**An-Najah National University**
**Faculty of Graduate Studies**

# SUSTAINABLE DESIGN MODEL FOR RESIDENTIAL NEIGHBORHOOD ASSESSMENT: THE CASE OF NABLUS CITY

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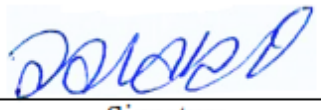
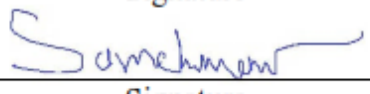
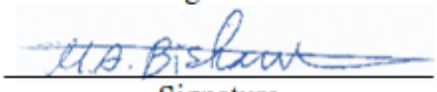
| Dr. Zahraa Zawawi<br>Supervisor |  <br>Signature |
| Dr. Sameh Monna<br>Co-Supervisor |  <br>Signature |
| Dr. Manal Al Bishawi<br>External Examiner |  <br>Signature |
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# Dedication

I dedicate my work to my parents, my family, and my friends.

Thank you for believing in me.

# Acknowledgements

This is to thank my supervisors, Dr. Zahraa and Dr. Sameh.

Your continuous encouragement was essential to the thesis fulfillment.

## Declaration

I, the undersigned, declare that I submitted the thesis entitled:

# SUSTAINABLE DESIGN MODEL FOR RESIDENTIAL NEIGHBORHOOD ASSESSMENT: THE CASE OF NABLUS CITY

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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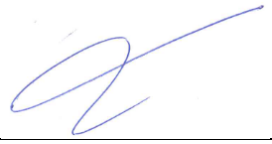
Signature: 

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## Abstract

The sustainable urban design of residential neighborhoods plays an important role in the efforts to achieve the sustainable development goals and alleviate the effects of climate change. This thesis aims to develop an assessment model for the sustainable urban design of local residential neighborhoods, which is missing on the local practice. The model is built on various international neighborhood sustainability assessment (NSA) tools, based on the review of existing assessment tools, to study the sustainability status of Palestinian neighborhoods, and to develop a sustainable indicator model for local sustainable neighborhood assessment. Two neighborhoods are compared according to their location and planning condition; Al-Mreij & Al-Masaken. Computer tools like Urbano and GIS tools as well as qualitative assessment methods are used. Results from the case study showed that the location and the planning condition affect the sustainability level of each neighborhood, evident through the count of strengths and weaknesses. The western location of Al-Mreij raised the potential for job opportunities, and the peripheral location of Al-Masaken raised its exposure for unsafety. Equally important is the pattern of planning, which influences indicators of Walkable streets and Access to quality transit in both neighborhoods. Moreover, the assessment of measured indicators found that some indicators from the (NSA) tools were partially or completely met, and some gaps appeared because of the lack of strengths in the selected indicators of the international tools when used for local social, ecological and governmental aspects, and there are issues in the inclusion of economic and environmental elements in current urban configurations. The proposed local model offers valuable insights for local governments, municipalities, and construction developers.

**Keywords**: urban design; sustainable neighborhood assessment; Palestine; sustainable development

# Chapter One
# Introduction and Theoretical Background

The global interest in the sustainability of buildings has expanded to the scale of neighborhoods; the cluster of buildings and what is between buildings. Sustainability of neighborhoods is the extension of the evolution of sustainability as a term for parallel schemes of needs; present and future (1). This extension is translated into the form of models with lasting social, economic, and environmental value (2). To assist and regulate the development of neighborhoods socially, environmentally, and economically, specific accredited metrics and third-party assessment systems (3) emerged to keep track of the associated practices. The development of any of these neighborhood sustainability assessment tools (NSA) is based on a conventional structure of indicators (3), characteristics (4), and applications of those indicators (5). Each indicator in an established (NSA) tool is assigned a specific weight, which proceeds to a calculated scorecard. The result gives a general outline of what sustainable neighborhood embeds as elements – indicators – which is used to numerically compare the 'sustainability level' of the investigated development to other accredited developments in similar contexts or regional classifications.

Due to the particularities assigned to differences of scale, regional priorities of different urban fabrics, cultural heritage, lifestyle, and building culture (4) from one country to another, distinctive assessment tools came up and are now presented and known with international recognition. Though NSA tools appeared holistic to their contexts, some gaps were addressed in some research papers that tackled how NSA differs, how similar they are, as well as how they are assessed (4) (6). Some major notes indicated that the evaluation continued to lack strategies for promoting sustainable urban development through economic methods (7) and socio-economic aspects (8). Furthermore, the addressed NSA paid little attention to monitoring the performance of governmental and non-governmental institutions as part of institutional sustainability (4), with an obvious lack of participatory decision-making process (9). Also, some countries still haven't got their tool established, among them is Palestine.

In the local context of Palestine, the Palestinian Higher Green Building Council (PHGBC) came into being in 2010. The council aimed to promote environmentally friendly and

sustainable architecture and buildings in Palestine by presenting the primary green building design ideas in its published guidelines (10). Many structures have been identified since the organization's founding. However, neither the council nor any new council added an investigatory extension on the scheme of sustainable neighborhoods. In the thesis paper [Strategic Planning Towards Sustainable Palestinian Neighborhoods], the proposed strategic assessment pointed out the inclusion of neighborhoods as a crucial future opportunity to be studied under the scope of the council's regulations (11). Previous studies on the topic of local neighborhoods sustainability assessment had been conducted to compare the spontaneous vs planned urban forms (12). The study considered accessibility, densification, and environmental qualities for assessment. Nevetheless, the study did not cover all sustainability parameters, such as govenemental, economic and social wellbeing, and ecology parameters. It was not clear how the assessment model was formed, and the study did not show how the local model can be distinguished from the given parameters.

Current Palestinian neighborhoods face urban challenges which are robust to affecting the current and coming condition of how Palestinian cities operate, how they look, and how they are nationally and internationally branded. With the absence of local formal tools to assess and reform, the negative impact becomes prolonged and arduous. Thus, the establishment of a local sustainable neighborhood assessment model is a necessity. The resulting assessment model can generate scientific-biased and systematic solutions, given that sustainability already revolves around the locally problematic aspects; economy, society, and environment. The use of the proposed local model can be of great importance for local governments, municipalities, and construction developers. The originality of the suggested assesment model is that it is extracted from NSA tools and local needs. The study selects two neighborhoods, based on location and planning pattern, to perform the assessment, and it compares their results. The resulting framework associates guidelines and recommendations for future sustainable neighborhoods.

The significance of the study is in finding answers to the questions of:

How far are the local neighborhoods from becoming sustainable? (Section 4.1) What is the role of neighborhoods location and their planning pattern on the measure of sustainability?(Section 4.1) How can the local NSA model be distinguished from the

accredited NSA tools? (Section 4.2) What are the gaps of NSA tools? (Section 4.3.4) How can the existing and new local neighborhoods become sustainable? (Section 4.4).

The study acknowledges the role of urban design in the process of space design and production since it is the simplified translation of larger planning schemes and it is the cumulative translation of architectural interventions. Investigating this reality puts ties between the impact of urban planning and the sustainability of urban design and the architecture of neighborhoods. Since the premiere usage of the study's established model is in Palestine, the study fills the gap of the insufficient urban studies of local neighborhoods and expands the exploration of sustainability to contexts of spontaneous planning.

Before exhibiting the used methodology of establishing the model, the following part presents the literature and the background on three subtopics: Neighborhoods: identification, evolution, elements,iterations, criticism (1.1 -1.6), Local Planning of Neighborhoods (1.7), and Sustainability of Neighborhoods: identification, principles. Importance, and NSA overview (1.8-1.11).

### 1.1 Definition of Neighborhood

The term 'Neighborhood' has been commonly used in the planning field at literature and practice levels. It has been used to describe a *spatially subdivided area in urban or rural contexts* (13). Such is born from the notion that people have always favored living in groups with shared & communal spaces, as Lewis Mumford introduced (14). Other literature has introduced the linguistic definition of Neighborhoods as either areas of a town surrounding specific residents, or specific communities within these towns (15).

### 1.2 Definition of Neighborhood Unit

Definitions of neighborhood units are about the performance of *social networks within defined geographic entities* (16). Social and physical distinguishing attributes of each of these groupings, resulting from the identity of their residents, may exist from one neighborhood to another. The framework of constructing neighborhood units is about *obtaining self-contained, self-sustaining, and community-centric entities* (15). Combining those subdivided areas- those neighborhood units- leads to the construction of bigger identifications of social groupings; towns, villages, and cities. Though the

distribution of services was iterated in models of neighborhood units, it was common to have a list including civic, commercial, shopping centers, administrative, residential, open spaces, parks, religious buildings, and schools. The literal meaning of civic covers entertainment, social, and business uses (17).

### 1.3 Evolution of Neighborhood Unit Concept

The industrial revolution in the early 1900s had several impacts on cities, economically, environmentally, and socially. One of them was the spatial qualities of how communities operate and live. The rapid urbanization and the significant increase in population resulted in the need to create subdivisions of communities and to redistribute communities to better respond to the new and the quickly changing patterns of cities (18). This is also paralleled by the constructive attempts to lower the resulting urban issues on the multiple schemes of health, transportation, etc., featured in Figure A.1 Appendix A.

### 1.4 Elements of the Neighborhood Unit

Size, boundaries and protective strips, internal streets, building layout, and facilities are elements that structure a neighborhood unit (15), as indicated in Figure A.2 Appendix A.

1. The size of a neighborhood is classified as a small entity within a town, typically varying according to planning. The count of neighborhoods is determined by the size of the town. The larger the town is; the more neighborhoods it will include, baring that the size of neighborhoods does not radically shrink or expand.
2. Neighborhoods are surrounded by main roads from all sides, to expose the unit for enough transit. Within these boundaries, protective strips exist to create a buffer area for green belts, security, and considerations of future street widening scenarios.
3. Internal Streets are where enclosures are. They are designed to ensure the safety of the people with school-going children in particular. Easy shops and community centers are established on the two sides of internal streets, to construct a mixed-use and vibrant area.
4. Building Layouts. How buildings align and fit in shape influences the social stability of a neighborhood. Residential size and typology should be respective to different income groups, by providing single-family houses, double-family houses, cottages, flats, etc.

5. Facilities. Neighborhoods are known for their hierarchical distribution of services. Schools dominate the central location, to operate as the nucleus to develop the social life of the unit. Shopping Centers are located on the circumference of the unit, preferably at traffic junctions and adjacent to opposing neighborhood units. Community Centers and social, cultural, and recreational amenities spread within the unit. All of the facilities should be reached within easy access and at a reasonable distance from each other.

## 1.5 Models of Neighborhood Unit-1929 & Iterative Developments: 1949, 1980, 2008, 2016

### 1.5.1 Clarence Perry's Neighborhood Unit - 1929

Clarence Arthur Perry managed to put the first neighborhood unit concept in diagrammatic settings as a planning tool for metropolitan cities (15). This was particularly in 1929 when the neighborhood unit concept was published under the Regional Plan of New York (19). Grown as a pioneer attempt at New Urbanism (20), the neighborhood unit of Perry addressed how the relatively smallest portion of the city - the neighborhood- 'standardizes' livability. Extracted from both morphological and analytical perspectives, the neighborhood unit concept put the Accessibility, Proximity, and Distribution of services in a planned urban layout. The base of the model was to structure communities surrounding elementary schools (21), that are accessible within a walk of 400 meters – 5-minute walk (22). Streets of the neighborhood can disconnect based on functionality; interior vs arterials vs traffic routes (23); (21); (13), which limit accessibility for both spatial and social purposes. What should pass through residential neighborhoods are cul-de-sacs and curved layouts, that ensure safety and overall calmness. This is where walkability was assigned as a mode of mobility, for areas where through traffic was not favored. Based on such transit mode separation, a spread of services followed the controlled flow of mobility. The model envisioned the layout of distributing services by centralizing some services, particularly schools, and churches (neighborhood institutions) while suggesting mixed-commercial services at peripherals (24); (21). This meant that the priority of service was not equal which might have affected the size of those services. Such is proven by the association of 10% of the neighborhood area for recreational services (21). Further impacts of the services hierarchy resulted in a diversity of architectural typologies including housing types (22).

### 1.5.2 Developments on Perry's neighborhood unit by others - 1942

The first development of Perry's neighborhood unit was introduced by Nickolaus Louis Engelhardt (13). The maximum walking distance to the elementary school was reconsidered to be approximately half a mile (800 meters). Engelhardt also suggested considering other types of school facilities by alternating the walking distance to 400 meters to playgrounds and nursery schools.

Later iterations of the model by Clarence Stein replaced the distance of 800 meters to elementary schools with a quarter mile (400 meters and added a small shopping center near the school (13). The iterated model considered grouping three neighborhoods to form a connected town; therefore, it suggested the addition of a high school accessed within one mile (1600 meters). Figure A.3 Appendix A shows the change of the model.

### 1.5.3 Neo-traditional planning - 1980s

Neo-traditional planning emerged to respond to suburbanization and automobile dominance developed by the segmentation of land use in American cities (25) (26) (27) (28). It brought social change through some physical changes (29). Such included supporting walkability, travel behavior, and density (30) (31) (32) (27) (33). Two remarkable approaches evolved under Neo-traditional planning (34): Traditional Neighbourhood Development by Duany and Plater-Zyberk, and Transit-Oriented Development by Peter Calthorpe. The application of both models covered brownfield and infill areas (25) (35) (36) (37).

- The Traditional Neighborhood Development (TND)

The Traditional Neighborhood Development (TND) suggested raising the compactness and the pedestrian-oriented development, by mainly mixing land uses, and offering dense and complementary uses (38). While the ratio in space distribution was still assigned 10% for open spaces and 70-80% for residential blocks, the remaining percentage was assigned as mixed-use, especially for commercial spaces and civic functions, including schools. Highways changed to boulevards, which promoted public transportation and considered walkable-friendly streetscapes and internal roads (39). Thus, a more humanistic approach to accessibility got established and the accessible link from one neighbourhood to another

got strengthened. The proximity of service in the model remained within a quarter-mile walking distance (38).

- Transit-Oriented Development (TOD)

Proximity in (TOD) was set to a 10-minute walking distance from the transit station, instead of distance from a particular service type (25). Proposing highly dense areas around transit nodes, and incorporating sidewalks and civic spaces combined both social and physical attributes of planning. Accessibility included multiple modes of transportation (40). Mixed land-use developments remained the basis of service distribution (41). The origins of the TOD go back to the Pedestrian Pocket concept, which separated urban channels for walking and automobiles (41).

### 1.5.4 Doug Farr -2008: Sustainable Urbanism

The version of Doug Farr's model eliminated the separation of civic and commercial facilities (39). It suggested the inclusion of high-performance buildings and high-performance infrastructure with the implementation of walkable, transit-oriented urbanism. The model developed the connection of human size to the urban-built environment in natural systems as a strategy for sustainability (42).

### 1.5.5 Carlos Moreno-2016: 15-minute planning model

It can be summarized that spatial qualities of Accessibility, Proximity, and Distribution of services in neighborhood units were iterated from one model to another for factors of transportation modes alterations, contextual fitting, health and social reforms, etc. The time-space relationship had transitioned, from 5min (in quarter-mile models) to 10 min (in Neo-traditional) walk model, to a recent -latest- upgrade of introducing 15-minute model. The incremental increase is logically justified to cope with the expansion of population and the associated urban growth in today's urbanism. The more density a neighborhood embraces; the more service sizes and types it requires, therefore, the larger the responsive urban intervention becomes (43).

Initiated by professor and Paris resident Carlos Moreno in 2016 (44), the spatial qualities of the 15-minute city emerged from setting a core intervention on the unhealthy current mobility means and the mass production of automobiles (45). He suggested a neighborhood planning that stimulated people-based cities (45) which substituted

mobility means with soft mobility modes (46). The 15-minute model maximized user experience through walkability (47), maximized social coherence (48) (49) (50), and incorporated renewable energies and automated waste management (51) (52), some that were highlighted shortcomings in previous planning models. The 15-minute city model bases on four principles: proximity, density, diversity, and digitalization, and six social functions: Enjoying, Learning, Living, Caring, Working, and Supplying. Those principles are complementary to the value of the city and all of them are essential for the making of cities.

### 1.6 Criticism of the Neighborhood Unit Concept

The concept of a neighborhood unit has been tied to urban attributes like aesthetics, safety, public health, and social networking, nevertheless, it got some criticism for its structure, functionality, and limitedness. First, the size of amenities. Due to the hierarchy of the distribution of functions in the concept, some services might be underestimated in how big or small they are and, therefore, how efficient they become to the neighborhood. Moreover, no distinctions in the size and type of required services were addressed in differentiating a neighborhood from another. Restricting the hierarchy of service type and distribution based on a specific horizontal spread does not consider the diversities of age groups, cultural preferences, etc (13). Thus, the insurance of social inclusion and holistic integration is questioned. More social class distinctions may arise if the neighborhood is not homogenously planned, and if not the cost of services is fair. Second, isolation. Since the concept opts to make an assigned area self-sufficient, some critics questioned the potential of pushing the sufficiency spectrum to isolation. Others pointed out that the practicality of self-sufficient, cost-effective services is not possible (26). Third, functionality. The suggested pattern of separating traffic areas from pedestrian areas might create inadequate accessibility and proximity deviations (20).

### 1.7 Overview of Planning Local Neighborhoods

The neighborhood, as retrieved from the Standards and Guidelines Handbook for Urban Planning in Palestine (2021), is an area located within a population locality, which consists of 3-5 vicinities within a radius of 1400m. In comparison with the literature on Neighborhood units, the size of neighborhoods in local planning is significantly higher (more than 3 times). Planning of local neighborhoods offers a set of services for an

estimated population of 4500-9999 people. The handbook revises the urban planning regulations set by the Un-Habitat, together with the regulations carried in countries like Jordan, Egypt, Iraq, Saudi Arabia, and South Africa, and recognizes the localization in the context of Palestine considering its demographic, economic, and political condition, ambitions, etc.

Planning in Palestine depends on the classification of the communities as rural & urban to provide an estimation of served people and service distribution, Table 1. These communities are further classified as planning units built sequentially from Precinct, Vicinity, Neighborhood, to District, etc., see Table 2. Mobility; generating transportation modes from walking, cycling, using cars, and using public transportation, follows the classification of planning units locally. For each unit, a suggested means of transportation is allocated, together with the distance required to reach services, Table 2. The distribution of services is set by assigning a hierarchy of service sizes. The hierarchy works as a pivot point for regulating the location of the service center, area of the service area, type of service, and other associated measures. Table 3 provides a breakdown of service types linked to the level of planning of neighborhoods. Table 4 assigns the area of services based on the classification of the planning unit.

**Table 1**

*Types of Communities in Palestine*

| Types of Localities | Type | Population Number |
|---|---|---|
| Rural | 1. Group | 5- 999 |
| | 2. Village | 999- 2499 |
| Urban | 3. Small city | 2500-9999 |
| | 4. Intermediate city | 10000-39999 |
| | 5. Large city | 40000- 100000 |
| | 6. Mega city | More than 100000 |

Note: Redrawn & Translated from the Manual (General Administration of Urban Planning and Planning, 2021).

**Table 2**

*Hierarchy of Planning Units for Palestinian Communities based on population density and number of residential units & Mobility among planning units*

| Types of Planning Unit | Consisting of | Population Number | Means for Accessibility | Distance to service (at maximum) |
|---|---|---|---|---|
| Precinct | Residential Units | 10 - 750 | Walkability, Cycling | 200m |
| Vicinity | 3-5 precincts | 1500-3000 | Walkability, Cycling | 700m |
| Neighborhood | 3-5 vicinities | 4500-9999 | Walkability, Cycling, Autonomous Vehicles | 1400m |
| Intermediate City | 3-7 neighborhoods | 10000-39999 | | |
| District | 3-5 neighborhoods | 12000-20000 | Cycling, Autonomous Vehicles | 3000m |
| Large City | Districts (2 at least) | 40000-100000 | | |
| Mega City | Districts (4 at least) | More than 100000 | | |

Note: Redrawn & Translated from the Manual (General Administration of Urban Planning and Planning, 2021).

**Table 3**

*Services on the level of planning of neighborhoods*

| Types of Services | Consisting of |
|---|---|
| Healthcare | Healthcare center |
| Educational | High school |
| Cultural and Religious | Mosque, Sports center, Library |
| Security | Secondary Police station, Civil defense center |
| Commercial | Shops (couple of supermarkets) |
| Administrative | |
| Recreational | Park |
| Others | Cemetery, Public station |

Note: Redrawn & Translated from the Manual (General Administration of Urban Planning and Planning, 2021).

