	Yes % 0 No%100	Yes % 0 No%100	Yes % 0 No%100	Yes%0 No%100	Yes % 05 No %95	Yes % 10 No %90
Interested In Riding Bicycle around	Yes %65 No %35	Yes % 60 No %40	Yes% 50 No %50	Yes % 65 No %35	Yes % 55 No %45	Yes%80 No %20	Yes % 70 No %30	Yes%65 No%35	Yes % 85 No %15	Yes % 75 No %25
Existed Water Element in the Housing Area	Yes % 15 No %85	Yes % 30 No %70	Yes% 0 No%100	Yes % 0 No %100	Yes % 05 No %95	Yes% 0 No%100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes %0 No %100
Water Usage in Watering plants	Yes % 10 No %90	Yes % 20 No %80	Yes% 0 No%100	Yes % 0 No %100	Yes % 05 No %95	Yes% 0 No%100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No %100
If children can Play with the Water Element	Yes % 10 No %90	Yes % 25 No %75	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No%100
Existence Of Solar Panels	Yes % 0 No %100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes% 0 No%100	Yes % 0 No %100	Yes % 0 No %100
Existence	Yes % 0	Yes % 0	Yes% 0	Yes % 0	Yes %	Yes% 0	Yes % 0	Yes% 0	Yes %	Yes %

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Of Wind Turbines	No %100	No %100	No%100	No %100	0 No %100	No%100	No %100	No%100	0 No %100	0 No %100
Existence Of any Trees in the Housing Area	Yes % 30 No %70	Yes % 20 No %80	Yes% 10 No %90	Yes % 05 No %95	Yes % 05 No %95	Yes% 10 No %90	Yes %15 No %85	Yes%15 No%85	Yes % 05 No %95	Yes % 05 No %95
If children Can Play with these Trees	Yes %15 No %85	Yes % 05 No %95	Yes%05 No %95	Yes % 0 No %100	Yes % 0 No %100	Yes% 15 No %85	Yes %20 No %80	Yes%10 No%90	Yes % 0 No %100	Yes % 0 No %100
Existence of Edible Gardens In the Housing Area	Yes % 20 No %80	Yes % 10 No %90	Yes% 10 No %90	Yes % 05 No %95	Yes % 10 No %90	Yes% 10 No %90	Yes % 20 No %80	Yes%15 No%85	Yes % 05 No %95	Yes % 05 No %95

Table 2. Physical Sustainability Evaluation of Questionnaire

Social Sustainability Evaluation of Questionnaire										
Cases	**Case1**	**Case2**	**Case3**	**Case4**	**Case5**	**Case6**	**Case7**	**Case8**	**Case9**	**Case10**
Pattern Shape										
Pattern Name	Adjacent	Determinant	Determinant	Determinant	Hybrid	Enclosure	Enclosure	Group	Group	Group
Importance of Meeting Neighbors	Yes %75 No %25	Yes %80 No %20	Yes %80 No %20	Yes %75 No %25	Yes %85 No %15	Yes %70 No %30	Yes %70 No %30	Yes%80 No%20	Yes %70 No %30	Yes %70 No %30
Meeting Neighbors frequently	Yes %70 No %30	Yes %85 No %15	Yes %80 No %20	Yes %70 No %30	Yes %75 No %25	Yes %85 No %15	Yes %80 No %20	Yes%75 No%25	Yes %85 No %15	Yes %85 No %15
Adequate Open Space To meet Neighbors	Yes %35 No %65	Yes %20 No %80	Yes %15 No %85	Yes %20 No %80	Yes %10 No %90	Yes %30 No %70	Yes %20 No %80	Yes%25 No%75	Yes %10 No %90	Yes %10 No %90
Roof Outdoor gatherings	Yes % 65 No %35	Yes % 80 No %20	Yes% 90 No %10	Yes % 75 No %25	Yes % 80 No %20	Yes% 85 No %15	Yes % 70 No %30	Yes% 65 No%35	Yes % 65 No %35	Yes % 60 No %40