**Table 4**

*Area of services of the neighborhood among the whole city*

| Types of Planning Unit | Urban Services | Area (donum) | Number | Total Area (donum) |
|---|---|---|---|---|
| Neighborhood | Healthcare center | 1 | 9 | 9 |
| | High school | 6 | 9 | 54 |
| | Mosque | 6 | 9 | 54 |
| | Library | 0.5 | 9 | 4.5 |
| | Secondary Police station | 0.6 | 9 | 5.4 |
| | Civil defense center | 0.4 | 9 | 3.6 |
| | Park | 6 | 9 | 54 |

The manual addresses principles for the process of planning residential neighborhoods; Privacy, Safety & Security, Topography and geographic locations, natural obstacles, and levels, Context and surrounding parcels, Adjacency of neighborhoods, Land use: land area, setbacks, floor number, building ratio controlled by master plans, Soil type, Pollution: visual, sound, and environmental pollution, Area shape, building classification: following social and economic factors, and building typology.

Furthermore, the manual explains how the estimation of the capacity of residents is one of the first stages of planning residential neighborhoods. Planning responsive architectural buildings recognizes the importance of the capacity to control the size, shape, area, orientation, typology, and building system spread in the spatial boundaries of the neighborhood. Developing such numeric values adresses factors, such include: Densities: Gross Residential Density, Net Residential Density, Population Density, Building Density, Over-crowding Average, Floor Area/ Person, and Floor Ratio (53).

Some studies were conducted on the scale of local neighbourhood strategic planning (54). Strategic goals were assigned, such as creating dynamic neighborhoods, strengthening social aspects, developing affordable housing, improving infrastructure, and improving governance and management. Since these goals were directed at some local neighborhoods, they can be generalized and developed for future local neighborhoods.

### 1.8 Definition of A Sustainable Neighborhood

A sustainable neighborhood can have various definitions according to context, and application. Some literature defines a sustainable neighborhood as a multi-purpose area in which people aim to live and work at present and shortly (55). Such stimulates maintaining a high quality of life, ensuring the needs of residents through the good integration of services offered equally among residents. Other resources associate sustainable neighborhoods as models with lasting social, economic, and environmental value (2).

### 1.9 Principles of A Sustainable Neighborhood

Adopting sustainable neighborhoods has been under the local action plans of many municipalities. Accordingly, frameworks for attaining sustainable neighborhoods may vary regionally. Nevertheless, some common aspects can be highlighted as principles/characteristics developed from the literature on neighborhood units and iterations. Compactness, mixed-use amenities, mixed communities, diversity of service, diversity of housing, and accessibility to transit support the resource efficiency of the model, Figure A.4 Appendix A (2). Generally, the output of a sustainable neighborhood is based on the balance among environmental, social, and economic factors, Figure A.4 Appendix A (56). Adapting principles may lead to re-thinking of development, municipal planning, and regulations, and change of local practices.

### 1.10 Importance of A Sustainable Neighborhood

Implementation of sustainable neighborhoods has been localized based on what each city opts to achieve. Variations of plans and strategies reflect the change in priorities, concerns, and vision. Generally, the importance of sustainable neighborhoods revolves around infrastructure efficiency, cost, walkability, public health, energy use and resources, affordability, job creation, and safety. From a wider perspective, sustainable neighborhoods help adapt long term and valuable human development to the natural environment in ways that minimize harm. Enabling the development of a Sustainable Neighborhood requires skills and knowledge, financial solutions, supportive policies, planning and development processes, marketing, and contracting (2).

### 1.11 Overview of NSA Tools Structure

Most of the indicators supporting neighborhood sustainability are similar in all the assessment methods, although occasionally they appear under different headings and include various expressions of sustainability (57), and each has a different numeric weight and description. Distinctions between indicators and their weightage among the NSA tools are justified per the location-specific conditions of population density, urban development, and energy needs, which trigger specific sustainability needs (57). The absence or running issues with one of these needs make the associated category a high necessity. For instance, the spread of sprawl and the excessive use of private cars in the US made transportation and location indicators gain the highest weightage in LEED ND's scheme (3). Another similarity between NSA tools is the inclusion of building. Some of the NSA schemes dedicate a specific category to the sustainability of buildings, especially in terms of the operational systems of water, material, and energy. This relates to the emergence of NSA tools after the formation of building sustainability metrics. Hence, it is no surprise that the inspiration for the neighborhood sustainability assessment follows the conception of green buildings (58) except that it adds on the dimension of private and public spaces between those buildings (59).

Figure A.5 Appendix A summarizes key points of chapter 1, and shows how it is delivered to the next section.

# Chapter Two
# Methodology

To establish a local sustainable neighborhood assessment, the thesis relies on quantitative methods. Few qualitative methods are used. Means like surveys and questionnaires were excluded. The knowledge of sustainability and what is required might be ambiguous to many residents, and this might expand the scope of the study to unrelated and non-professional points. Instead, the model is structured of international standards coming from expertise and professional background. The study still signifies the role of citizen participation, but it delays it to the part of setting guidelines related to the application of the model and not its establishment.

Figure A.6 Appendix A below illustrates the phases that guided the process of structuring the localized assessment model. For each phase explained in the subsections (2.1-2.4), specific methods are mentioned. Section (2.5) explains the selected neighborhoods, of which the assessment is investigated.

## 2.1 Phase 1: Review of the Assessment tools

The first phase relies on reviewing and comparing the six sustainable neighborhood tools; LEED ND, PCRS, BREEAM COMM, CASBEE UD, DGNB ND, and GREEN MARK DISTRICTS, which assists in understanding the distinctions and the background of each. The comparison includes the establishing year, country of origin, indicators, objectives, and highlights, illustrated in Table 5.

**Table 5**

*Comparison of NSA tools*

| | LEED ND | PCRS | BREEAM COMM | CASBEE UD | GMD | DGNB UD |
|---|---|---|---|---|---|---|
| Open Name | Leadership in Energy and Environment Design -Neighborhood Development | Pearl Community Rating System | Building Research Establishment Environment. Assessment Method (for) Communities | Comprehensive Asses. System for Built Environment Efficiency Urban Development | Green Mark For Districts | Deutsche Gesellschaft für Nachhaltiges Bauen-Neubau Stadtquartiere/ New Urban Development |
| Release/ Version Date | 2009<br>2009 | 2010<br>2010 | 2009<br>2012 | 2006<br>2014 | 2009<br>2013 | 2012<br>2012 |
| Country of Origin | USA | UAE | England | Japan | Singapore | Germany |
| Main Categories (Point or weights) | 1. Smart location and Linkage- 24.5%<br>2. Neighborhood model and design- 40%<br>3. Green infrastructure and buildings- 26.3%<br>4. Innovation and Design Process- 5.5%<br>5. Regional Priority- 3.7% | 1. Integrated Development Process- 6.2%<br>2. Natural Systems -8.6%<br>3. Livable Communities - 23.5%<br>4. Precious Water -22.8%<br>5. Resourceful Energy -25.9%<br>6. Stewarding Materials - 11.1%<br>7. Innovating Practice -1.9% | 1.Governance 9.3%<br>2. Social and economic welfare 41.7%<br>3. Resource and energy 21.6%<br>4. Land usage and ecology 12.6 %<br>5. Transportation and movement 13.8% | Qud 1 Environment<br>Qud 2 Society<br>Qud 3 Economy | 1. Energy Efficiency -17.3%<br>2. Water Management.- 11.3%<br>3. Material and Waste Management -15.7%<br>4. Environmental Plan -22.7%<br>5. Green Buildings and Green Transport -18.9%<br>6. Society and Innovativeness -14.1% | 1. Ecologic Quality 22.5%<br>2. Economic Quality 22.5%<br>3. Sociocultural and Functional Quality 22.5%<br>4. Technical Quality 22.5%<br>5. Process Quality 10% |
| Main Objective/ Concern | Tackling Rapid urbanization: spread of sprawl and excessive use of private cars, and natural resource stresses | Focusing on the rapidly changing built environment. Recognizing the responsibility in project stages (design, construction, management). | Regulating selection of an appropriate site for development, since it is determined by developers, landowners | Updating the scale of assessing several buildings to block size. Cover the regional safety of the energy environment, and lowering carbon emissions. | Following Singapore's Codes of practices, local climate and weather patterns (i.e. tropical climate). | Integrating environment, economy, sociocultural and functional aspects, technology and processes for area planning. |
| Highlights | Transportation. Infrastructure. | Culture. | Ecology. Community. | Resources. | Energy. | Economy. |

### 2.2 Phase 2: Investigating the reality of Palestinian neighborhoods

Similar to the reviewed NSA tools, the assessment model must be born from the reality of the context, aiming to develop it and guide its used practices. Thus, the second step towards developing a sustainability assessment model that is responsive to Palestinian cities is to prioritize the local challenges and identify them.

The following table, Table 6, lists challenges in the Palestinian neighborhoods, particularly the city of Nablus, gathered from the everyday norms, observations of urbanism, and secondary resources such as literature of articels and master thesis. Subjects as the issues of local housing (60), environment- related issues of local buildings (61), impact of physical environmetns on social interactions (62), and resulting issues of urban sprawl and city expansion (63) form the reality of today's context.

A comparison between the pillars; economic, social, and environmental, of sustainability in the context of neighborhoods is identified. The addressed challenges are listed under those pillars. Below gives an identification of those pillars in relation to sustainability.

Economic sustainability in neighborhoods is a complex concept that is often unevenly integrated into sustainable development projects (64). It is a vital aspect of achieving sustainable cities and is influenced by factors such as the preservation of natural systems and resources, economic prosperity, and social equity (65). Environmental sustainability in neighborhoods encompasses a range of factors, including transport, density, urban forms, and buildings (66). Physical sustainability in neighborhoods is usually tied to social, resource management, and energy concerns. Social sustainability in neighborhoods embeds social justice, community interaction, and attachment to the environment. Understanding power dynamics and personal investment in addressing sustainability challenges in impoverished neighborhoods is highly important (67). Mixed use promotes social interaction and inclusion (68), and the combination of social sustainability aspects in urban planning enhances local identity (69).

### 2.3. Phase 3: Developing sustainable indicators model for local neighborhoods

The highlighted challenges, in Table 6, are next corresponded with identified indicators from the selected NSA. Table 7 summarizes the list of twenty-seven sustainability indicators that compel with the topics of local challenges. These indicators will be used,

to measure the sustainability level in accord with specific themes. This makes the assessment reference-based, and more strategically centric towards defined parameters.

**Table 6**

*Challenges in Neighborhoods of Nablus*

| Sustainability Pillar | Associated Points |
|---|---|
| Environmental Sustainability | -Inconsistent quality of streetscape and urban design<br>-Topography leading to inconsistent accessibility of services<br>-Poor transit-oriented developments<br>-No public transportation<br>-Poor proximity to services<br>-Lack of architectural conservation of old buildings and management of building uses |
| Physical Sustainability | -Limited use of renewable energy resources & low considerations of surfaces' energy performance<br>-Limited use of alternative water resources & Mismanagement of Rainwater<br>-Mismanagement of building design to site & topography<br>-Inconsistent quality of building components<br>-Potential disasters from instabilities of political status |
| Economic Sustainability | -Poor relation between job creation & housing (opportunities are not well distributed among residents)<br>-Lack of diverse green infrastructure & used landscape: wetlands, embankments, gardens, parks, etc.<br>-Mismanagement of property Ownership & implementation of by-laws<br>-Lack of affordable housing typologies<br>-Non-generalization of mixed-use neighborhood promoting local (inward) job opportunities<br>-High cost of Construction systems & Buildings<br>-Limitation of Public Lands vs spread of private lands (land ownership)<br>-High cost of Available Lands<br>-Unbalanced Income of residents |
| Social Sustainability | -Lack of Public participation in the design of neighborhoods<br>-Excessive spread of low standard commercial housing projects<br>-No availability of public spaces<br>-Absence of cross-disciplinary teamwork<br>-Limited culture-related activities<br>-Issues of privacy & security in current housing typologies & urban spaces<br>-Limited inclusive spaces (for women and elders)<br>-Lack of social Justice in accessing all services with equal efficiency<br>-Poor distribution of services<br>-Lack of flexible live- work spaces |

Note: gathered from the everyday norms, observations of urbanism, and secondary resources.

**Table 7**

*Neighborhood Sustainability Indicators assigned to target Challenges in Neighborhoods of Nablus*

| Sustainability Pillar | Associated Points |
|---|---|
| Environmental Sustainability | -Inconsistent quality of streetscape and urban design Walkable Streets -LEED ND<br>-Topography leading to inconsistent accessibility of services Access To Quality Transit- LEED ND<br>-Poor transit-oriented developments Access To Quality Transit- LEED ND<br>-No public transportation Access To Quality Transit- LEED ND<br>-Poor proximity to services Mixed Use Neighborhoods- LEED ND<br>-Lack of architectural conservation of old buildings and management of building uses Building Reuse- LEED ND |
| Physical Sustainability | -Limited use of renewable energy resources & low considerations of surfaces' energy performance Heat Island Reduction- LEED ND<br>-Limited use of alternative water resources & Mismanagement of Rainwater Environment, Resources- CASBEE UD<br>-Mismanagement of building design to site & topography Material And Waste Management- GMD<br>-Inconsistent quality of building components Environmental Risks- DGNB<br>-Potential disasters from instabilities of political status Environmental Risks- DGNB |
| Economic Sustainability | -Poor relation between job creation & housing (opportunities are not well distributed among residents) Housing And Job Proximity - LEED ND<br>-Lack of diverse green infrastructure & used landscape: wetlands, embankments, gardens, parks, etc. Land Use And Ecology- BREEAM COMM<br>-Mismanagement of property Ownership & implementation of by-laws Integrated Development Process- PCRS<br>-Lack of affordable housing typologies Demographic Needs & Priorities- BREEAM COMM<br>-Non-generalization of mixed-use neighborhood promoting local (inward) job opportunities Economic Impact- BREEAM COMM<br>-High cost of Construction systems & Buildings Lifecycle Cost- DGNB<br>-Limitation of Public Lands vs spread of private lands (land ownership) Land Use Efficiency- DGNB<br>-High cost of Available Lands Lifecycle Cost- DGNB<br>-Unbalanced Income of residents Demographic Needs & Priorities- BREEAM COMM |
| Social Sustainability | -Lack of Public participation in the design of neighborhoods Governance - BREEAM COMM<br>-Excessive spread of low standard commercial housing projects Demographic Needs & Priorities- BREEAM COMM<br>-No availability of public spaces Demographic Needs & Priorities- BREEAM COMM<br>-Absence of cross-disciplinary teamwork Integrated Development Process- PCRS<br>-Limited culture-related activities Innovative Practice- PCRS<br>-Issues of privacy & security in current housing typologies & urban spaces Livable Communities - PCRS<br>-Limited inclusive spaces (for women and elders) Demographic Needs & Priorities- BREEAM COMM<br>-Lack of social Justice in accessing all services with equal efficiency Inclusive Design- BREEAM COMM<br>-Poor distribution of services Mixed Use Neighborhoods- LEED ND<br>-Lack of flexible live- work spaces Neighborhood Pattern And Design - LEED ND |

Table 8 lists the selected indicators under their identified category and references from NSA tools. The description, requirements, and accredited practices of the selected indicators are reviewed and reflected in the assessment of local neighborhoods. Suggested reforms and guidelines for local sustainability will be directed to these addressed indicators.

Though the indicators are similar between a sustainable assessment tool and another, the study considers NSA reference with indicators of the highest weight. The highest weight indicates a higher value, thus more focused strategies for obtaining the associated indicator. The level of relevancy of the NSA tools to Palestinian needs is generated based on the number of chosen indicators. The relevancy of the different sustainability assessment tools to the Palestinian context shows LEED ND at the top with 13 indicators, followed by BREEAM COMM and DGNB with 4 indicators each, followed by PCRS with 3 indicators, and finally CASBEE UD and GMD with 1 indicator each. Figure A.7 Appendix A provides a graphical representation of the relevancy evaluation.

**Table 8**

*Developed framework of Assessment indicators for possible Sustainable Palestinian neighborhoods*

| NSA Reference | Category | Assessed Indicators |
|---|---|---|
| Assessed Indicators Taken from LEED ND | Smart Location and Linkage | A. Preferred Location<br>B. Access to Quality Transit<br>C. Housing and Job Proximity |
| | Neighborhood Pattern and Design | A. Compact Development<br>B. Mixed-Use Neighborhood<br>C. Housing Types & Affordability<br>D. Visitability and Universal Design<br>E. Reduced Parking Footprint<br>F. Walkable Streets<br>G. Connected and Open Community.<br>H. Access to civic and public space |
| | Green Infrastructure & Buildings | A. Heat Island Reduction<br>B. Building reuse |
| Assessed Indicators Taken from BREEAM COMM | Governance | A. Community management of facilities |
| | Social and Economic Wellbeing | A. Economic impact<br>B. Demographic needs and priorities<br>C. Inclusive design |
| | Land use and Ecology | A. Landscape |
| Assessed Indicators Taken from PCRS | Integrated Development Process | A. Integrated Development Strategy |
| | Livable Communities | A. Safe and Secure Community |
| | Innovating Practice | A. Showcase of Regional & Cultural Practices |
| Assessed Indicators Taken from DGNB UD | Environmental Quality | A. Pollutants and Hazardous substances |
| | Economic Quality | A. Lifecycle Cost<br>B. Land use efficiency<br>C. Environmental Risks |
| Assessed Indicators Taken from GMD | Material and Waste Management | A. Minimize Cut and Fill in Earthworks |
| Assessed Indicators Taken from CASBEE UD | Environment Resources | A. Rainwater Utilization |

## 2.4 Phase 4: Assessing sustainability in local neighborhoods Qualitatively and Quantitatively

Listed indicators in Table 8 are assessed, qualitatively and quantitatively on the selected neighborhoods. Conducting the assessment is based on several methods, where the use of methods depends on the requirements needed for assessing each indicator. The following methods and tools were used:

1. Fieldwork & Observations.
2. Secondary Resources: (PCBS, Geomolg, Cadmapper, Snazzy Maps, Polymer)
3. Calculations.
4. 3d modeling & Mapping.
5. Generative tools: Urbano in Grasshopper, Openstreetmap.

Weight of using each method is demonstrated in Figure A.8 Appendix A. The diagram numerically illustrates the number (weight) of tools used for each sustainability indicator, and the number (weight) of each tool among the whole other tools. Workflow that guided the assessment of each indicator can be understood from the set of used tools.

### 2.4.1 Fieldwork & Observations

The majority of identified indicators were assessed through fieldwork and on-site observations at first glance. Due to the scale of assessed neighborhoods, gathering data required multiple visits. To get the maximum benefit of surveying, walkthroughs were the primary means of data collection, followed by couple of rounds by car. The walkthroughs paths differed from a visit to another. They usually started from main streets, then resumed towards pointed-out landmarks through specific internal streets and then passing through another internal street to the way back. Streets, buildings, landscape, urban elements were captured at both static (with no users) and dynamic (with users) rhythms. Fieldworks were mainly conducted for noting the physical condition of objects, noting building heights and associated services, affirming landmark locations, street widths, and uses of open lands. The term observation is used to justify the condition of indicators that are included in the general overview of city's common characteristics such as its landscape preservation conditions, culture of using spaces, patterns in construction, etc.

### 2.4.2 Secondary Resources: PCBS, Geomolg, Cadmapper, Snazzymaps

Secondary resources accompanied the majority of the data collection process. References like the Palestinian Central Bureau of Statistics and Bylaws (building regulations & permits) were used to cover some parts of local investigations. Stored databases about street type, street widths, building uses and heights, and aerial maps of neighborhoods were collected from Geomolg, which are used for the process of mapping. For the method of 3d modeling, cadmapper website provided the topography mesh, street lines, and a few building outlines. Snazzy Maps is an open-source platform that provides customized raster images for contextual studies.

### 2.4.3 Calculations

The indicator of density was assessed based on attaining a specific numeric value. The density of neighborhoods is a parameter that is not provided on a governmental database, therefore it needed to be calculated.

### 2.4.4 3D modeling & Mapping

3d modeling is crucial for the study to analyze better the distribution and the orientation of buildings, the ratio of built and unbuilt areas, and the relation of buildings to streets. Rhinoceros was used for building the 3d model of the neighborhoods. Primary data extracted from Cadmapper were opened in Rhinoceros. Outlines of buildings were revised by layering aerial maps from Geomolg, and building heights were revised in accord with observations. Diagrams of the 3d model were also exported from Rhinoceros. Mapping the analysis of indicators majorly depended on one workflow. Arcmap software was used to generate mappings of collected data from Geomolg, and was used to generate buffer studies needed for indicators tied to requirements within specific areas. Visualization was the post-production process for the constructed maps and 3d model. Enscape, a synchronized real-time rendering tool, was used to export images of 3d model and diagrams. Photoshop was used to enrich exported maps from Arcmap. Workflow of 3d modeling and mapping is explained in Figure A.9 Appendix A.