Table 3. Social Sustainability Evaluation of Questionnaire

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Economic Sustainability Evaluation of Questionnaire										
Cases	**Case1**	**Case2**	**Case3**	**Case4**	**Case5**	**Case6**	**Case7**	**Case8**	**Case9**	**Case10**
Pattern Shape										
Pattern Name	Adjacent	Determinant	Determinant	Determinant	Hybrid	Enclosure	Enclosure	Group	Group	Group
Finding Essential Shops Function	Yes %25 No %75	Yes %30 No %70	Yes %85 No %15	Yes %55 No %45	Yes %35 No %65	Yes %90 No %10	Yes %85 No %15	Yes%40 No%60	Yes %10 No %90	Yes %15 No %85
Small Shops Function In the Housing Area	Yes %95 No %05	Yes%100 No %0	Yes %95 No %05	Yes %95 No %05	Yes %90 No %10	Yes%100 No %0	Yes %95 No %05	Yes%90 No%10	Yes %95 No %05	Yes %100 No %0

Table 4. Economic Sustainability Evaluation of Questionnaire

Block Organization Sustainability Evaluation of Questionnaire										
Cases	**Case1**	**Case2**	**Case3**	**Case4**	**Case5**	**Case6**	**Case7**	**Case8**	**Case9**	**Case10**
Pattern Shape										
Pattern Name	Adjacent	Determinant	Determinant	Determinant	Hybrid	Enclosure	Enclosure	Group	Group	Group
Sun Penetration On urban Open Space	Yes % 90 No %10	Yes % 80 No %20	Yes% 75 No %25	Yes%55 No %45	Yes % 85 No %15	Yes% 70 No %30	Yes % 60 No %40	Yes% 75 No%25	Yes % 85 No %15	Yes % 85 No %15
Sun Reaches Rooms Properly	Yes % 85 No %15	Yes % 70 No %30	Yes% 80 No %20	Yes % 65 No %35	Yes % 75 No %25	Yes% 65 No %35	Yes % 65 No %35	Yes% 70 No%30	Yes % 90 No %20	Yes % 85 No %15
Moderate People Density In this Area	Yes % 65 No %35	Yes % 80 No %20	Yes% 55 No %45	Yes % 45 No %55	Yes % 55 No %45	Yes% 40 No %60	Yes % 55 No %45	Yes% 80 No%20	Yes %75 No %25	Yes % 80 No %20
Adequate Night Light Level	Yes % 20 No %80	Yes % 35 No %65	Yes% 50 No %50	Yes % 55 No %45	Yes % 35 No %65	Yes% 55 No %45	Yes % 60 No %40	Yes% 30 No%70	Yes % 15 No %85	Yes % 10 No %90

Low Crime Rate	Yes % 75 No %25	Yes % 70 No %30	Yes% 80 No %20	Yes % 70 No %30	Yes % 75 No %25	Yes% 80 No %20	Yes % 85 No %15	Yes% 80 No%20	Yes % 75 No %25	Yes % 70 No %30
Installed CCTVs	Yes % 15 No %85	Yes % 20 No %80	Yes% 10 No %90	Yes %15 No %85	Yes % 25 No %75	Yes% 20 No %80	Yes % 10 No %90	Yes% 15 No%85	Yes % 20 No %80	Yes % 10 No %90
Good Building Quality	Yes % 65 No %35	Yes % 85 No %15	Yes%70 No %30	Yes % 60 No %40	Yes % 60 No %40	Yes% 70 No %30	Yes % 65 No %35	Yes% 60 No%40	Yes % 75 No %25	Yes % 70 No %30