### 2.4.5 Generative tools: Urbano plugin in Grasshopper, Openstreetmap

A. Introducing Urbano

Urbano is a mobility modeling and simulation tool, first introduced in 2019. It is an analytical tool that uses built-in algorithms to measure the walkability and activeness of amenities and streets (70) that may be integrated into the design process and the decision-making of urban environments (71). The tool resulted from a collaboration between the Environmental Systems Lab (ES Lab) of the College of Arts, Architecture, and Planning (AAP) and the School of Civil and Environmental Engineering (CEE) at the College of Engineering at Cornell University (72). It integrates the field of architectural design, sustainability, building performance simulation, and computational design (72).

The website of Urbano.io provides significant assistance for downloading the tool and gives a reference for some demo files and samples (72). It further extensively explains the features of the tool, metrics, contributors, and the research publications of the contributors.

B. Overview of Contributors:

Urbano tool is a research output of Timur Dogan, Samitha Samaranayak, Nikhil Saraf, and Yang Yang. Timur Dogan is an academic at the M.Arch. Program and the Environmental Systems Lab (73). His research revolves on the topic of sustainable and performance-driven design workflows at urban and architectural scales. Samitha Samaranayake is an academic in the School of Civil and Environmental Engineering and a Graduate Field Faculty in the School of Operations Research and Information Engineering, the Center for Applied Math and the Systems Engineering Program at Cornell (74). He focuses on the algorithm design for large-scale transportation network problems. Yang Yang is a design researcher at the Environmental Systems Lab of the College of Arts, Architecture, and Planning (AAP) at Cornell University (75).

C. Overview of Features and Metrics:

The toolbox of Urbano, exhibited in its interface, mimics the workflow process of the tool (76). Commands and components used to construct scripts in the tool are taken from four categories: Setup, Model, Simulation, and Utilities. Icons of the components visually depict the data type of each, Figure A.10 Appendix A.

D. Workflow

Urbano runs as a plug-in only under Rhinoceros3D-Grasshopper (GH). The use of Rhinoceros3D-Grasshopper platforms supports the scientific flow for evaluating the study parameters. The workflow constructed for the study followed two steps: Building Contextual model, and Mobility Simulation. Building Contextual Model was developed in two stages. The first stage included importing the components of Buildings, Amenities, and Street Networks from OSM (OpenStreetMap website) to the Urbano interface.

Each included key metadata (77):

1. Buildings: Building footprint, Building Height.
2. Amenities: Amenity Type, Amenity Capacity, Opening, Rating, Destination Factor.
3. Streets: Street Segment ID, Length, and Routing Factor.

The second stage was to resolve the inclusion of Terrain in the model. A mesh from Cadmapper was uploaded and identified to the interface of Urbano. Points of street segments and building edges needed to be projected to their location on the mesh. Only then, the Urbano model was built and was ready to integrate into proceeding studies.

E. Selected Parameters for the Study

The study will make use of two parameters of the mobility simulation of Urbano tool; StreetHits, which resembles the accessibility and connection of streets, and Walkscore which resembles walkability. The following parts describe these two components and explain more about their significance, how they operate, and what they represent. Overall script is provided, Figure A.11 Appendix A.

Streetscore - or what is referred to as Street Hits measures how many people use a certain street segment in a given trip. This can be an indicator of how vibrant a street is within the network. The magnitude of Streetscore varies from (0 to 67), where 0 indicates weak street activity, and 67 indicates the highest street activity. Results of Streets Hits indicate the location of the scored street segment, the value of the scored street segment, the average of Streets Hits of an area, and data about Streets Trips (indicating trips of starting amenity and destination amenity that generated the result of overall Streets Hits), as attained in the script in Figure A.12 Appendix A. The value of Street Hits can justify the

numeric diversity of street segments of different locations and lengths. They can also be influenced by the type and quantity of amenities along them.

Walkscore rates the walkability to amenities based on proximity. The magnitude of walkscore varies from (0 to 100), where 0 indicates the lowest walk score, and 100 indicates the highest. It follows the exact notions of walkability measure, explained in Figure A.13 Appendix A. The script explained in Figure A.12 Appendix A, runs to give an evaluation of walkability around buildings. It graphically shows the impact on buildings, rather than streets.

Both metrics of StreetHits, and Walkscore require the component of ADP (Amenity Demand Profile) Trip Engine. ADP Trip Engine generates trips from buildings based on the activity demand profile, Travel Mode and Destination Choice Model. As shown in Figure A.15 Appendix A, the travel mode for the ADP trip engine covers means of Pedestrian, Car, Bus, and Bike trips. Destination Choice model may calculate the Nearest trips, Nearest Unvisited Trips, Trips by Destination Factor, and Time Limit. The destination factor keys can only be activated if the Destination factor was selected. Factor keys include Amenity Capacity, Amenity Ranking, Amenity Opening, and Custom Destination factor. Amenity Demand Profile (ADP) provides measuring of human activeness based on the activeness of amenities. It describes the population-weighted demand for activities based on persona type. Details about persona type and activity can either be uploaded or can depend on the loaded data following certain systems, Figure A.14 Appendix A. The analysis in the thesis depends on the Walkscore (normalized) system. Each activity type has specific weights as listed in Figure A.16 Appendix A.

### 2.4.6 Supporting tools

Flourish builds AI-generated dashboards of connected datasheets. In the thesis, Flourish was used to compare quantitative values of findings. Pudding website provides a platform for worldwide estimation of human terrain (density) (78). Thus, it was used to give a visual representation of density change across two periods.

### 2.4.7 Limitations of Some Methods

Some collected data from secondary resources were outdated, as pointed out in Figure A.9 Appendix A. To cover the information gap, other methods were used. For instance, fieldworks were conducted to cover data about building heights and uses.

Furthermore, information collected from OpenStreetMap was limited, therefore, the simulation on Urbano could not operate for this reason. Fieldwork assisted in this case too for collecting missing data. Next, the researcher updated the data on the OpenStreetMap website: building outlines, building heights, and building types, which was sufficient for Urbano simulation to operate. For the contribution of research and data availability, data on both neighborhoods got updated and accessible for any user to download. Figure A.17 Appendix A shows the size of available data before and after the researcher's intervention to the data stored in the website.

## 2.5 Phase 5: Case study

This study selects the case of Nablus City to conduct the assessment. Nablus City contains 43 neighborhoods. The neighborhoods are non-uniform in size, demographic data, and land use. Moreover, the urban fabric is not uniform and it is distinguished based on residents' culture, and physical distinctions. Thus, the case of Nablus city makes the assessment rich and open to inclusivity and diversity.

The study relies on a comparative methodology where it compares two neighborhoods of the city; Al-Masaken and Al-Mreij. The comparison aims to understand how some existing urban characteristics such as location and planning conditions lead to local sustainability measures. The study compares how the peripheral location of Al-Masaken results in different urban qualities than the centric location of Al-Mreij. Moreover, it compares the two cases regarding their planning pattern (spontaneous vs planned), as it affects the sustainable attributes of neighborhoods. As viewed from the plans, Al-Mreij neighborhood has a spontaneous planning, while Al-Masaken neighborhood contains an organized grid.

The following part shows the results of the comparison between the two neighobrhoods.

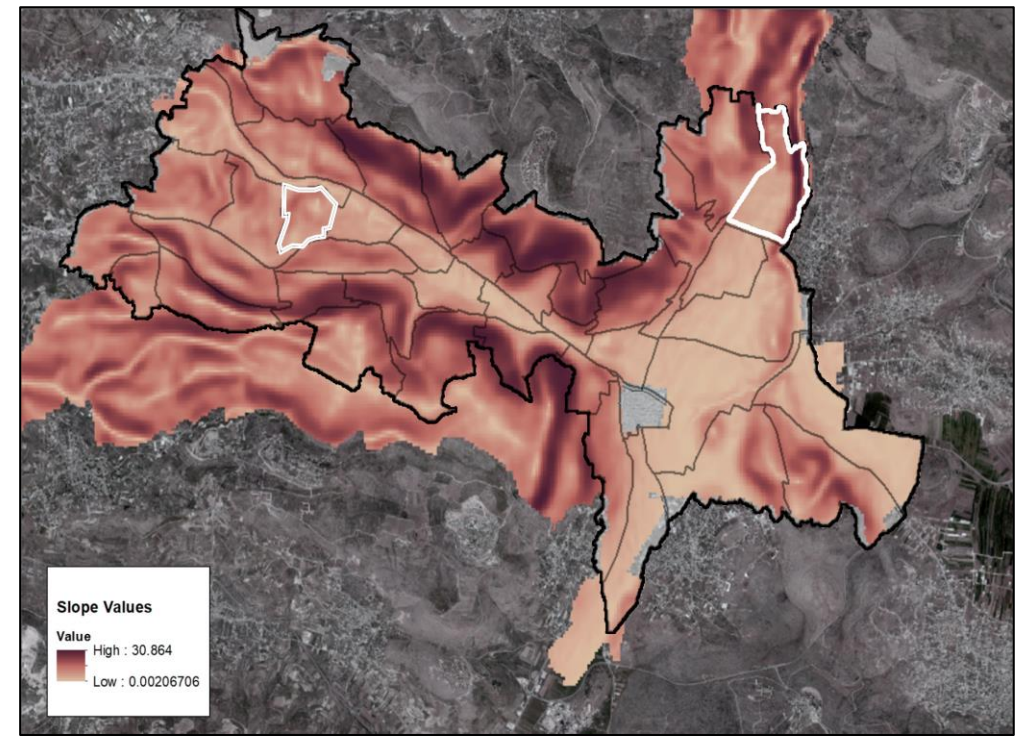
# Chapter Three

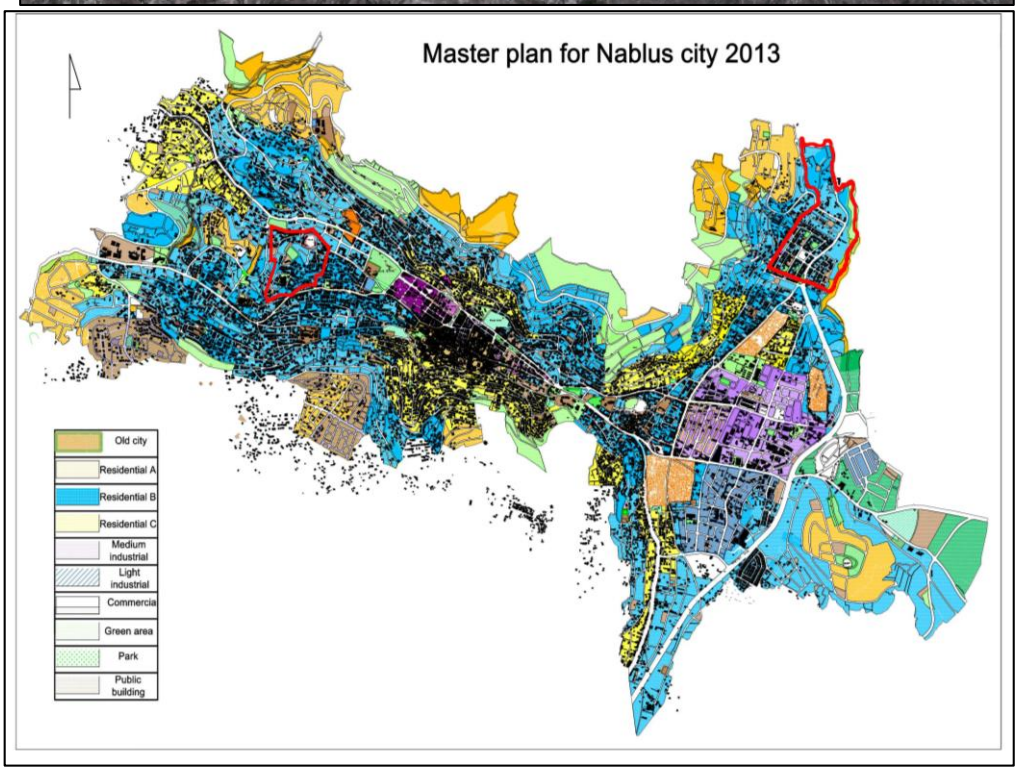
# Results

To investigate the sustainability spectrum of local neighborhoods, the twenty seven sustainability indicators developed from the methodology section are used to evaluate and compare two local neighborhoods; Al-Masaken (planned, located east of the city) & Al-Mreij (spontaneous, located west of the city). Both of these neighborhoods have different socio-economic and physical attributes, though the majority of their land use is residential. Through examining the two selected neighborhoods, the findings of the assessment will bring in distinctions of sustainability between peripheral and centric neighborhoods on one hand and planned and spontaneous neighborhoods on the other hand. The comparison will list the strengths and the weaknesses of each case, and accordingly, recommendations will follow. Qualitative and quantitative methods described in the previous chapter are applied to measure each indicator at the two cases.

**Figure 1**

*Topogrphy, Location & Landmark of Al-Mreij & Al-Masaken within Nablus city*



### 3.1 Smart Location and Linkage

#### 3.1.1 Preferred Location

The remarkable morphology and geomorphology of the urban development of the city of Nablus are usually identified based on two narratives: topography, and land-use planning. The classification of neighborhoods based on topography is recognized as the following: the center/valley, the northern mountain, and the southern mountain, Figure 1. Both mountains have high to moderate topographic values.

In terms of the city's topography, Al-Mreij is close to the northern mountain (eibal). The difference in topography from one area to another in the neighborhood is significantly noticed in Al-Mreij neighborhood. In terms of location and landuse planning, the neighborhood sits towards the western commercial center as shown in Figure 1. The neighborhood is generally classified as a site with good transit access due to its location being adjacent to two significant commercial streets in Nablus, Rafidea Street, and Yafa Street. Al- Mreij neighborhood is strategic to its surroundings thanks to the inclusion of landmarks and closeness to active and wide streets. Those aspects usually increase social ties between people residing in the city, which makes the geographical location of Al-Mreij generate a dense urban district.

Unlike Al-Mreij neighborhood, Al-Masaken neighborhood is located on the peripheries at a close distance from the eastern entrance of the city depicted in Figure 1. It is considered the last urban area before Al-Badhan and other rural areas—regions that are outside the city. The path to these areas starts from Sulaiman Al-Nabulsi Street, an active street that passes through Askar Camp and then to Al-Masaken neighborhood. The location of Al-Masaken offers some pros in the social and physical schemes. The closeness of Al-Masaken to Askar camp and the industrial area put the neighborhood at a strategic location for accessing services, jobs, and public areas. Moreover, the neighborhood is classified as a calm area because of its low-density rate and far location.

Al Masaken neighborhood can be classified into three areas (see Figure A.18 Appendix A); planned and dense (the lower part), spontaneous and low density (the northern part), and unused space towards the valley (the eastern part). The northern part includes a garbage dump, which certainly affects the livability of the neighborhood. An unpleasant odor surrounds a couple of residential buildings nearby. Al-Masaken neighborhood is an

example of how poor management of waste and infrastructure design impacts an area's economic, physical, and social sustainability.

Regarding topography, Al-Masaken is bounded from the west by the northern mountain (eibal). The inclination of its lowest part is generally homogenous, in comparison with Al-Mreij. The direction of inclination goes across to the eastern side, where a valley is located.

### 3.1.2 Access to Quality Transit

The main intent of the access to quality transit credit is to encourage development in locations shown to have multimodal transportation choices or otherwise reduced motor vehicle use. They can significantly reduce greenhouse gas emissions, air pollution, and other environmental and public health harms associated with motor vehicle use.

In the city of Nablus, the prevailing means of mobility are private cars and publicly shared caps. It must be acknowledged that the selected neighborhood and the whole city of Nablus lack the infrastructure of diverse and developed public transportation. There is no public transportation in Nablus or the West Bank. The only means of providing public mobility facilities is the use of shared caps that are designated according to destinations. Those public caps can be taken from their main station at the city center, from the main streets of the city, and rarely from internal streets. Evaluation of efficient transportation service accounts for whether the service is publically accessible, accommodates multiple passengers, uses a fixed route, and is visible through transit maps or signage.

Al Mreij is close to two active streets: Yafa and Faisal Street from the north and Tounis Street from the west, shown in Figure A.19 Appendix A. Both of these two streets are wide and have four street lanes beside some commercial landmarks, which makes them hierarchical in the transit circulation of public vehicles and destination passages. From the south, Al Mreij is bounded by one of the main streets, which experiences a consistent flow of public transportation. Rafidea Street is accessible from multiple internal streets and is visible to offer double-route service. However, accessing active streets is beneficial to buildings opposed to those streets. Accessibility of residents from buildings closer to the center to those streets is challenging due to the topography, as shown in Figure A.20

Appendix A. Duration of walkability is generally non-uniform, due to non-uniform inclination of lands, patterns of streets, and proximity of internal streets to buildings.

Another doubtful fact about the efficiency of transit is the occupancy of caps. The majority of caps crossing Rafidea Street are taken from the center and they flow back to the center unless the driver accepts broken trips. This makes Rafidea Street operate as a transit-passing route rather than a collector route.

Street shape, street pattern, and street condition are strongly associated with facilitating residents' access to the locations of transit-catching areas. Locally, the street systems in Al Mreij neighborhood follow irregular patterns. They cannot be identified as warped parallels because the relation of the building distribution path to the street beside is what is parallel, not the streets to each other. Streets are closer to the classification of curvilinear modified rectangular, altered by the non-uniform distribution of buildings. The resulting pattern allows maximum accessibility from buildings to car-based streets. Street shapes in Al Mreij neighborhood are organic and twisted according to the segmentation of built areas, land blocks, and topography. This may lead to longer trips and inconsistent pathways, though they may contain paved streets.

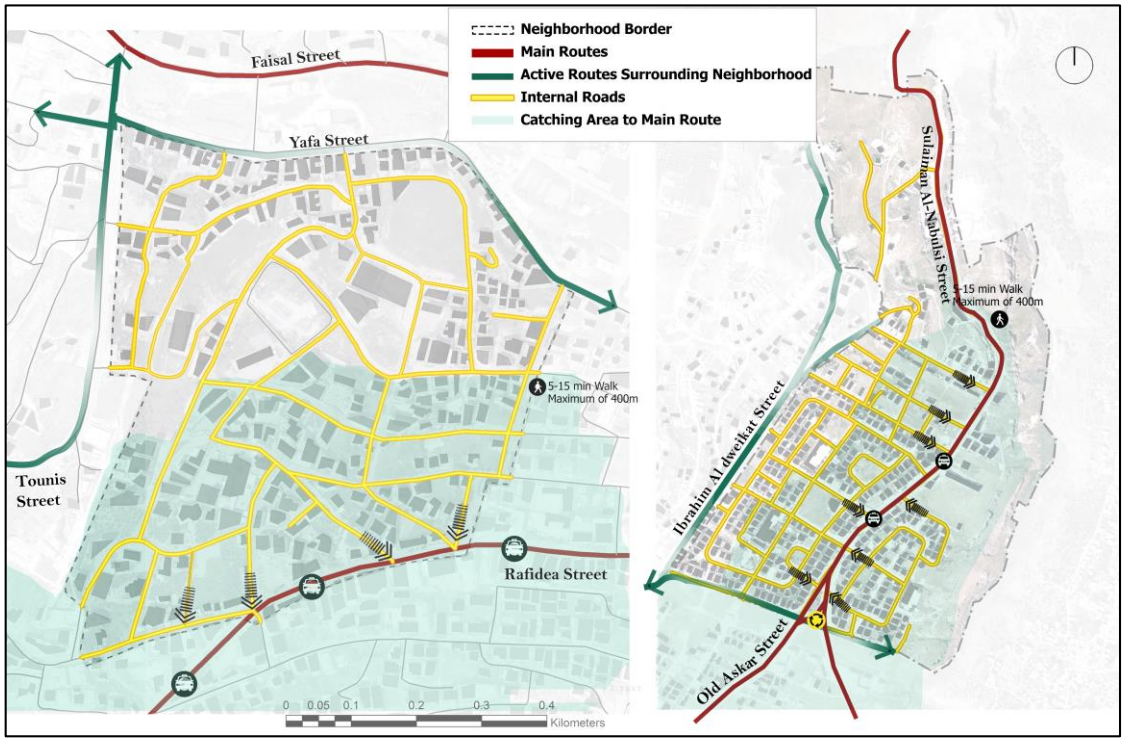
What’s remarkable in Al-Masaken neighborhood is the diversity of vehicle types passing through or stopping by its streets. Cabs, trucks, bicycles, private cars, and buses flow through the neighborhood’s wide streets, see Figure A.21 Appendix A. Reaching the neighborhood from the center station takes almost 20-25 minutes, which is double the calculated time and distance to Al-Mreij. Thus, the number of cabs passing by the neighborhood is relatively lower. This is also tied to the density and the assigned activities in the area. There aren’t any specific or distinguished landmarks to attract city residents to visit the neighborhood, which makes the area inactive. Speaking about the paths of the public cabs, they run on active and main streets, which are on the neighborhood boundaries, similar to the paths of all cabs. Sulamain Al-Nabulsi Street comprises 4 routes, 2 for each direction. This main street allows side parking areas, which facilitates accessing the commercial uses on both sides. Some features of suitable road infrastructure that regulate the transit of vehicles are noted. This includes roundabouts, service roads, and multiple car drop-offs, see Figure A.21 Appendix A. The path to getting to Al-

Masaken neighborhood from the city center and the rest of the city usually starts from Amman Street, then to Old Askar Street or Ibrahim Al Dweikat Street.

The neighborhood spreads adjacent to the main streets. Street patterns follow a clear grid of linear shapes, and almost all of them are parallel. Thus, the accessibility of residents to transit routes is efficient, easier, clearer, and closer than irregular patterns. Also, it is noticed that the direction of the neighborhood's internal streets all leads to the main street in a clear path; often perpendicular, as seen in Figure 2. Though the topography influences the walkability of the main street, the network of internal streets and their link to the main street are adequate for the residents. The condition of streets does not differ much from how streets are in Nablus; experiencing variations of inconsistent levels and cracks.

**Figure 2**

*Quality Transit & Accessibility Measures in Al-Mreij (left) & Al-Masaken (right)*




Note: Al-Mreij on the left, Al-Masaken on the right.

### 3.1.3 Housing and Job Proximity

This credit intends to encourage balanced communities with a diversity of uses and employment opportunities. One of the quantitative validations of this credit requires the association of full-time jobs within (½ mile) 800 meters from the center of the neighborhood, and the number of these jobs must be equal to or higher than the number of the covered dwelling units.

The calculated linear distance from the center of Al-Mreij to its boundaries is approximately 300m. This indicates that estimated job opportunities are within 300 m or less if directed from and to the center, and jobs are within a maximum of 600m from boundary to boundary, which satisfies the first part of the quantitative reference. Nevertheless, due to the inconsistent topography, the accessibility to jobs might vary from an area to another. On the other hand, there exist some concerns about the count of jobs and their relation to dwelling units.

Stimulating job opportunities can happen in two ways: either through mixed-use buildings or the existence of retail and shop single floors, see Figure A.22 Appendix A. Part of measuring local job proximity encompasses an investigation of building frontages, whether they are active economically and socially or unused. Locations like schools and hospitals at the neighborhood provide profession related jobs. Buildings opposed to or leading to active streets are active with job opportunities, as shown in the map of Figure 3. Mainly, the northern and southern boundaries of Al-Mreij are the most vibrant among the whole neighborhood, due to the spread of shops and retail. However, the regulations for owning a shop do not oblige the buyer to reside in the same neighborhood. Therefore, this means that the jobs created in the neighborhood might be employing the population of other neighborhoods and not necessarily creating jobs at a reasonable distance for the residents. Moreover, it is very hard to count the number of offered jobs in the area, as they are restricted to a maximum of 3 shops at frontages (if any) and a couple of unstandardized used floors in buildings. Some buildings do not include any means of job creation, which indicates that the job census is lower than building units.

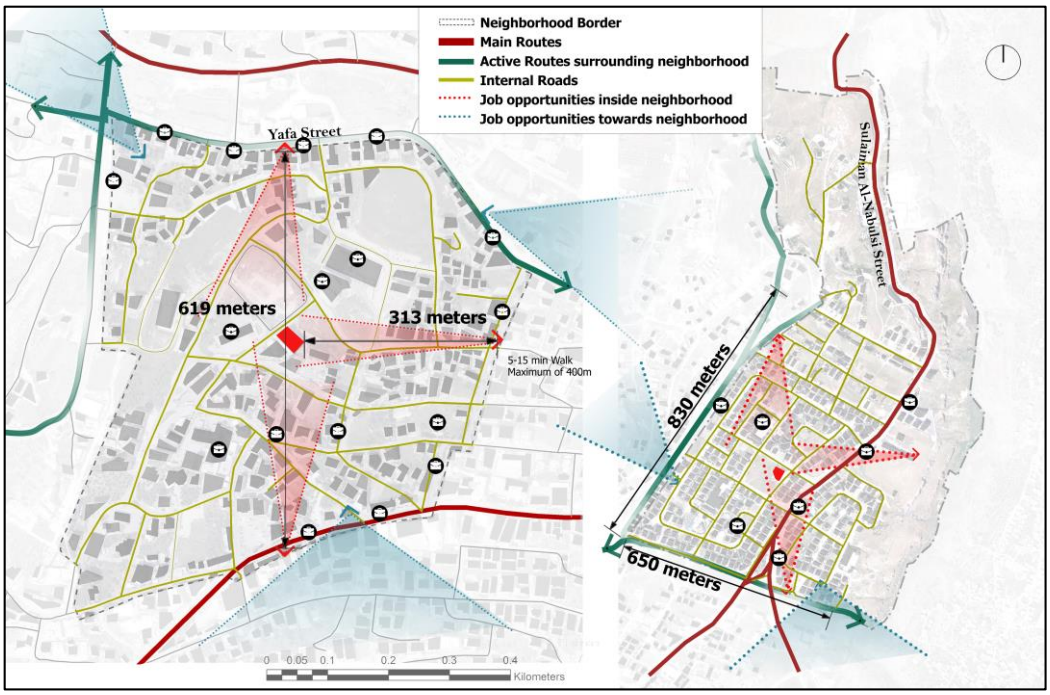
In Al-Masaken, the center for job opportunities is designated in the lower part of the neighborhood, where a planned area is located. As seen in Figure 3, the calculated linear distance from the center of Al-Masaken to its boundaries is approximately 300m on the

short side and 400 m on the long side (whole lengths of 650m x 830m). In this condition, the distance of job proximity matches what is set out in the literature, however, the calculation does not account for the topography. Topography in al-Masaken seems to incline in one direction, which lowers the inadequacy of walkability and therefore does not majorly affect the accessibility to jobs. On the other hand, the number of shops and job opportunities is low compared to what it is supposed to be. Similar to Al-Mreij, not all buildings use their frontages for jobs, and there is barely any indication of floors for job uses in the buildings.

It was noted that a lot of buildings' frontages were not active. Though the fieldwork was done during the day, shops were either closed or had few visitors. Generally, very few buildings—those that are opposite the main street—showed an indication of mixed-use buildings. Not only does the number of shops show low opportunities for job proximity, but also the types of jobs. The use of shops in Al-Masaken is not inclusive, and shops are not enough for everyday necessities. One hypermarket is provided, one coffee shop, one informal vegetable vending, a closed clinic, etc. The landuse and the surroundings of the neighborhood influenced the type of jobs offered.

**Figure 3**

*Measuring job opportunities in Al-Mreij & Al-Masaken*




Note: Al-Mreij on the left, Al-Masaken on the right.

The relative closeness of the industrial area to Al-Masaken neighborhood puts an assumption of residents seeking outer job opportunities more than what the neighborhood offers them. Within 1600 meters (max. 10 minutes via car), a resident can move from the center of the neighborhood to the entrance of the industrial area. Secondly, locations at Amman Street are strategic to offer residents of Al-Masaken job opportunities at a reasonable distance.

## 3.2 Neighborhood Pattern and Design

### 3.2.1 Compact Development

Expansion in the city of Nablus dominated both the vertical and horizontal directions. This expansion had massively affected urban and architectural schemes and raised the density noticeably, see Figure A.23 Appendix A. Compactness is a conception that targets densification while promoting livability, walkability, and transportation efficiency, including reduced vehicle distance traveled. For a compacted community to be created, specific densities must be set. In one of the neighborhood sustainable assessments, residential components should be at a density of 7 or more dwelling units per acre (17.5 DU per hectare) of buildable land available.

Inspections of the Al-Mreij neighborhood indicate that the center has 13 residential buildings within an area of 1 hectare (10000 square meters), see Figure A.24 Appendix A. Baring the differences in floor numbers of those buildings, the assigned area in the center has approximately 200 dwelling units, which satisfy and exceed what is set as requirements. The count of buildings varies from the neighborhood peripherals to the center, thus the density varies. Alternatively, the density will be calculated based on the overall number of buildings in the whole neighborhood. The 419 donum of Al Mreij (41.9 hectares) should include 733 dwelling units, according to the quantitative reference. After operating calculation described in Table B.1 Appendix B, the generated count is 2526 units, which is almost 3.5 times more than the number required. The following part describes the detailed steps for measuring the count of units.

To calculate the overall density of the neighborhood, a couple of mathematical equations are used. First, housing units are generated based on the number of floors each apartment building has. For each building holding the same number of floors, the number of floors

is multiplied by 3, which is the average number of housing units per floor in Nablus. The result estimates the sum of housing units in the neighborhood.

Further, the total number of units is then multiplied by 5 (the average number of family members per unit) to calculate the population estimate of all neighborhood buildings.

Theoretically, a dense neighborhood should be distinguished by urban design measures and architecture accompanied by such an urban phenomenon. A dense and livable neighborhood preserves enough setbacks, privacy, height, direction of openings, etc. These distinctions were not found in the fieldwork conducted.

At the center of Al-Masaken, 18 buildings existed within an area of 1 hectare (10000 square meters), see Figure A.24 Appendix A. Baring the differences in floor numbers of those buildings, the assigned area in the center has approximately 140 dwelling units, which satisfy and exceed what is set as requirements. Concerning the overall density of the neighborhood, shown in Table B.2 Appendix B, the 895 donum of Al Masaken (89.5 hectares) should include 1566 dwelling units, according to the quantitative reference. The generated count is 3216 units, which is almost 2.0 times more than the number required. The following part describes the detailed steps for measuring the count of units.

In comparison with Al-Mreij, less density is assigned in Al-Masaken, though the spread of horizontal space is higher, almost double. Both the built-up density (ratio of built lands to whole area), and the density of population density (ratio of population occupying the whole area) is lower. The built-up density in Al-Mreij is 80% opposed to 66% in Al-Masaken. This affected the architectural volume, the environmental considerations, and the urban design of Al-Masaken. More open spaces are integrated, and there isn't much confiscation between the buildings, as what is in Al-Mreij. In general, compactness in local applications is merely achieved in the quantitative references, and not in the qualitative measures.

### 3.2.2 Mixed-Use Neighborhood

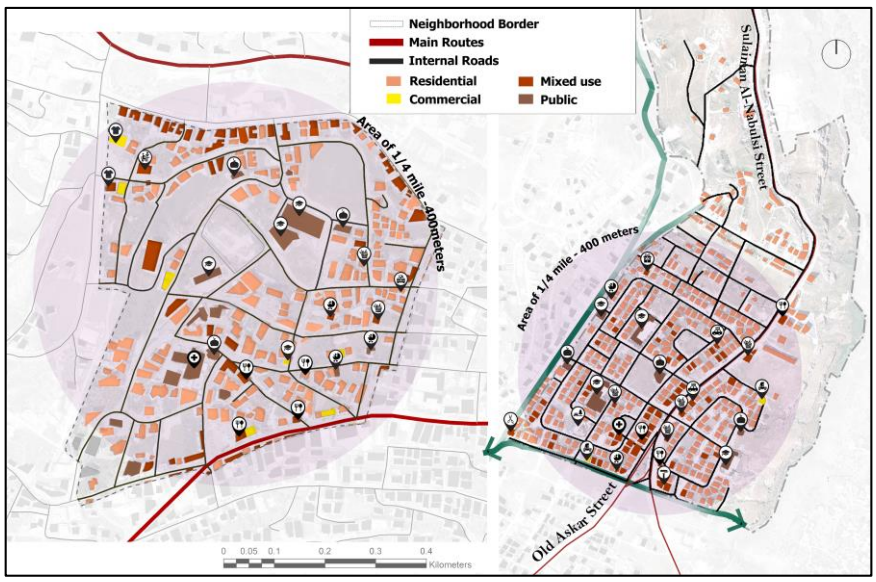
The mixed-use neighborhood is where diverse land uses are embedded with well-accessible neighborhoods and regional centers to encourage daily walking, biking, and transit use and support car-free living. Investigating this credit shows that 50% of neighborhood dwellings should be within ¼ mile (400 meters) of walking distance and

should be of at least 4 uses and a logical maximum of 20. Uses in each use type can be repeated only twice.

Noted from Figure 4, both Al-Mreij & Al-Masaken neighborhoods includes diverse uses. Al-Mreij includes residential, mixed-use buildings, public buildings, and commercial. The count of service types is listed as: 3 Kindergartens, 3 Schools, 4+ Restaurants, 3+ Clothing stores, 2 Hospitals, 3+ Mosques, 1 Laboratory, 4+ Grocery Stores, 1 Electronics Shops, 1 Car Maintenance. The total is 18 (considering the count of 2 for those exceeding more than 2 locations of the same use type). Al-Masaken neighborhood includes residential, mixed-use buildings, public buildings, and commercial. The count of service types is listed as: 1 Kindergarten, 3 Schools, 1+ Restaurants, 1 Clinic, 2+ Mosques, 3+ Grocery Stores, 1 Park, 3+ industrial locations, 1 Barberry shop. The total is 13 (considering the count of 2 for those exceeding more than 2 locations of the same use type). Regarding service density, they are less than the service density in AL-Mreij. Also, they are better distributed; services are not repeated at an unstudied distance. Most of the buildings in Al-Masaken are residential, followed by mixed-use buildings, commercial uses, public buildings, and a few industrial uses. Generally, both neighborhoods are well serviced.

**Figure 4**

*Measuring building uses in Al-Mreij & Al-Masaken*




*Note:* Al-Mreij on the left, Al-Masaken on the right.

As a reference to sustainable neighborhoods, the creation of a compacted community matches the benefits of having a diverse community. High densities bring in higher service rates and, therefore, more diverse service types. Those different service types are addressed to meet the diverse needs of a population from diverse age groups, genders, education, financial status, and other socioeconomic distinctions. Building uses in investigated neighborhoods prove whether this diversity is embraced in the first place and whether it is embraced sufficiently and equally. However, services are not distributed in coordination with each other. Similar uses can be found next to each other based on the choice of owners. This means that neither the distribution nor proximity to services is considered. Also, there is no specific coordination of building density with the type or the number of allowed shops, for instance. Some shops use part of single-family housing, and others use the leveling floors of low- and high-density buildings, see Figure A.25 Appendix A.

### 3.2.3 Housing Types & Affordability

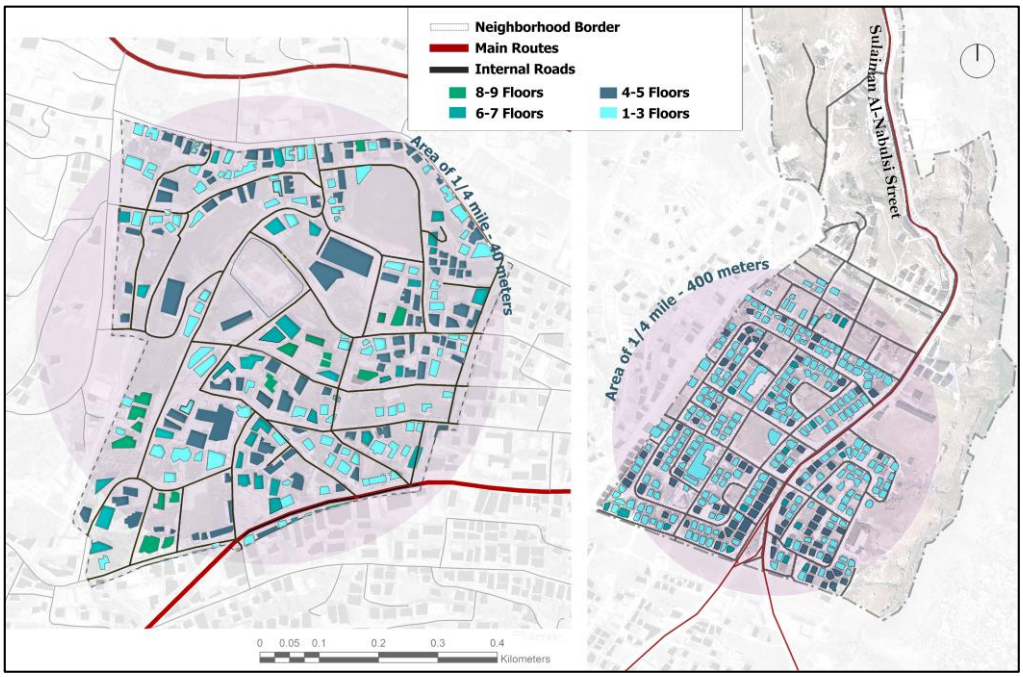
The classification of housing types is primarily related to enhancing communities of different age groups and economic statements. According to one of the neighborhood sustainability assessments, the 400 meters (¼ mile) of the neighborhood center should include diverse types of housing that are evaluated according to the Simpson diversity. Simpson Diversity Index calculates the probability that any two randomly selected dwelling units in a project will be of a different type. Buildings in Al-Mreij and Al-Masaken vary in typology; single, low-density, and high-density buildings. Variation is more noticeable in Al-Mreij, due to its higher density and its higher number of buildings.

Building size, and more precisely, scale, relate to its typology. Building shapes and sizes in both neighborhoods follow the shape and size of the land they are built on. Buildings that share the same block, bounded by internal roads, are fairly of the same orientation. Since land parcels tend to vary in size and their shapes are irregular, the neighborhood buildings are not uniform either in size or form. Though residential buildings look fairly similar in size and have a similar architectural language of materials and treatment of components, their construction was not coordinated; instead, the building design process is heavily related to the land parcel. Hence, the planning of the architectural output usually includes the consideration of minimizing setbacks from the plot, leveling by cut and fill, and prioritizing parking footprint over open space footprint.

Housing types also relates to the density of the buildings. Al-Mreij neighborhoods include 89 buildings out of 236 of 1 to 3 floors high – 37.7%, followed by 98 buildings /236 of 4 to 5 floors high – 41.5% and 49 buildings/236 of 6 to 11 floors high – 20.7%. Despite Al-Masaken neighborhood includes more buildings, it is characterized by buildings of low density as well as low population density and more space between buildings. The majority of buildings are between 1 and 3 floors high (238 buildings /344 total buildings) – 69.2%, followed by those 4 to 5 floors high (84 buildings/344) - 24.4%, and 6 to 8 floors high (22 buildings/344) - 6.4%. It is noticeable that many buildings expanded vertically in different years, as indicated by the contrast of materials between adjacent floors. This is either a result of expansion for private or investment use. Figure 5 shows the graphical representation of densities in both neighborhoods.

**Figure 5**

*Building density in Al-Mreij & Al-Masaken*




*Note:* Al-Mreij on the left, Al-Masaken on the right.

In reference to sustainable neighborhoods, affordability is mainly concerned with having new dwellings directed to those who are earning less than the area median income (ami). Locally, typologies suiting affordability are poorly assigned in Nablus or the West Bank; the private sector does not favor this type of investment and the government and the municipality do not offer enough subsidies. None of the buildings in both neighborhoods

were built on the concept of offering affordable housing, and neither was adopted as a strategy in the existing buildings. Moreover, the bylaw does not mention any specifications for it, nor does it mention in which category of planning it should be.

Both neighborhoods are classified residential uses, under area (b) according to the city's master plan. In the latest version of the bylaw and building permits (79), the maximum allowed floor is 5 for the designed planning area (B). Many buildings exceed this number.

### 3.2.4 Visitability and Universal Design

Visitability and universal design are mainly directed for making spaces comfortable, inclusive, and accessible for all social categories. Guidance in accrediting this point is primarily directed to the design and features of internal spaces. It further stresses the availability of multiple housing typologies: single attached, single detached, and buildings of multiple dwelling units, as studied in the previous credit.

In the urban scope, the identification of neighborhood landmarks indicates the visitability of these locations by residents of the neighborhood, residents from nearby neighborhoods, and residents from other neighborhoods. Maintaining a good impression of a space boosts investment and the overall economic sustainability of a neighborhood. Therefore, this part highlights the landmarks of Al-Mreij neighborhood that are considered crucial for attracting visitors; Rafidea Surgical Hospital, Talaee Al Amal School, Islamic elementary school, Nablus Businessmen Forum, well-known clothing stores such as Leopard & Springfield, a remarkable cafe for teenagers and young adults, Arab Specialty Hospital, etc. Figure A.26 Appendix A features the expected user type based on assigned uses.