Table 5. Block Organization Sustainability Evaluation of Questionnaire

Housing Blocks and Public Space Relations Sustainability Evaluation of Questionnaire										
Cases	**Case1**	**Case2**	**Case3**	**Case4**	**Case5**	**Case6**	**Case7**	**Case8**	**Case9**	**Case10**
Pattern Shape										
Pattern Name	Adjacent	Determinant	Determinant	Determinant	Hybrid	Enclosure	Enclosure	Group	Group	Group
Satisfaction Of not Sheltered Urban Open Space	Yes % 55 No %45	Yes % 40 No %60	Yes% 35 No %65	Yes % 55 No %45	Yes % 70 No %30	Yes% 65 No %35	Yes % 85 No %15	Yes% 70 No%30	Yes % 65 No %35	Yes % 60 No %30
Arcade Paths Need in Urban Open Space	Yes % 70 No %30	Yes % 75 No %25	Yes% 55 No %45	Yes % 65 No %35	Yes % 60 No %40	Yes% 50 No %50	Yes % 45 No %55	Yes% 45 No%55	Yes % 40 No %60	Yes % 60 No %40
Closed Gathering In the Urban Open Space	Yes % 85 No %15	Yes % 80 No %20	Yes% 85 No %15	Yes % 75 No %25	Yes % 70 No %30	Yes% 90 No %10	Yes % 70 No %30	Yes% 65 No%35	Yes % 80 No %20	Yes % 75 No %25

Table 6. Housing Blocks and Public Space Relations Sustainability Evaluation of Questionnaire

4.2. Open- Ended Questionnaire Part

Moving into open-ended interview section, it was meant to meet with the architects and urban planners. Firstly, the sustainable criteria that architect and urban planners did recommend that for elderly and disabled people that to design suitable environment with flat ground as a must respect for them. It also considers specific coloured paths with signs for them to follow, meanwhile they are moving around the urban open space they can see different elevations on ground but they are not in need to use them. Therefore, they move freely with no limitations. Another point is set such small café shop for them with suitable ground accessible surfaces and suitable non-slippery natural materials. These small café shops could afford small libraries with low music, “they mentioned”. Then, thinking about the safety level. Most of the interviewed architects and urban planners mentioned the techno-safety, which emphasises code openings by identity cards or fingerprints

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for residents. Technology plays a major role recently in architecture as well. Coding is extremely safe for children to get gates or doors locked; meanwhile, there is manual coding type for safety which is used for safety against children by doing puzzle of openings such doing two moves to the right then one move up to get the door or window opened instead of using iron bars for safety in windows and so on. Moreover, safety also indicates cameras everywhere that controlled and monitored by security staff around the housing area, so that, decreases the crime rate by signing in with personal identities. After this, walking and activities in the housing area may include fitness saloon, swimming pools, small libraries, and mini cafes, but these activities may vary in scope of luxury and possibilities.

Turning into the social sustainability that architects proposed, meeting points is extremely important in housing areas that they mentioned occasion hall. This hall could be set on ground floor having landscape view and natural light in; through massive window sizes. This also could have semi open area for seating and small café 'Architects claimed'. This meeting point is vital for residents to meet, talk, discuss, and share knowledge to increase the social aspect in the housing area. Moreover, this meeting point could be functioned as welcoming guests for weddings, and social events. Another point that they mentioned allotment gardens is appreciated in the housing areas, which motivate individuals to work in groups and meet up for doing these activities. After this by thinking about the economic section, both some of architects and urban planners agreed that housing patterns could sustain the economic region if housing area are maintained periodically and civilians got being warned and conscious about their environment. Plus, rental facilities such cafés and restaurants encourage young people into work field, which slightly generate the economy.

V. CONCLUSION

Through this thesis, there are many important main steps of considerations that are needed in designing sustainable housing patterns. Some of them do exist in previous case studies, some are missed, and some need modifications or update to be sustainable housing patterns. To sum up, there would be steps of recommendations for each case study and shared mutual steps of recommendations to start with in design to achieve sustainable housing patterns in relation to sustainable urban open spaces, which categorized into two parts as follows:

5.1. General sustainable housing patterns and urban open space recommendation in Tripoli:

1. Wind Flow: trying to avoid west cold wind and afford east wind flow.
2. Sun Orientation: building lower storeys from south to afford sun penetration further.
3. Basement Car Parking: this way moderates the vehicular traffic on streets.
4. Water management: both rain water collection and rain water recycling.
5. Waste Management: collecting waste to be used as fertilisers on gardens of the urban open space.
6. Natural Ventilation and Lighting.
7. Solar Panels: energy efficiency
8. Local Materials usage: keeping the identity and the values of Tripoli.
9. Edible Gardens: indicating eatable fruit trees.
10. Green Roofs and Green Walls: works for mitigating the atmosphere and the green roof could be roof gathering for dwellers according to the questionnaire showing that %73.5 of them demanded it.
11. Green House: for planting essential food needs and it is meeting plating with neighbours for sharing activity and social aspect.
12. Double or Triple Layers Glass: for protecting against summer heat and noise.
13. Adequate Ground Materials and Ground Levelling for Elderly and Disabled.
14: Clear Circulation and Connectivity.
15. Accessibility: including elderly and disabled access to their needs.
16. Pedestrian Urban Open Space: this focuses on prohibiting vehicles usage close to urban open spaces.
17. Encourage non Carbon-Emission vehicles, Bikes, and Electrical Scooters.

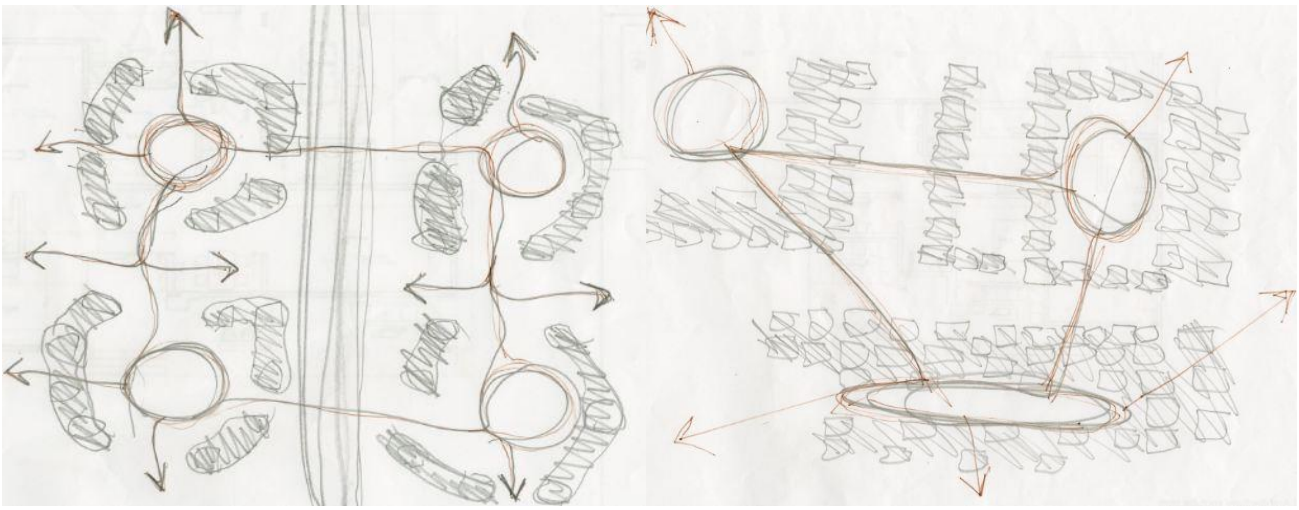

Fig.5. The Author's sketches on continuous connectivity among the housing patterns

In overall, there are many sustainable housing patterns among the selected case studies, which are examined as adjacent, determinant, hybrid, enclosure, and group. However, the case study 4 of the determinant housing pattern was expected to meet the lowest sustainable criteria in the thesis investigations that the blocks close to each other neglecting the proper distances among the blocks, with forming no proper clear urban open space. Therefore, other case studies with their various ideology techniques could meet the sustainable housing patterns design and the sustainable impacts on the urban open space if sustainable features were implemented and installed according to the process explained during this dissertation. Meanwhile, the of the important feature that Author's highlights is connectivity and continuation of pedestrian routes where all people classes and different abilities and ages can reach their destinations easily in natural adequate flow of environment with some squares or meeting point nodes according Alexander C,'s philosophy (1977) of continuous urban open spaces for pedestrians (see fig.3, fig.5). This could be inspired in sustainable housing patterns among the blocks and spread to other neighbourhoods and spread more to form sustainable cities.

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