The visitability of Al-Masaken is generally claimed to be low due to its location within the city. Shops at Sulaiman An-Nabulsi Street or some of the industrial uses might attract those who are passing the street to enter or exit the city. Three schools are located, and a public park, which is attractive to residents in close neighborhoods, such as Askar. For both neighborhoods, it is noted that there are no diverse communal spaces for women or elders. This might indicate the low activity of some categories residing in the neighborhood.

### 3.2.5 Reduced Parking Footprint

This credit intends to minimize the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff, by assigning sufficient parking capacity and not exceeding it. The Institute of Transportation Engineers, Transportation Planning has prepared a booklet for parking generation and a recommended parking ratio (80). According to the booklet, 1.65 meters square is assigned for each rented dwelling unit, and 1.85 square meters is taken for each owned dwelling unit. This means that for an average residential building (5floors), approximaltely 28m2 is required (5 x 3 x 1.85 = 27.75).

In both neighborhoods, it has been noticed that the majority of parking is on-street; not all residential buildings offer private parking. Some buildings assign underground floors for parking, others depend on the ground-floor area tied to the entrances, and others use the open area of the street adjacent to the building. The local use of land for parking follows two types of patterns: formal and informal, where the only difference is the payment. A formal parking lot puts a rate of payment per hour for every car that parks; blanket parking; a pattern that is very similar to a parking lot at the city center. Both informal and formal off-street parking lots in Al-Mreij Neighborhood make use of open land (with no asphalt). An example of formal parking in Al-Mreij is located opposite Rafidea Street, leading to mixed-use areas such as shops, offices, cafes, and residential components. It is mainly used during the weekdays and in the daytime by users of these areas. Open spaces in Al-Masaken remain unused, which justify the non-existence of off-street parking lots. Parking patterns are demonstrated in Figure A.27 Appendix A.

Moreover, the size of the parking area and the location of the parking lot affect its urban footprint. Though parking lots help regulate car circulation and parking habits, their location generates benefits for their surroundings at a certain distance. Residents who park to access surrounding services would be making the best use of the lot. On the other hand, parking in the lot becomes unpleasant for those who are visiting services at a distance, as they have to walk for longer trips.

In terms of the size of the parking area, it can be estimated that the demonstrated example of a parking lot, Figure A.28 Appendix A is almost replacing 2 to 3 residential components. Environmentally speaking, this void brings better visibility and air

circulation to the surrounding buildings. It also creates a balanced entity for controlling compactness.

The use of open areas for informal and formal parking in Al-Masaken is less than in Al-Mreij. It is estimated that the local areas assigned for off-street parking are not sufficient for the number of dwelling units. Off-street parkings are not consistant and they are not distributed in a systematic pattern locally. Parking patterns in the neighborhood are either those that are assigned as floors in residential buildings, or those that are on-street parking on building entrances, and those on service roads (Figure A.27 Appendix A). Designation of areas for parking as service roads is efficient for transit access, walkability, and regulating parking footprints. The use of service roads can replace side parking on internal streets if it integrates within adequate intervals. Though all of the parking areas use asphalt, which raises the environmental impacts on short and long-term runs, the allocation of vegetation mitigates the environmental impacts of using asphalt on streets (Figure A.27-c Appendix A).

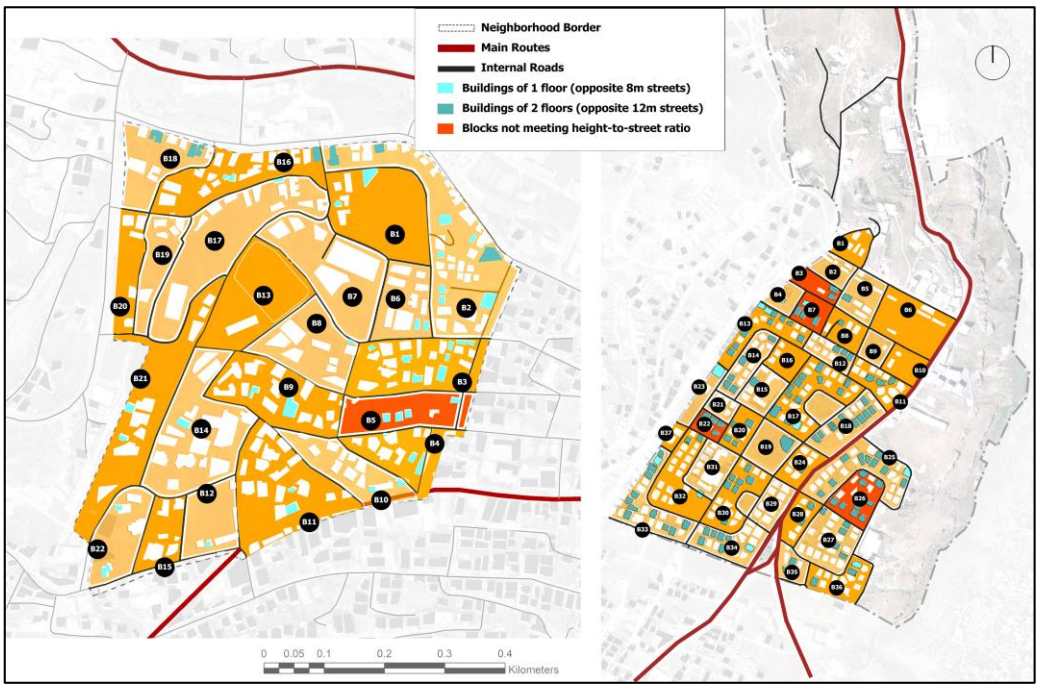
Generally in both neighborhoods, it can be noted that road type influences the size and type of parking. More side parking is found on active streets than on internal streets, mainly due to the commercial use of shops that requires adequate parking spaces.

### 3.2.6 Walkable Streets

Identification of walkable streets includes lowering the distance traveled to destinations in the neighborhood. Additionally, it focuses on providing streets that have good settings for safety, comfort, and aesthetics. Thus, walkability depends on parameters such as height-to-street ratio, street width, and sidewalk measures. According to one of the sustainable neighborhood assessments, 15% of the building block must have a minimum height-to-street ratio of 1:1.5. In the case of distinctions between building heights, an average is taken. 22 blocks exist in Al-Mreij Neighborhood, and 37 blocks exist in Al-Masaken. One block is found not satisfying height-to-street ratio in Al-Mreij, while 4 are found in Al-Masaken, Figure 6. This is assumed to be a result of the low density of buildings in Al-Masaken, and the arrangement of building count per block space.

**Figure 6**

*Mapping buildings, and blocks not satisfying height-to-street ratio in Al-Mreij & Al-Masaken*




Note: Al-Mreij on the left, Al-Masaken on the right.

In Al-Mreij, the ratio of building height to street width across one street is different due to the instabilities of building heights. Variations in building height exist among buildings next to each other or buildings opposite to each other, Figure A.29 Appendix A. It is hard to depict a frequency pattern or a cluster of buildings of a certain height duplicating, with coordination, other buildings in an adjacent block.

In terms of street width, width of internal streets of both neighborhoods vary; 8m; allowing 2 vehicle pathways, less, and more, Figure A.30 Appendix A. Opposite these streets are apartment buildings that are of 4-7 floors which exceed the minimum building height-to-street ratio. To satisfy the ratio at exact, buildings must be at a height of 5.3m (approximately 1-2 floors) opposite 8m street and have a height of 8m opposite 12m street (approximately 2-3 floors).

In terms of walkability and comfort, sidewalks and all-weather paths are required to be continuous on both sides, 2.5 m wide beside retail and mixed-use buildings, and 1.2 m wide beside other buildings. In Al-Mreij, sidewalk condition, pattern, and material in Figure A.31 Appendix A are inconsistent, leading to inconsistency in walkability and a

fragmented experience of walkability. For instance, it is noted that some streets have a pattern of two sides of sidewalks, another street has only one side of sidewalk, and others have no sidewalks on either side. Materials and colors vary among those patterns of sidewalks. Some have the indication of sidewalks controlling the parking of vehicles, such as the red and white or black and white sidewalks, and other sidewalks are tiled, which gives more comfort for walkability. The condition of sidewalks differs from one street to another without regard to specific building usage, location, or sidewalk width. While sidewalks beside the school are higher and in better condition, public places such as mosques lack sidewalks at the entrance. Not all of these sidewalks are continuous, and neither shows a consistent consideration of width. Similar conditions are observed in Al-Masaken, Figure A.31 Appendix A.

Walkable streets are also safe streets. Urban signage and the inclusion of street details as crosswalks are necessary for the evaluation of residents' movements within streets. Lighting features are needed for the safety of walking and driving residents. The local fieldwork noticed a general lack of crosswalks within streets and around intersections in Al-Mreij (Figure A.32-a Appendix A). On the other hand, street widths increase safety in Al-Masaken. Since walkability is highly associated with topography, the aspect of having the shortest distances to services depends on the difference in topographic levels between locations of amenities. Overall, Al Mreij neighborhood is not flat. Each block is either higher or lower in level than the surrounding blocks. Hence, walkability is subjective to the distance traveled from one block to another and whether there are any shortcuts through stairs. In Al-Masaken, the linear spread of the neighborhood, not the topography, can challenge walkability in its streets.

Results from the Urbano tool show that the walkability score towards neighborhoods buildings is fairly the same, probably due to the scale of the neighborhoods, and both are poor in walkability. In comparison with the global score of walkability, Al-Mreij scored 22.25 out of 100, as buildings are rendered in green-yellowish in accord to the legend spectrum, Figure A.33 Appendix A. Al-Masaken scored 6.51 out of 100 as a result, shown in green, Figure A.33 Appendix A. Though Al-Masaken implies the existence of some urban measures that raise walkability; street widths, suitable topography, and segmentation of building blocks which influence the level of walk score, the urban infrastructure lacks physical and aesthetic considerations in the form of pavements and

walking lanes and the linear spread of the neighborhood might have lowered its walkability values, in comparison to Al-Mreij. Results are extracted from the streetscape quality and the analysis of street hits and amenity hits. For the readability of the Urbano maps, the highest values of walk score are indicated in red or orange, and the lowest values of walk score are visually depicted in blue.

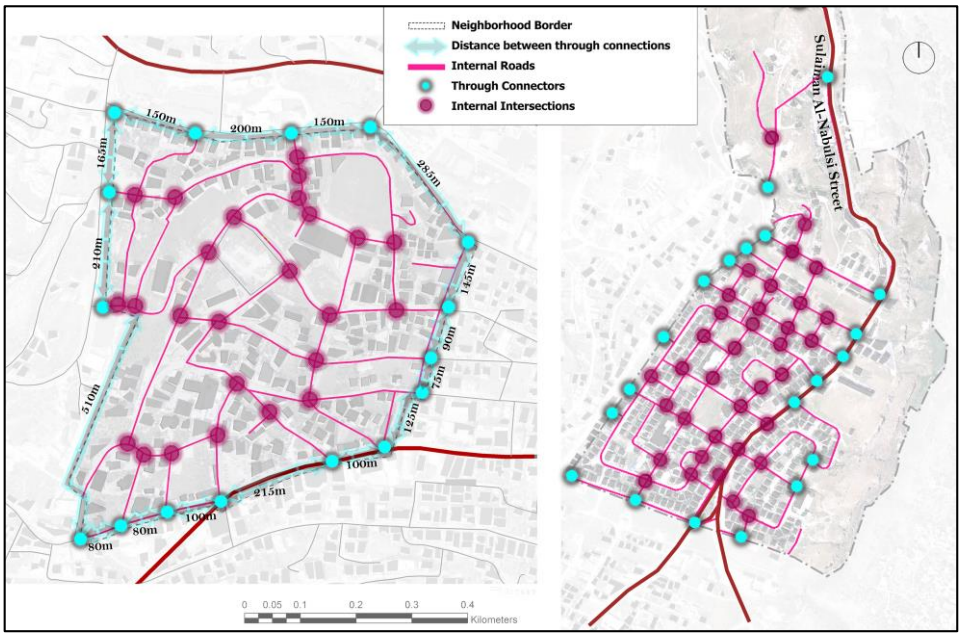
### 3.2.7 Connected and Open Community

Connected streets refer to the experience of accessibility and walkability in neighborhoods. It refers to promoting transportation efficiency and encouraging public physical activity. In a sustainable quantitative reference, internal connectivity requires preserving 54 intersections per square kilometer, and the circulation network is required to be open for public use with no gated streets. Surrounding connectivity requires at least 35 intersections per square kilometer of ¼ mile (400 meters).

Al Mreij neighborhood is 409 donum (0.409 square kilometers), which requires 22 intersections to satisfy the numeric requirement. The neighborhood has 23 internal intersections, which satisfies the needed number of intersections, Figure 7. Al Masaken neighborhood is 895 donum (0.895 square kilometers), which requires 48 intersections to satisfy the numeric requirement. The neighborhood has 36 counted internal intersections, which do not satisfy the needed number of intersections, Figure 7. This is mainly because of the inhomogeneous distribution of densities in the neighborhood.

**Figure 7**

*Street Intersections & Street Connections in Al-Mreij & Al-Masaken*




Note: Al-Mreij on the left, Al-Masaken on the right.

In Al-Mreij, the results of connectivity using Urbano showed a range of different values on the street hits. For the pedestrian score, the lowest values, indicated in blue, refer to a couple of short and internal streets and tertiary intersections. On the other hand, the highest values, indicated in red or orange, are noticed in continuous streets and around landmarks. The majority of streets in Al-Mreij are in orange which refer to moderate street score in the neighborhood, Figure A.34 Appendix A. Another noticeable result is the inconsistency of street score among the neighborhoods streets, depicted in the line graph of Figure A.35 Appendix A. In comparison, street scores are higher for the simulation of car transit. The highest score relates to Yafa street.

In Al-Masaken, the minimum pedestrian street score is observed in Sulaiman Al-Nabulsi Street, Figure A.36 Appendix A. This emphasizes that the street was meant for transit for cars, coming in or out of the district. On the other hand, Ibrahim Al-Nabulsi Street shows the highest pedestrian street score. This is suspected due to the flatness, and the high width of the two-sided street that increases the level of pedestrian friendliness. Some internal streets near open spaces tend to be more pedestrian than dedicated to cars. Few streets scored significantly higher results, as shown in the line graph in Figure A.37 Appendix A. According to the Urbano analysis, Sulaiman Al-Nabulsi Street got the highest value

of car travel mode due to its strategic location, which links the city to outer districts. The service road scores some intermediate scores. Generally, internal streets leading to Sulaiman Al-Nabulsi Street score higher than internal streets running through the neighborhood and higher than the values of Ibrahim Al-Nabulsi Street. Differences in the slopes and widths of streets do not seem to cause much difference in the values of street scores. Instead, the density of units impacts the street score values. The first horizontal street from the top, shown in blue, runs through a low-density area that has few units on both street sides. The short lane opposite Al-Kuther Nursery has a low street score, which indicates a portion of safety considerations for passengers accessing the nursery. In comparison with Al-Mreij, there is more variation in street score values. The graph also shows that many streets scored high values.

### 3.2.8 Access to civic and public space

This credit highlights the use of open spaces close to work and home to sustain a healthy and social neighborhood. One NSA reference specifies that ⅛ acres (675 square meters) of square, park, or plaza should be located within 400 meters of walking distance.

The fieldwork conducted in Al-Mreij did not find any of the available open spaces used for recreation, seating, or outdoor gatherings. Though the neighborhood includes open spaces, they are not used for public use as they are privately owned. Locally, the land prices will not allow public uses of lands, and the topography is an obstacle too. On the other hand, Al-Masaken neighborhood includes one park. Figure A.38 Appendix A shows the generated service area of 400 square meters around the park without considering the topography. With the topography, the service area will most likely become inhomogeneous and cover less area due to the inconsistency of topography levels. In both situations, the service area does not cover the whole neighborhood. This indicates the need for more recreational spaces dedicated to the existing open spaces. In comparison with Al-Mreij, more open spaces are available, which increases the potential for high and diverse recreational and public uses. Residents of Askar camp may find a possibility to access the park of Figure A.38 Appendix A within 20mins walking (400m). There is a suitability in walking down the Old Askar Street since it has a linear path and sidewalks exist on both sides. Figure A.39 Appendix A shows images of the park.

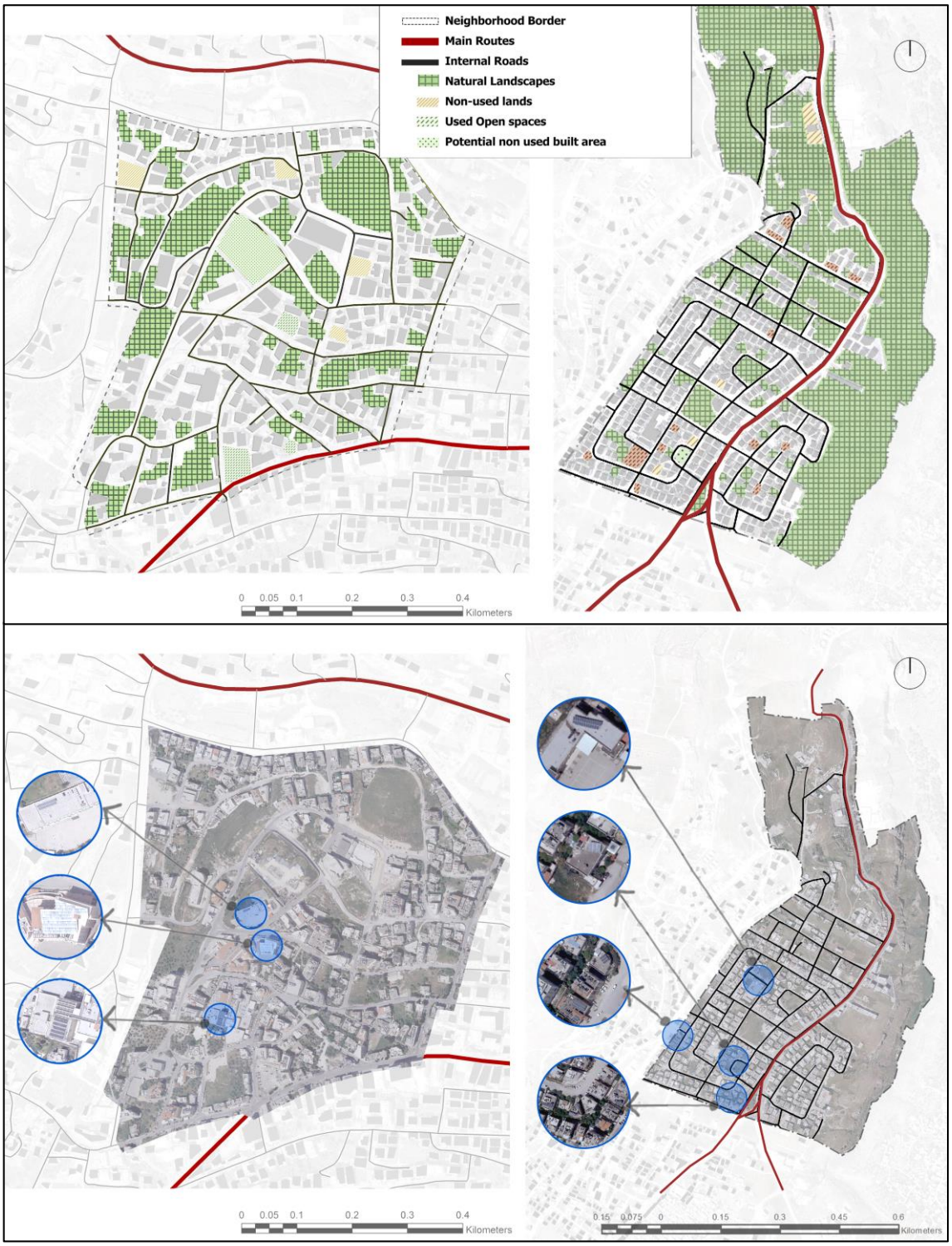
### 3.3 Green Infrastructure & Buildings

#### 3.3.1 Heat Island Reduction

This credit intends to reduce negative impacts on the microclimate and population. Measuring the impact of the heat urban island phenomenon is strictly connected to the ratio of built-up areas and the materials used for the construction. According to stored data in Geomolg, the neighborhood has an area of 419 donum, with 80 donum of empty area (20% of total land) (81). Al-Mreij includes multiple open areas, some of which are used as parking, and unbuilt spaces, depicted in Figure 8. In terms of building materials, roofs do not include any specific coatings for mitigating the impact. Instead, they are typically used for water tanks, satellite dishes, etc. The roofs of three public buildings include energy generation systems, such as solar panels, and four buildings of those in Al-Masaken, Figure 8. Streets barely include shading systems areas in Al-Mreij, and not all buildings are designed to cast shadow for passersby.

**Figure 8**

*Classification of open & unbuilt areas in Al-Mreij & Al-Masake, & Solar panel usage in Al-Mreij & Al-Masaken*




Note: Al-Mreij on the left, Al-Masaken on the right.

There is a clear observation that Al-Masaken has a significant amount of landscape area, either penetrated within the densely built area, or within the expansion towards the east and the north. The ratio is generally high compared to the type of open spaces in Al-Mreij neighborhood, Figure 8. The total area is around 895 donum, with 302 donum empty land (34% of total land). Most of the used open areas are either classified as cul-de-sacs, uncultivated areas, parking, or for informal usage, Figure A.40 Appendix A. Other than green areas, very few non-used open spaces are noticed. It is worth noting that some residential units in Al-Masaken have vegetation and green pavements at their entrances. This assures a better performance of mitigating urban heat island compared to Al-Mreij. In terms of buildings, there is no distinction to what's in Al-Mreij in terms of shading, roof coatings, and roof usage. According to fieldworks, more urban space was directed at the entrances or backyards of the divided lands compared with Al-Mreij; however, it is argued to be a result of the division and the size of streets.

### 3.3.2 Building Reuse

The conception of building reuse emerges with the intention of lowering the waste of material, energy, and infrastructure required for every construction. Reusing a building may refer to the approach of adaptive reuse of a building when it is used for a new function or may refer to the use of most building components when adapting renovations. This is generally more applicable in old neighborhoods.

Few abandoned and unutilized buildings are detected in the context of Nablus neighborhoods, this is obtained from different means: facade texture, facade colors, aging marks, massing of low-height buildings, opening sizes and styles, and some informal urban elements and systems as exposed HVAC systems, as in Figure A.41 Appendix A in the case of Al-Mreij. There is indeed a side of aesthetics in informalities caused by the contrast of abandoned buildings; however, renovation and retrofitting are required to create a better harmony with the neighborhood buildings. In the current practice of construction, owners of neglected buildings usually wait for a vendor to demolish the old building and build another, usually for commercial uses, or they keep the land vacant for future investments when the land price gets doubled or tripled. No abandoned buildings were detected in Al-Masaken neighborhood, as the buildings are generally new.

## 3.4 Governance

### 3.4.1 Community management of facilities

Communities can take part in sustainable development by managing, developing, or owning contributive communal facilities. Community facilities refer to community buildings, meeting places, and areas of public access that expand the economic, social, and environmental benefits of their community. Creating these facilities requires two steps: first, establishing a community development trust (CDT) that is an independent management body consisting of active community members; and second, partnerships with developers or local authorities that bring in significant financial, technical, and operational support for the construction of the facility.

Semi-implementations of these facilities are found in the old city of Nablus, under the theme of conservation and regeneration projects, and most of them are executed by external funds. On the other hand, the spread of community facilities is generally low across contemporary urban fabrics.

Similar to the majority of buildings in Nablus, there isn't a community center in Al-Mreij and Al-Masaken neighborhoods. Generally, none of the units are addressed for social or supportive purposes, except for schools addressing formal educational services. It is planned that a cultural center will be established in one of the open spaces in Al-Masaken. The project has not finished yet; therefore, the evaluation of its success in stimulating a better, more connected community is questioned.

## 3.5 Social and Economic Wellbeing

### 3.5.1 Economic Impact

The target of obtaining economic impact in neighborhoods stimulates improvements in several aspects. Identification of needs, economic conditions, skill gap analysis, and opportunities in local areas mark the initial steps for setting narratives for attractive and needed inward investments. This study requires data about employment and unemployment rates, economic activity rates, location of business types (existing and proposed), provision of facilities (services and social and economic infrastructure), and education levels of the population.

Both neighborhoods do not include any facility dedicated to job creation or training for boosting inward economic growth in the neighborhood. Most of the commercial use areas are privately owned, and there are limited regulations on their type, rate, necessity to local needs, or future economic planning of areas.

### 3.5.2 Demographic needs and priorities

Demographic needs and profiles, current and future trends, and priorities are essential to the success of spaces. Local authorities must have demographic profiles and census data that include several aspects: age, gender, religion, household size, values, tenure and change, population projections, headship rates, deprivation, employment (sectors, incomes, businesses, unemployment), education, skills and training, crime, and health. Those parameters form the general conceptions of housing, services, facilities, and amenities. Assessed services include community buildings, dwellings, leisure facilities, education services, health care facilities, communication services, and banks.

Part of the local demographic data is provided in the PCBS, and the latest information dates back to 2012 (82). Projection equations were applied in Table B.3 – Table B.6 Appendix B.

According to collected data, 88% of housing units in Al-Mreij Neighborhood are purchased. To measure income more precisely, employment rate is investigated. Almost 42.9% of total residents (1216/2835) are employed, which generally indicates average income of the neighborhood.

Ties between those social censuses and the current urban fabric of spaces are found to be missing, as no flexible facilities are allocated. Conventionally, assurance of the integration of those data happens in projects led by municipalities and local authorities. The local notion states that the majority of projects are led by the private sector and investors, which may not be part of a national plan.

According to collected data from the PCBS, 84% of housing units in Al-Masaken neighborhood are purchased. This assures the cultural preference of owning a property, rather than an indication of income of residents, which was noticed in Al-Mreij as well. To measure the average income of the neighborhood, almost 43.2% of total residents (1663/3850) are employed. The figures are not distinctive from those of Al-Mreij. Thus,

the estimation of the condition of the application of employment centers, economic investments, and national plans shows no difference. This may lead to the notion that the neighborhoods of the city are primarily distinguished according to their location. Their physical attributes, especially architectural massing and functions, attained from economic or socioeconomic resources, do not define a neighborhood from another.

### 3.5.3 Inclusive Design

Ensuring accessibility for all residents is essential to the livability of neighborhoods. Part of practicing social justice is to cover the needs of all genders, ages, and disabilities with the same efficiency. Community engagement and inclusivity usually come under a national plan for the vision of sustainable neighborhoods. This is transferred to the design implications of housing, transport methods, emergency strategies, and overall distribution of services and spaces.

Observations of inclusivity can be pointed out from urban forms, urban functions, urban elements, and urban mobility. Generally, local neighborhoods do not set distinguished places in terms of building typology. Diversity of space uses does not extend to more than residential, commercial, and administrative (very few), and within these uses little diversity is carried to allocate for diverse needs. Also, few strategies in transportation is set to reform the gap of accessibility. Urban elements like streetscape lack measures for people for disabilities, and rarely entrances of buildings have ramps.

The physical rigidity in applying inclusive measures observed in Al-Masaken matches that of Al-Mreij. However, the potential for their inclusion is high in Al-Masaken due to its wide streets and the existence of open spaces.

## 3.6 Land use and Ecology

### 3.6.1 Landscape

Landscapes are crucial to the introduction of how spaces are used and how they are communally perceived. A healthy and aesthetically pleasing landscape reflects the efforts in resource management, design, and maintenance. Several aspects, like planting design, site protection measures, the inclusion of native species, and the management of irrigation and water efficiency systems, shape the interest in preserving and strengthening

ecological value. This consideration extends to the scheme of existing and new landscapes.

Locally, the cultural landscape is part of the defining characteristics of Nablus city. Unfortunately, developments that took place in urban areas, including the two neighborhoods, were not keen on preserving features and components of landscapes. The city grew to be less green and more confiscated, with buildings that did not have enough landscape designs. Rarely is it possible to find residential complexes with landscapes for seating or social use, except for single-use typologies. In local regular construction, the remaining landscapes of land, if any, stay as neglected lands of projects that pile up waste. The management of natural resources is questioned in the local process of planning and managing existing neighborhoods. Moreover, there is a lack of diverse green infrastructure and used landscapes: wetlands, embankments, gardens, parks, etc.

The good aspect of the landscape in Al-Masaken is the diversity of vegetation conditions, location, density, type, and size. From the observations in Figure A.42 Appendix A, it is clear that the neighborhood includes different vegetation sizes that offer different impacts; shading, aesthetics, fencing, etc. Landscapes that are in good condition are mainly in open spaces and empty lands. On the other side, the landscape in a few open spaces is neglected and mismanaged.

The landscape in Al-Masaken is generally rich as it runs horizontally (green lands) and vertically (green belts of continuous trees). Mostly, the landscape is nurtured in areas that require healthy environments, such as schools. It can be said that the landscape is dense in the internal streets of the neighborhood significantly more than the condition of the landscape in external streets. The distinctive note in comparing the landscape to that of Al-Mreij, is the existing and potential influence of the landscape on the sustainability of the neighborhood. The existence of adequate and walkable streets near the landscape in Al-Masaken increases the level of adoption of green runs.

### 3.7 Integrated Development Strategy

#### 3.7.1 Integrated Development Strategy

Neighborhoods are one of the physical entities expressing the vision of governments and cities. Producing and retrofitting neighborhoods is more challenging than managing buildings. It requires a longer plan, a more complex arrangement, and more coordination between stakeholders. Hence, it is crucial to have an integration of synergies between participating parties and an integration between application phases.

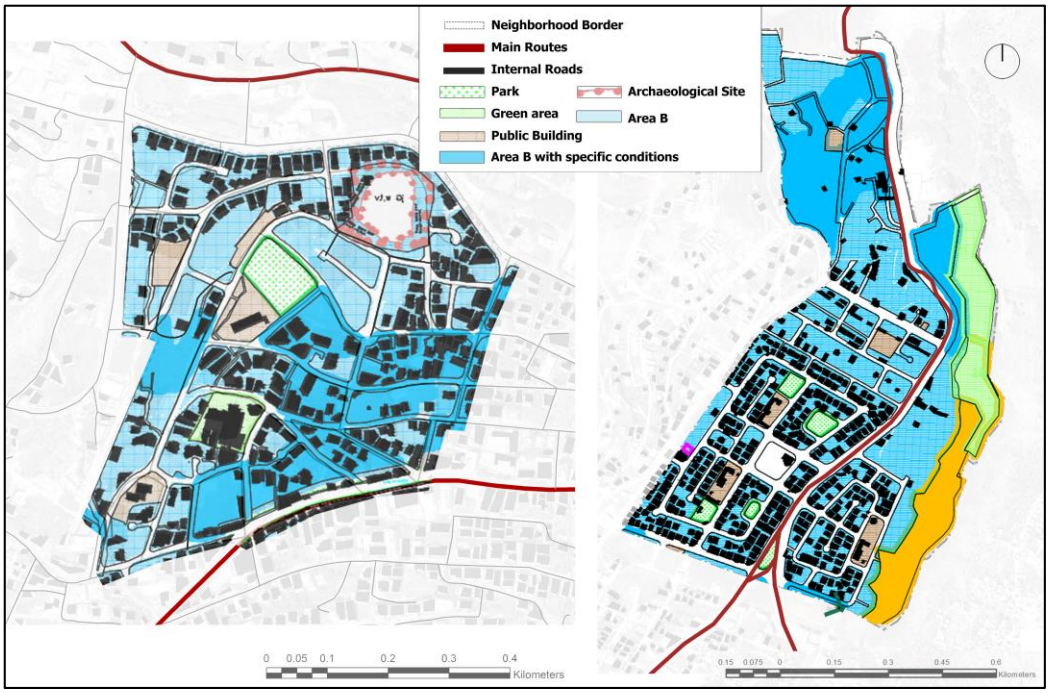
In the local context, there are huge issues with managing the formation of neighborhoods and their development. Locally, master plan manages the lands which manage the development and the use of lands. The majority of lands are privately owned, which favors the construction of commercial, high-rise buildings. The role of the municipality is to assign the land uses of the city lands and assign building permits and regulations based on a set of bylaws. However, it does not participate in supervising the development of neighborhoods by ensuring harmony and compatibility or studying the impact of projects on each other. In other words, the one who owns the land might not be the one who puts on the construction plans, nor the one who coordinates and supervises the to-be-lived output, nor the one who assigns the target users of space. The lack of neighborhood development management is evident in the fragmentation of construction as a process and as a product.

Though Nablus City has a land-use plan, violations of application exist in the spread of area uses and building uses, and the neighborhood of Al-Mreij is no exception. For instance, the area assigned as a park in Figure 9 was used as a stadium, and the project did not resume due to financial issues. The land is not even accessible today. In addition, the assigned green area is used as a government hospital. Based on the assigned master plan of the city, less violations are assigned to the Al-Masaken neighborhood. Areas that assign public buildings include the three schools in the neighborhood. Only one of the areas assigned as parks is a public park; the rest are green spaces that preserve their cultural landscape, except for one. The master plan of Figure 9 assigns one building for medium industrial use. In reality, many other buildings operate for industrial purposes, especially those that are on the low eastern periphery of the neighborhood. In contrast to Al-Mreij, some empty lands are located for public use. This refers to a better-integrated

development strategy where potential future uses of these lands can be studied and used in a managed flow.

**Figure 9**

*Extracted from Nablus Master plan 2013, Al-Mreij& Al-Masaken*




Note: Al-Mreij on the left, Al-Masaken on the right.

## 3.8 Livable Communities

### 3.8.1 Safe and Secure Community

Safety and security insurance relies on systems, strategies, and risk assessments. In the scale of buildings, the safety and security layout plan measures the allocation of adequate setbacks and the relation of their entrances to transportation routes for the safety of passengers from traffic. Emergency vehicular access routes, external evacuation routes, emergency care facilities, control centers, civil defense stations, and awareness centers are tangible spatial measures and systems for safety on the scale of neighborhoods.

Assessment of Crime Prevention Through Environmental Design (CPTED) bases the implementation of safety on factors of territoriality, natural surveillance, access control, and activity support. Territoriality focuses on the role of ownership, controlling user type and space usage duration, and scheduling, which parallels the factor of activity support.

Surveillance of spaces requires maximizing visibility through the placement of security men or people responsible for safeguarding property and the addition of night-time lighting. The use of gates, landscaping, fences, and checkpoints puts in place strategies for access control.

In the analysis of the local context, the general strategies for the safety of neighborhoods are missed. The neighborhood of Al-Mreij does not include any institution or facility for safety except healthcare facilities. Internal roads do not have service areas for drop-off in front of any building, and neither internal nor external roads are wide enough or dedicate specific lanes for emergencies. A couple of observed elements are visualized as potential threats, shown in Figure A.43 Appendix A. The use of corrugated sheet roofs (Zinco) for the indication of a nursery entrance is a violation of the bylaws of the designated area and a threat to the users in case of damage or deterioration. In addition, the majority of vacant lands are available for access, but with few precautions for safety. Substances and softscapes like rocks and disposable and indisposable waste might be risky for kids or elders walking down the sidewalks opposite these lands. Moreover, the availability of buildings-in-process of construction elevates the potential for suspicious actions at night, especially since they are kept open without restriction of access. Some temporal fences are observed in a couple of unfinished projects; however, their openings are not sealed, therefore threatening the protection of the property.

Safety in Al-Masaken is analysed based on two aspects; density and building types. The quietness resulting from the low density of the neighborhood can lead to a higher exposure to crime. Moreover, the industrial uses of some areas are reflected in the existence of many storage facilities, exposed materials, and unused buildings that might be robbed or used for informal purposes. Similar to Al-Mreij, buildings in construction do not allocate any measure of fencing for protection or management. Also, inadequate materials are used in some buildings of Al-Masaken; Figure A.43 Appendix A.

The location of Al-Masaken neighborhood exposes the area to political instability. The usual occupation forces towards refugee camps of Askar and Balata pass through Al-Masaken.

### 3.9 Innovating Practice

#### 3.9.1 Showcase of Regional & Cultural Practices

Cultural distinctions majorly contribute to distinguishing a region from another and a neighborhood from another. Since culture is shaped by space users, spaces can be iterated as long as there is a change in habits, norms, and lifestyles among the residents. A generalization of a one-way method incorporating culture restricts the growth of the community. While culture is initially a conception, the creation of sustainable neighborhoods suggests that cultural aspirations are reflected in architectural outputs, schemes of energy and water efficiency, and other systems. Though the society of Nablus is generally characterized by social cohesion, current urban spaces in Al-Mreij do not allocate specific culturally related services or facilities. The map of archeological and cultural landscapes of Figure A.44 Appendix A shows a location in Al-Mreij, however, it is not used for promoting inward investments such as tourism or any educational programs about the site.

Some repetitive tendencies in using spaces are noticed in Al-Mreij, which is visualized as being a result of culture, Figure A.45 Appendix A. First, there is a general lack of creativity in using balconies; balconies are used as open-air storage or for cleaning purposes. Roofs are rarely used for communal purposes; instead, they are used for storing water tanks. Also, the majority of buildings in Al-Mreij neighborhood are cladded with stone, despite their differences in construction time. This is a reflection of cultural restrictions in designing apartment buildings.

No archeological or cultural landscapes are located in Al-Masaken. Concerning the culture of using urban spaces, many informal recreational activities are noted in Al-Masaken, Figure A.45 Appendix A. During the two visits to the neighborhood, groups of children were witnessed using streets and open spaces for multiple types of play. Some were running after others, some were cycling, and others were studying on pavements. This indicates a culture of enjoying outdoor environments for some social age groups. The culture of using roofs, balconies, building materials, and other architectural attributes remains similar to those of Al-Mreij.

Cultural specificities affect the preferences and typolgoies of housing. Locally, people favor maximum privacy by the form of separate and family-owned constructions. This

can partially indicate the financial status of the resident. Usually, a family that owns the house is the one that owns the land, and the land price exceeds the price of an apartment in a residential building.

### 3.10 Environmental Quality

#### 3.10.1 Pollutants and Hazardous Substances

Construction materials affect the durability of the building, its performance, maintenance requirements, and its contribution to the environment. Evaluations of the adequacy of choosing building materials include manufacturing, processing, operation, and disposal. Materials constructing external and internal walls, foundation work, basement floors, slabs, and roofs, which should be tested and examined. The materials used in these components can contribute to diverse types of pollution, including indoor air pollution, odor nuisances, moisture damage, and mold if they are not the right choice.

In the local context of Nablus, there is a general lack of adequate and consistent inspections of the treatments and construction processes of buildings. Good practices are found for sure; however, the majority of implementations favor saving the cost of materials rather than studying the long-term effects of using a specific material. Determination of the level of accurate practices for material uses needs documentation of specifications, which are unrecorded overall.

While this credit is mainly about the pollution inside buildings, the impacts extend to the urban fabric. Generally, this affects the level of livability of the impacted buildings. The process of reforming those buildings might require specific coordination and might affect accessibility to impacted buildings for certain periods.

Architecture is generally similar, but not unified across the city of Nablus. The establishment of local buildings usually relies on similar materials (stones), facade sizes and types, texture, and construction processes. This leads to similar inconsistent inspections of the treatments, construction processes of buildings, and inaccurate practices for material uses. This is not necessarily generalized, as the quality of architectural massing and production is differeniated according to budget and design of areas. It is noted that Al-Masaken neighborhood have more industrial, and informal practices of using open lands and cultural landscapes, Figure A.46 Appendix A, This

leads to higher exposure of pollutants substances in urban and architectural schemes. The closeness of Al-Masaken to the industrial area might expose the area to air pollution. Visibility to the industrial area make the visual and environmental impact valid. However, this exposure is generally low due to the low height of existing buildings.

### 3.11 Economic Quality

#### 3.11.1 Lifecycle Cost (Building & Land cost)

Lifecycle cost is about ensuring comprehensive consideration of the operation and production costs of a project from the early planning stage until reaching the development stage.

Issues of high local land prices and high construction costs can be considered and managed under the credit of lifecycle costs. There is a general notion of high construction cost, due to local prices of materials and building logistics which is applied to the whole city, including the two neighborhoods.This follows the fact that building sector gains a significant value of local investment. This what makes the private sector in control of the urban output and the process of making places. Locally, the establishment of a building is layered on a maximized building area, but with little attention to efficiency for the public.

#### 3.11.2 Land use efficiency (Ownership)

Rising quality of life and population significantly mean more use of land. The conception of land use efficiency puts forth a strategy to overcome the resulting urban sprawl by emphasizing development efficacy and density. Efficient use of land is essential to maintaining sustainable urban developments that incorporate increased building land, minimized land use, and minimized space for streets. Land use efficiency manages lifecycle costs and puts control of production costs and building prices; otherwise, the focus of developments on specific urban areas increases land and building prices. Locally, there is a high prices of lands, and an excessive purchase of lands from individuals and from the private sectors. There is a lack of land use efficiency, which leads to rising limited uses of land as prevalent issue in the city’s neighborhoods, including Al-Mreij and Al-Masaken.

### 3.11.3 Environmental Risks

The objective of conducting an environmental risk analysis is to ensure the safety of residents, increase resilience, and lower the impact of risks environmentally, socially, and economically. Ensuring an inclusive environmental risk plan includes producing updated risk maps, classification of risks, compensation and protection measures, hazard level measures, and warning systems.

Both Al-Mreij and Al-Masaken neighborhoods, like other city neighborhoods, lack an environmental risk management plan and an emergency plan. This could have been implemented in the existence of emergency centers, the preparation of streets, or the design of buildings. Also, no emergency centers or police stations were noted in both neighborhoods, nor in any of their surrounding areas. The streets are wide enough; however, no specific lanes are dedicated to emergency lanes, and no assembly points are assigned.

## 3.12 Material and Waste Management

### 3.12.1 Minimize Cut and Fill in Earthworks

Sustainable applications of managing earthworks suggest designing with minimal impact on earthwork and adopting the reuse of excavated materials. While cut and fill might refer to excavation for piling and foundation work for construction projects, the topographic nature in the local context exaggerates within the portions of land excavation and earthwork to primarily make the land prepared for construction. When the topography is inconsistent, more excavations are required; therefore, more cost is needed for land preparation. A lot of lands have access from two levels, and this is what drives the excavation to continue to a high depth. Most of the designs in Nablus City are based on design proposals that work on emptying and flattening the whole land surfaces. They even use the whole surface area of the land, and the only restrictive constraints are the setbacks of 3 m, 4 m, and 5 m. A further issue is the transfer of the extracted earthworks. Some projects rely on transferring sand and rocks from the project site to another vacant land area or areas on the city peripherals.

In Al-Masaken, few buildings have access from two street levels. This notion, together with the condition of topography, lowers the exposure to more earthworks compared with

Al-Mreij. In Al-Mreij, much-extracted land is found with no coordination with the adjacent land at the upper level. Dealing with buildings setbacks in the two neighborhoods is no different from how buildings in the city are designed.

### 3.13 Environment Resources

#### 3.13.1 Rainwater Utilization

This conception is directed to measuring the status and the rate of rainwater utilization for indoor and outdoor uses. The management of rainwater is tied to physical implementations and regulations.

The current infrastructure of local pavements is not made of permeable material, which causes relative floods during rainy seasons. Since vacant lands are left with no boundaries to their surroundings, rainwater is observed mixing with unporous ground surfaces such as clay, which affects the walkability of residents during raining times. Strategies to benefit from direct and stored rainwater for rooftop greening are not adopted in any of the neighborhood buildings. On the scheme of benefiting from rainwater on a scale of domestic uses, apartment buildings are not benefiting from the collected water from the catchment roof surface. Gutters or any convenience system connecting buildings' roofs to ground levels lead water to the streets.

Urban elements in Al-Masaken as streetscape specifications and materials, urban fixtures, boundaries of open spaces, and gutter specifications and designs, are almost the same as those in Al-Mreij. Thus, the actions for rainwater utilization and management also match.

The following diagram illustrates how the assessment came up with an original model that is extracted from local needs. The assessment pointed out aspects that are related and important to the sustinability of local context. Table 9 shows an example of the aspects pointed during the assessment and added to the model after its initial establishment to gain its originality and locality. The rest of other points are found in Table B.7 – Table B.10 Appendix B.

**Table 9**

*Part of the Developed framework of Assessment indicators for possible Sustainable Palestinian neighborhoods (after assessment)*

| NSA Reference | Category | Assessed Indicators | Aspects for local measures |
|---|---|---|---|
| Assessed Indicators Taken from LEED ND | Smart Location and Linkage | A. Preferred Location | 1) Location within the city<br>2) Land use<br>3) Planning condition<br>4) Positive and negative attributes of location |
| | | B. Access to Quality Transit | 1)Flow of Transportation<br>2) Diversity of vehicle type<br>3) Location of Transit<br>4) Width of streets<br>5) Impact of street pattern on transit<br>6) Visibility<br>7) Road infrastructure<br>8) Impact of topography on the accessibility of transit |
| | | C. Housing and Job Proximity | 1) Job proximity<br>2) Job Activity<br>3) Job efficiency<br>4) Job accessibility<br>5) Job distribution<br>6) Job diversity & typology<br>7) Job sufficiency<br>8) Potential to surrounding areas |

# Chapter Four
# Discussions and Conclusions

The previous part quantitatively and qualitatively evaluated the inclusion of neighborhood sustainability parameters in the selected cases. Following the resulting notions, this part aims to quantify and list strengths, weaknesses of each investigated indicator. Despite the absence of various sustainable attributes, development tendencies and potentials existed in some characteristics of the cases' current condition. Section (4.1) provides detailed explanation of the findings analysis. Answers to the research questions are found in sections (4.1, 4.2, 4.3.4, 4.4).

## 4.1 SWOT Analysis of Findings

This section answers the questions of: *How far are the local neighborhoods from becoming sustainable? And What is the role of neighborhood location and their planning pattern on the measure of sustainability?* Structured as a SWOT analysis, qualitative and quantitative strengths and weaknesses of each neighborhood are pointed out. Table B.7 – Table B.10 Appendix B are divided according to the corresponding NSA reference. Each table provides the strengths (highlighted in green) and the weaknesses (highlighted in red) that are obtained under the indicators of each specific NSA tool.

Table B.7 Appendix B describes the assessment results of selected LEED indicators. Almost all of the indicators have strengths and have satisfied some aspects assigned in the LEED ND metric. In Al-Mreij, three indicators did not have any strengths scored; Access to civic and public spaces, and Building reuse. Al-Masaken achieved at least one strength per each indicator. The detailed count of strengths and weaknesses of LEED ND related measures is 31 strengths, and 29 weaknesses for Al-Mreij; and 30 strengths and 33 weaknesses for Al-Masaken.

Indicators of Community management of facilities, Economic impact, Inclusive design, and Landscape, show no strengths in Al-Mreij. Al-Masaken achieved at least one strength per each indicator, illustrated in Table B.8 Appendix B. The detailed count of strengths and weaknesses of BREEAM COMM related measures is 2 strengths, and 10 weaknesses for Al-Mreij; and 8 strengths and 7 weaknesses for Al-Masaken.

Indicator of Integrated development strategy scored no strengths in Al-Mreij, and Safe and secure community scored no strengths in Al-Masaken, illustrated in Table B.9 Appendix B. The detailed count of strengths and weaknesses of PCRS related measures is 2 strengths, and 12 weaknesses for Al-Mreij; and 3 strengths and 16 weaknesses for Al-Masaken.

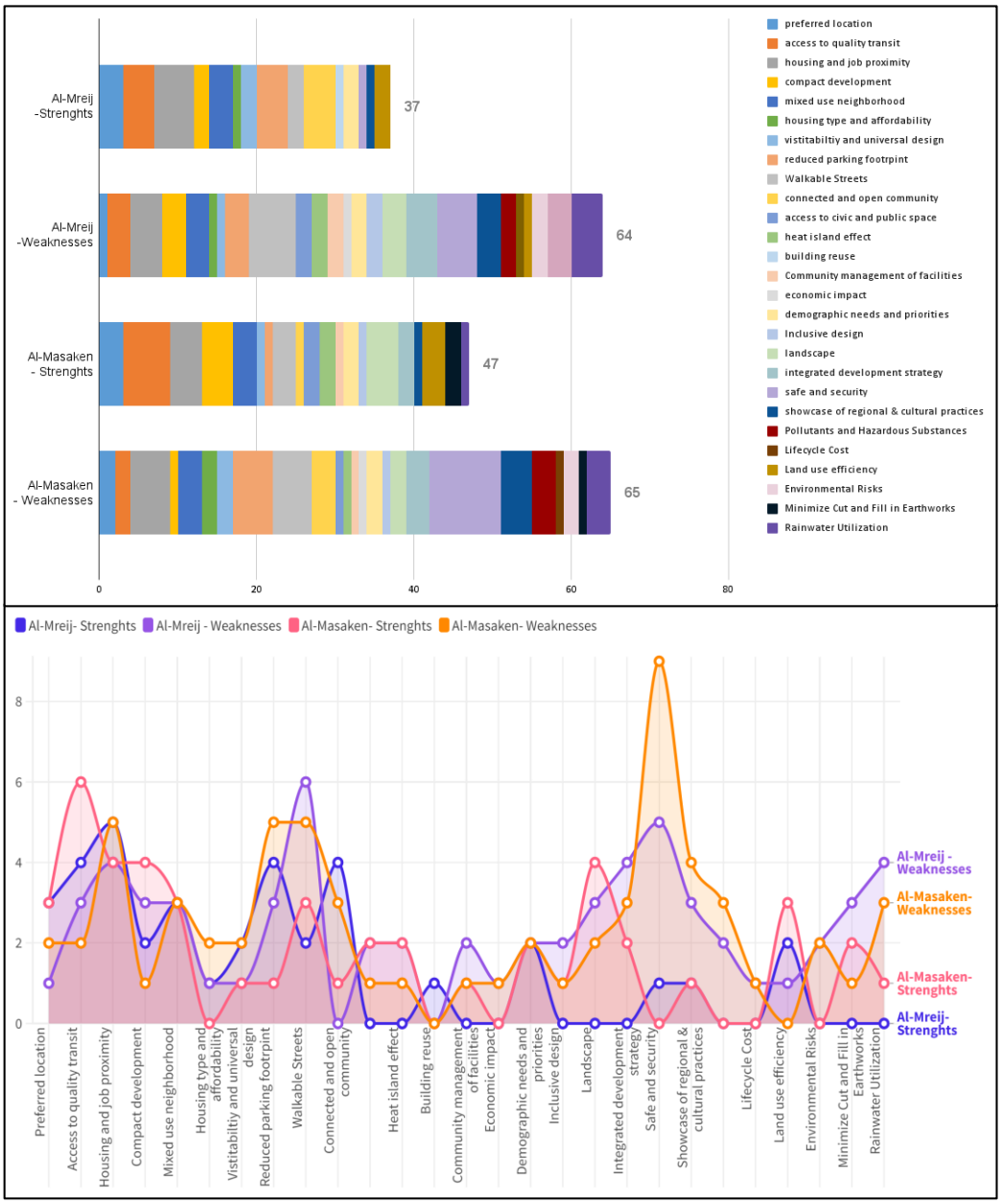
Pollutant and Hazardous materials, and Environmental risks scored no strengths in both neighborhoods, as shown in Table B.10 Appendix B. The detailed count of strengths and weaknesses of DGNB UD, GMD, AND CASBEE UD related measures is 2 strengths, and 13 weaknesses for Al-Mreij; and 6 strengths and 10 weaknesses for Al-Masaken.

Figure 10a illustrates an overview of the quantity of summarized results; their strengths and weaknesses. From the first observation, it can be understood that Al-Masaken is more sustainable than Al-Meij (47 strengths compared to 37). Thus it becomes crucial to have a comparative overview of the weight of each indicator assigned to each neighborhood Figure 10b and the reference from NSA tools to understand the result.

**Figure 10**

*Results of both neighborhoods*

*(a) Analyzing Weight (Quantity) of Strengths, Weaknesses of both neighborhoods. (b) Breakdown of indicators count in both neighborhoods, from Flourish*




One of the study's major findings is that the indicator of Housing and job proximity scored the highest count of strengths in Al-Mreij (5 points), and Access to quality transit scored the highest count of strengths in Al-Masaken (6 points). On the other hand, the indicator of Walkable streets scored the highest count of weaknesses in Al-Mreij (6 points), and Safe and secure community scored the highest weaknesses in Al-Masaken (9 points).

Here comes the emphasize that the neighborhoods location qualitatively and quantitatively impacts their sustainability measure; evident in the link of Housing and job proximity, and Safe and secure community indicators. The western location of Al-Mreij raised the potential for job opportunities, and the peripheral location of Al-Masaken raised its exposure for unsafety. Equally important is the pattern of planning, which influenced indicators of Walkable streets and Access to quality transit in both neighborhoods.

Since the majority of local counted strengths are dedicated to LEED ND in Table 10, this reflects a good base for local physical sustainability, however the social sustainability still requires to be covered and reflected upon it. Reflecting on weaknesses attained under other NSA tools, economic, ecological, and environmental elements are required to be better integrated into current urban configurations.

**Table 10**

*Relevancy of overall results of highest strengths and weaknesses to NSA tools*

| Related measures under | Higher Strengths | Higher Weaknesses |
|---|---|---|
| LEED ND | Al-Mreij (31pt) | Al-Masaken (33pt) |
| BREEAM COMM | Al-Masaken (8pt) | Al-Mreij (10pt) |
| PCRS | Al-Masaken (3pt) | Al-Masaken (16pt) |
| DGNB UD, GMD, CASBEE UD | Al-Masaken (6pt) | Al-Mreij (13pt) |

### 4.2 Distinction of the developed model , limitations & generalization possibilities

This section asnwers the question of *How can the local NSA model be distinguished from the accredited NSA tools?*

The established local model from the study is distinguished from other accredited NSA in its cultural, social, and physical characteristics. The notion that it was built from local challenges makes it responsive and extremely related to its context. Aspects added in Table 9 (notes in red) mark the disctinctions of the established model, in comparison with other NSA models.

The process by which the model was established has significantly led to the exposure of highlighting several gaps; gaps in the literature of selected NSA tools, gaps in the application of the methodological framework, and gaps addressed in the selected

neighborhoods (covered in section 4.3.4). The coverage of those gaps makes the study available for local and international contextualization.

The results from this study are in line with the results comparing the implementation of NSA tools at international level, which highlighted differences in both the quality and the quantity of sustainability and resilience aspects covered by different international NSA systems (87). These distinctions and similarities in the international NSA serve as a base towards enhancing these existing systems and establishing modified versions according to the local contexts and regional priorities, which was one of the aims from this study. The new proposed model can serve the future sustainability and resilience of neighborhoods taking into account the specificity of different contexts.

## 4.3 Researcher's opinion about the findings

### 4.3.1 Link to Literature of Local Planning & Literature of Neighborhood Planning

In comparison with literature, the two cases of the study do not comply with Perry's neighborhood unit model. Boundaries and size of Al-Masaken neighborhood exceed the buffer area of 400meters. Though boundaries of Al-Mreij make the neighborhood close to the size of perry's model, it does not consider the adequate distribution and structure of services. Generally, the association of neighborhoods in the city followed the infrastructure network, and not based on a fullfillment of elemenets of neigborhood units.

The planning of the two neighborhoods does not comply with what the local planning manual is currently providing. In both selected cases and in the Palestinian context as a whole, population density and building units are higher than what is estimated. Locally, a neighborhood contains a population of 4500-9999. In both neighbrhoods, population exceeds 10,000. The assigned mobility types are not achieved. The planning of service area is also higher than what the existing neighborhoods require.

The researcher finds that the sizes of neighborhoods across the city should have been more uniform. Uniform sizes means uniform planning; which refers to equal service types and sizes, equal accessibility measures, feasible interventions, etc. Further, the researcher understands the gradual increase in the size of neighborhoods and the impact on service distance and accessibility duration, yet she considers that in today's realm other passive solutions are shifting the priority in setting specific measures of time and distance. A lot

of services are now served remotely, and the quick transit modes as trams and metros with electrical engines can cut down the challenges of accessibility and travel impacts. She suggests that the size of neighborhood can still continue to grow, but with an assurance of compatible transit mode, and service type and size to comply with the expansion. Moreover, she considers that the expansion of neighborhood sizes is much more efficient than the management of multiple smaller neighborhoods.

### 4.3.2 Reflection of the number of strengths (attained sustainable aspects)

Speaking about the notion of having strengths, the discussion pointed out that the highest points attained in the study imply under LEED ND. The researcher puts an assumption that the description of indicators on the reference of LEED contributed to this result. The description of LEED ND was simpler, more concise and much more readable than other NSA, which made the assessment easier to follow. Other tools generally included many practical, and descriptive details which were already limited or constrained to the local context. This may have influenced the grasp of requirements, and therefore the evaluation of the assessment. Nevertheless, the researcher is aware that the attainment of strenghts is about local specificites. Satisfied indicators under LEED are potential points for what locally can be enhanced and assessed.

### 4.3.3 Attainment of Indicators

The researcher finds a gap between the qualitative and quantitative attainment of assessed indicators. Though the evaluations of some sustainable parameters were attained successfully numerically, there is a major gap in the qualitative implementations. For instance, a street can be wide enough but without incorporating any safety measures, walkable lanes, or landscape features. Another example, buffer areas for measuring job proximity cover the required number of buildings, but the buildings themselves miss the inclusion of flexible and mixed-use spaces and are not designed to offer responsive spaces to the changing patterns of employment. The result is a neighborhood that has many repetitive buildings that are superficial to stimulate job creation among the residents themselves or to bring in investments.

### 4.3.4 Gaps of Indicators

This section answers the question of *What are the gaps of NSA tools*? During establishing the methodological framework from NSA tools and using it for evaluating the local neighborhoods, some aspects were noticed either not covered in NSA tools, or not sufficiently covered in the NSA tools.The major three points to highlight are the lack of addressing human behavior, the lack of the addressing architectural (third) dimension in the NSA tools, and context specification.

A. Culture & Human behavior

The first note reflects on nighttime vs daytime urbanism as it is part of human activeness. This aspect was diversely addressed under each NSA tool. GMD & LEED ND mentions nighttime under the aspect of Energy modeling and management systems, stressing exterior lighting and nighttime ventilation settings. PCRS considers applying sufficient nighttime lighting for surveillance and safety, and BREEAM sets nighttime measures for noise pollution. CASBEE interestingly considers calculating daytime and night populations to estimate economic growth, and it puts forward the night lighting of facilities for crime prevention. DGNB extensively includes nighttime for broader measures. It puts on the experience of open spaces at both daytime and nighttime, morning and night ventilation for workplace comfort, noise and light emissions, night road traffic noise, and night use of some social and commercial infrastructure such as museums. However, none of them introduces the necessity of regulating public transportation at night, contextual and cultural nightlife, seasonal night activity, walkability and the pedestrian use of streets during the night in terms of social and physical aspects, and the consideration of nighttime for the beautification of neighborhoods (use of diverse light fixtures/ projecting light on elements, etc.).

Second, while this might not be the norm of all cities, the impact of informal urbanism on spaces is missing from the coverage of NSA tools. Street vending, and informal transport that may influence the transit, visit ability, and the use of spaces are not mentioned in any of the NSA metrics.

Third, emphasizing the beautification of neighborhoods in terms of supporting the use of materials is only found in CASBEE. Unified earth color for walls and roofs, harmonization of exterior materials in buildings, and pavements color are addressed under

culture and visual aspects in CASBEE. None of the other tools have body text of words like [textures], and [geometries] to set measures for the holistic, and synthesized perception of aesthetics. The word aesthetics was found used in PCRS and BREEAM under the description of green spaces and landscape, and for the description of workplace comfort environment under DGNB. Moreover, the perception of aesthetics differs in accord with age groups, which is poorly addressed.

Fourth, the relation of streets to society and environment. Though NSA tools speaks about streets in terms of accessibility, transit, and walkability, little is mentioned about the social use of streets, the relation of streets to others, and the hierarchy in their value and use. This is proven in the limited use of street types in the NSA, and the limitation of using distinctive identifications of street types. Lack of identification of their types imposes a lack of their relation to building frontages which affects walkability and human behavior. To justify, words like [boulevard] were only described in PCRS. Indicators like improved outdoor thermal comfort, and provision of amenities and facilities assign pedestrian walkways along boulevards. Moreover, the indicator of Neighborhood Connectivity assigns boulevards as a type of required street network. [Alley] was only used in LEED ND for circulation network and block frontages, and connectivity, where street to alley intersection is addressed. [Highway] is used in PCRS where 'green bridges' are assigned under/over highways to provide continuous habitat. DGNB brings in the need for traffic noise protection on highways. BREEAM counts highway drains for flood assessment and stresses the safety and level of air quality and noise in highways. It also raises the inclusion and access to highways under the indicator of inclusive design. [Ring road] was not used in any of the NSA tools.

B. Architectural (3-dimensional) aspects

References used for building the assessment local model lacked significant three-dimensional aspects.

The first aspect to discuss is topography. Topography generally influences the form, orientation, circulation, and sometimes functions of buildings. The influence and existence of topography are discussed in NSA tools in multiple ways. PCRS, mentions the topography as an environmental component that is assessed before the design process begins, and as a structure and component of habitat creation. It is also addressed under

neighborhood connectivity, where it is described as a restriction to pedestrian and vehicular connections. BREEAM introduces topography as one of the energy efficient measures recommended for reducing operational energy use for construction, and it is also introduced as a solution for protecting site from flood water. DGNB puts the topography as a characteristic that defines urban climate, landscape, eligibility for construction, and a parameter that assess potential environmental risks and influences the quality of natural water resources. None of the NSA tools indicate how topography influence quantitative measures in established indicators of walkability, accessibility, job proximity, and distribution of services. This aspect in particular was very critical in the local assessment, therefore, it was considered at the description of the results. In the local condition, topography is used as an urban strategy to build more floors (floors under the street level). This notion creates an opportunity for rethinking the urban design.

Second, privacy and visibility, or any social and cultural-related measures are not addressed in the orientation or form of buildings in NSA. Visibility of streets and spaces is solely addressed in PSRS as part of maintaining safety and security. The relation of fences & building boundaries to streets., and their level of visibility and other characteristics is poorly understood.

Third, the relation of buildings to each other is not sufficiently emphasized. There is a lack of addressing the connection of buildings (buildings of the same blocks or neighboring buildings) in terms of orientation, size, setback, uses, etc. It is understood that this work is a result of planning, and maybe this is why NSA tools do not intervene in these settings of buildings. However, the vision of a sustainable neighborhood should include connected buildings, not only streets. In the local context, there is irregularity in the shapes, layout, and size of buildings due to land segmentations. By addressing the relation of buildings to each other, the local issue of neglected spaces and inner spaces between the buildings is expected to be resolved.

C. Context Uniqueness: Resilience, Risk Management & Landownership of Neighborhoods

Amid the local specific condition of political instability, short and long-term impacts on neighborhoods are inevitable. Indeed, some words like [Refugee camps] and [Geopolitical divisions] will not be used in any of the NSA tools, since they are not

relevant to their existing context. However, it was vital to review the inclusion of words like [Resilience], [Emergency], and [Risks] in the selected NSA tools.

BREEAM COMM includes the provision of emergency plans in the event of flooding and it specifies the need for inclusive design for the setting of emergency strategies for all social categories. CASBEE specifies the necessity for emergency power and water storage and generators as safety and security operations under disaster prevention. PCRS designates emergency services vehicular access routes, marine approach or helipads, building emergency exit locations, external evacuation routes, and emergency refuge areas. The word [Resilience] was used in BREEAM COMM as a description of building design and materials handling floods. DGNB UD highlights the inclusion of emergency planning escape and emergency routes under the indicator of (Safety concepts) and (Resilience and adaptability).

Furthermore, types of risks and hazards are not presented uniformly in all the NSA. In other words, types of potential risks, and therefore their mitigation strategies, and the scope of their discussion differ from one reference to another. Among all NSA tools, DGNB UD puts on most classifications for the type of hazards. Under the indicator of (Resilience and adaptability) , DGNB UD presents strategies for mitigating accidents and weather-related blockages/restrictions of streets. BREEAM COMM and GMD solely expand strategies for floods, on the other hand, PCRS and LEED ND do not assign any type of risks except for what is related to waste and materials management and land contamination.

Speaking about landownership, little is explicitly shared about the role of land policy in the contribution to the sustainability of neighborhoods. While other countries, like the UK, allow private ownership of the lands, the issue of land ownership is critical to the local context and it has a huge impact on the resulting urban form. The local land prices are unstable and may rise significantly due to the surrounding investments.

Though the study points out gaps and measures that were not mentioned in NSA tools as topography, night urbanism, etc., this does not mean that the NSA references need to update their measures. Instead, this is an indication that locally these points need to be revised and studied to establish local sustainable neighborhoods. It also refer that data about these local measures need to be constantly updated and measured.

To undertake those gaps and weaknesses, some urban interventions and recommendations to improve local neighborhood sustainability are addressed. Assigning interventions relies on the importance, availability in literature and practice, and/or the feasibility of concepts. The interventions are discussed with more details in the last sub-section (4.4).

### 4.4 Recommendations and Possible Guidelines for Sustainable Neighborhoods in Nablus

After the analysis of the selected case and pointing out the strenghts and the weakness of both in terms of sustainability, the study suggests guidelines for the formation of sustainable neighborhoods. Figure A.47 Appendix A assigns some of the major guidelines that should be attained in neighborhoods to become sustainable. It puts an intervention on the elements of perry's neighborhood unit model. It assigns actions and parties responsible for each related point. Figure A.48 Appendix A puts on recommendations that can be used for the establishment of local sustaianble neighborhoods. The size of each indicator depends on its evaluation in the assessment.

To apply the suggested model, and answer the question of *How can the existing and new local neighborhoods become sustainable?*, the following section illustrates detailed actions and recommendations for new and existing neighborhoods to make them more sustainable.

1. Social & Economic sustainability: Acknowledging the importance of community facilities in each neighborhood. The role of communal centers is to work on two aspects: recreational, administrative, and managerial. These centers become a benchmark for neighborhood residents to meet and have fun and a place to resolve neighborhood-related issues or potential reforms in any aspect. They can take part in multiple ways, including boosting job creation opportunities for residents, supervising the safety and cleanliness of streets and spaces, and coming up with community-related programs. The establishment of those small-scale managerial bodies reduces pressure on the municipality to cover responsibilities of neighborhoods, increases the potential for reforms born from an in-depth understanding of what each neighborhood requires, and increases the involvement of society through their participation in authentic and highly contributive tasks. These centers can become the nucleus of society and the municipality. They are also an opportunity for landowners and neighborhood residents to work on and manage the

property. This will be more rewarding if a resident is a developer too. The creation of the facility strengthens and manages the possibility of extending future joint work between communities and developers. They can be the physical centers for adopting methodologies where neighborhoods learn from each other.

2. Governmental role: Importance of finding new narratives for land uses and development plans. The current mean of land ownership stands opposed to having a strategic governmental plan for envisaging spaces and livability. Land purchases have grown to be the strongest investment for residents. Prices for the majority of lands rise over time, and there is no plan for how or when they are used. Repurchasing lands from their owners is neither feasible nor logical; therefore, strategies for proper development should include encouraging investors, developers, and landowners to work on innovative project typologies that have sustainable impacts and fit within the local policy and plan for development. Integrated management that includes insurance of lifecycle costs and management of resources should become the norm for planning, construction, and operation. Workflow dedicated to supervising pollutants and hazardous substances, lifecycle costs, environmental risks, and other sustainable parameters that require documentation and consistent assessment must be integrated into the process of producing the neighborhoods of the future. In addition, an integrated development strategy is highly required in the local context. Once a vision is formulated, parties from the construction team, commissioning agent, potential building owners, operators, relevant regulatory authorities, and permit agencies should work in parallel (83). In the case of synergies, a list of successes, challenges, and processes is achieved as part of the management of the developments and as evidence of the sustainability of projects. Furthermore, an in-depth understanding of the local economic condition of the city assist in establish reasonable urban outputs. This matches the inclusive thinking about the aims and functions of architectural and urban developments.

3. Compactness, inclusivity & Diversity. Compactness in Nablus is merely achieved by the high density. The absence of diverse service chain, and the gap in equal accessibility affects the compactness, the inclusivity, and the quality of living in current neighborhoods. The tangible step for achieving this aim is to shift the priority of investing in one-type of commercial and residential typologies to the priority of experimenting new typologies that are socially and physically inclusive. The creation of multipurpose facilities in buildings is

crucial to allow diversity to be reflected, shared and exercised and to reform gaps in having services for all social groups. Otherwise, flexible architecture can target these aspects. It introduces the possibility of experimenting the location, ratio, and proximity of services. In the local context, wide scopes of flexible architecture may tackle urban design reforms by reimagining change of service type, service duration, massing, and impact on non-uniform urbanism. Innovation in flexible architectural paradigms and architectural typologies would respond to pointed-out and changing needs of the population. This supports the notion that cities cannot work as rigid incubators for the growing urbanism and the dynamic, constantly changing cultures and demographics. Furthermore, the temporary introduction of the flexible paradigms allows responsive and respective applications to the local shortage of vacant lands (84).

4. Equity & Accessibility. The local concept of compact communities must consider the obstacles of aging populations and other social categories facing decreased individual mobility. Neighborhoods that embed mix incomes, mix age groups, and mix land-uses, are areas that are diverse, vibrant, inclusive, affordable, efficient, and equitable. The municipality and the parties assigned for planning of the city should have a plan covering these attributes. Only after the plan is approved, and well-investigated, stakeholders and private parties can purchase the land and invest according to the assigned plan. Services must be at adequate distances to guarantee safe and efficient accessibility. Though the existing condition of planning services is not well distributed, the spontaneous urban form can facilitate the use of neglected spaces or unused frontages to fill the servicing gaps.

5. Density & Growth. It must be clear that compactness should not be mixed with urban crowdedness, where densities exceed the physical capabilities of the neighborhoods to sustain a healthy living environment. Hence keeping a regular assessment of the growth of density supports the long-term sustainability measure of the neighborhood to attain the balance. Part of this is to strategically set a plan for the future expansion of the population density, bearing that the urban container (the neighborhood boundary) remains as is. The increase in density might be handled by the concept of verticality (addition of floors), however, this solution requires simulative studies of how high can local buildings extend depending on visibility, views, densification limit, and environmental studies. Once these studies are approved and supported, the municipality can revise its regulations on building heights, and prepare permits for safe extensions. The building bylaw, especially (law 51), mentions that the addition of floors requires a certification for the structural ability of the building to handle the extension. So far, the latest update on the building regulations was conducted in 2011, and none of the buildings had any expansions after they were built and

used, except for family housing. The good aspect of having multiple densities in the neighborhood is that it supports the gradual densification over time and satisfies the residents' needs (12).

6. Raising awareness of the importance of adapting to sustainability. Stakeholders, including local authorities, municipalities, and residents, can be skeptical about the feasibility of adapting to sustainable developments. Implementations might be too ambitious, locally not fitting, demanding, or simply not convincing. Therefore, awareness is the key, along with developing rationales that put sustainability as the solution for challenges that every resident is facing. Sustainability should become a policy and a pool for evidence-based designs.

7. Tranist & Parking. To overcome limitations in occupancy and transit circulation, secondary public stations can be added to active streets, like Rafidea Street, which increase the access of quality transit in the neighborhood of Al-Mreij. This station may incorporate bus services, bicycle renting, etc., to create a multimodal transportation system. The station can have stops at each neighborhood and can be accessible within an adequate walking distance. The availability of secondary and main routes organizes the mobility of future public transport. In terms of enhancing means of mobility, biking can be adopted. Yafa Street, one of the previously mentioned active streets, follows a relatively flat and continuous topography. It is also wide enough to welcome future streetscape enhancements. Inclusion of safety measures must be a priority for reimagining streetscapes as well. Also, the creation of a sustainable community must bear in mind the pattern of parking areas and the aim of stimulating multimodal transit. When parking lots become abundant with free or subsidized parking at weekends or at non-peak times such as evenings and nighttime, the demand for them becomes high, and users become less motivated to look for any transportation alternatives. Therefore, shared parking strategies may make use of the parking lot at different times for different usage types. For areas using asphalt for parking lots, the ground materials of parking lots can be revised and filled with alternatives since the reduction of parking footprint is born from the environmental aspect of limiting impervious surfaces. Third, the use of multi-story parking limits the parking footprint on the ground and reduces land consumption (85). This can be adapted to existing off-street parking at open spaces. Fourth, shared-use vehicles encourage the efficiency of transit usage.

8. Job creation. Part of reforming credit for job proximity is to encourage jobs for residents in the neighborhood. The practicality of this strategy is to either promote remote work and assign spaces in residential components or otherwise support residents to come up with new job opportunities at the location of open spaces. Another strategy is to encourage residents of the adjacent neighborhoods, who can access Al-Mreij neighborhood within 800 meters at maximum, to invest in the commercial uses. Job creation must look at the short- and long-term schemes. Proposals for development should set targets for both existing and future economic activity and productivity. Moreover, potential employment and training opportunities for neighborhood residents can be obtained through different means. First, jobs can be directed to projects reforming existing infrastructure and facilities. Implementation of these provisions requires a regular review of changing needs, consultation and assessment of needs required for the community, and a genuine interest in integrating the community's vision of space and experience. Second, proposed new developments or projects that bring in investments in specific locations may stimulate temporary and permanent jobs, part-time and full-time jobs, and apprenticeships (86). In the case of highlighting preserving landscapes as a necessity, a qualified ecologist can be assigned to maximize the environmental, social, and economic efficiency of designed or preserved landscapes (86). Third, promoting inward investments can happen in supporting tourism, or any educational programs that acknowledge archeological urban sites.

9. Environment. Mitigating urban heat islands can be achieved through several strategies. One, the use of existing and installed vegetation can provide shade for paved areas or can be used for vegetated roofs. Roofs can also include features such as skylights, whose transparency lowers the impact of built surfaces. A high-reflectance roof and incorporated through coatings or bright materials minimizes the impact on buildings. Also, the use of energy generation systems such as solar thermal collectors and photovoltaics can be integrated into shading devices of structures. Moreover, the use of an open-grid pavement system is a good alternative to asphalt and therefore is supported for landscape design. Furthermore, the preservation of open spaces and green spaces lowers the ratio of built-up areas, therefore lowering the environmental impact caused by buildings.

10. Resources: Rainwater collection systems and storage tanks can be integrated and used communally. For non-potable uses, rainwater can be used to reduces the use of potable water. Slopes of Al-Mreij can be seized to let rain flow towards a storm water pool or a retarding basin. Parking areas can use a crushed-stone-type reservoir under the surface material to allow the management of storing rainwater before it gets to the third and deeper ground layers.
11. Landscape and ecology. Plenty of reformation projects on existing neighborhoods need to incorporate projects of plantation and importing natural and artificial vegetation. To narrow down the need for future reformation, cities of today should learn how to value and preserve the existing cultural landscape. Preserving landscape is a concept for authenticity and livability that many local projects can adopt. If it becomes a building constraints for the designing and planning of the urban and building schemes, the reality of how the neighborhoods look and operate will significantly improve.
12. Affordability. Affordable housing in Nablus can be integrated as a policy for reducing the prices of conventional housing for certain users. Future uses of small-sized buildings can be targeted toward affordable housing rather than segmenting a large building that requires much more time and cost for construction, operation, and maintenance. The vertical expansion of single houses can consider offering affordable housing. The government can stimulate this as a policy to encourage the owners of the properties through subsidies and other facilitations.
13. Walkability. One of the recommendations to create walkable, sustainable neighborhoods is to have the new buildings connected to sidewalks and with entry to a plaza or a park of 15m in depth. Localizing plazas can bring in specific innovations on stimulating space sustainability. Moreover, walkability is enhanced with the inclusion of human scale neighborhoods. An example is about providing sense of enclosures, where public squares and plazas become public rooms.
14. Safety and security. The scale of buildings and neighborhoods should be part of a strategy for safety. Building typologies like small-scale clinics, emergency centers, etc. should be better integrated. Reforms at the scale of streetscape are crucial. For instance, the radical difference in levels must, at least, have fences or protecting

parapets to mitigate the high risk of safety. Consistent assessment of safety of walkability is crucial.

15. Neighborhoods formation. Sizes, outlines, and boundaries existing neighborhoods influenced the scope of the study and of course the results. Generally, block sizes should be limited to be better injected with urban needed measures.

All in all, the study came up with an assessment model for obtaining sustainable neighborhoods. It took the case of two neighborhoods in Nablus city, and developed findings related to the city's context. Structure, models, and renders of the two neighborhoods were compared (Figure A.49-A56 Appendix A). The assessment model can be generalized at the scale of other neighborhoods and other Palestinian cities, with baring contextual socio-economic and physical differences. The application of the model opts to form guidelines that are the reference for obtaining sustainable neighborhoods. The different priorities in each area develop different usage and different specifications of those guidelines, however, it remains as the basis. The limitations of model application include issues on the scale of individuals and governments. Such include financial limitations and instabilities, lack of capacities, existing infrastructure, private ownership of lands, etc. These limitations can be covered through governmental plans and policies, and integration of the study's model and findings.

# List of Abbreviations

| Abbreviation | Meaning |
|---|---|
| NSA | Neighborhood Sustainability Assessment |
| PHGBC | Palestinian Higher Green Building Council |
| TND | Traditional Neighborhood Development |
| TOD | Tranist-Oriented Development |
| LEED ND | Leadership in Energy and Environment Design -Neighborhood Development |
| PCRS | Pearl Community Rating System |
| BREEAM COMM | Building Research Establishment Environment. Assessment Method (for) Communities |
| CASBEE UD | Comprehensive Asses. System for Built Environment Efficiency Urban Development |
| GMD | Green Mark for Districts |
| DGNB ND | Deutsche Gesellschaft für Nachhaltiges Bauen-Neubau Stadtquartiere/ New Urban Development |
| ES Lab | Environmental Systems Lab |
| AAP | College of Arts,Architecture, and Planning |
| CEE | Civil and Environmental Engineering |
| OSM | Open Street Map |
| ADP | Amenity Demand Profile |
| CPTED | Crime Prevention Through Environmental Design |

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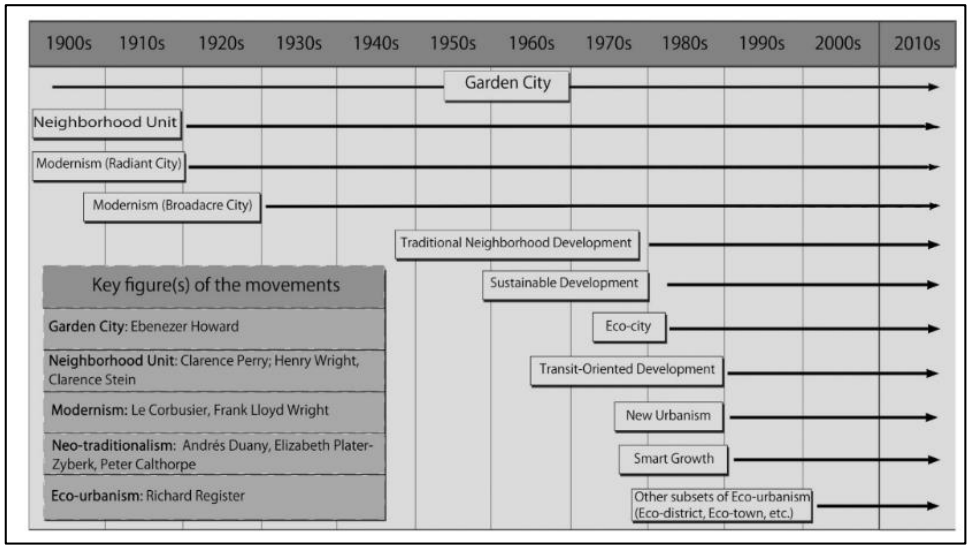
# Appendices

## Appendix A

## Figures

**Figure A.1**

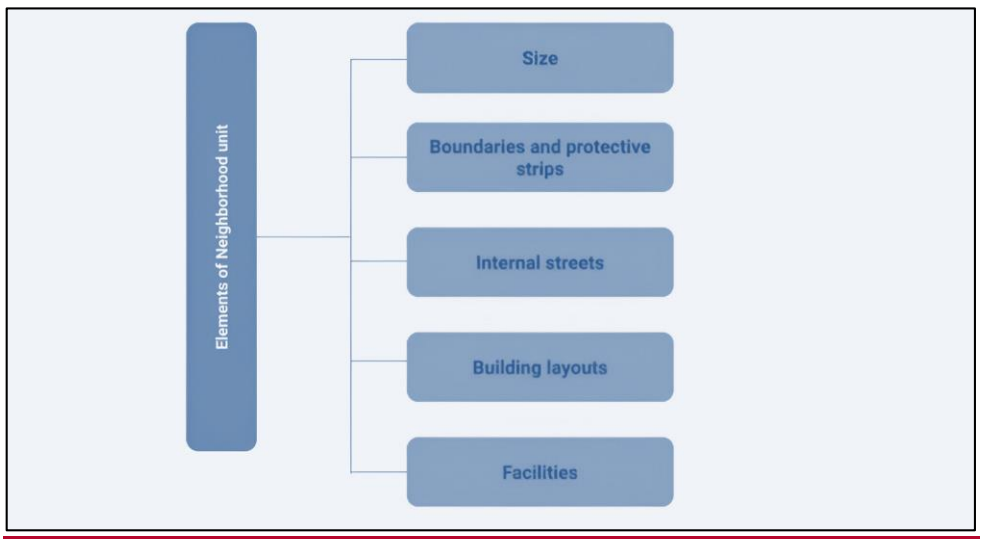
*The evolving agenda and key figures of the studied movements*




Note: (Sharifi A. From Garden City to Eco-urbanism: The quest for sustainable neighborhood development. Sustain Cities Soc [Internet]. 2016;20(1):1–16. Available from: http://dx.doi.org/10.1016/j.

**Figure A.2**

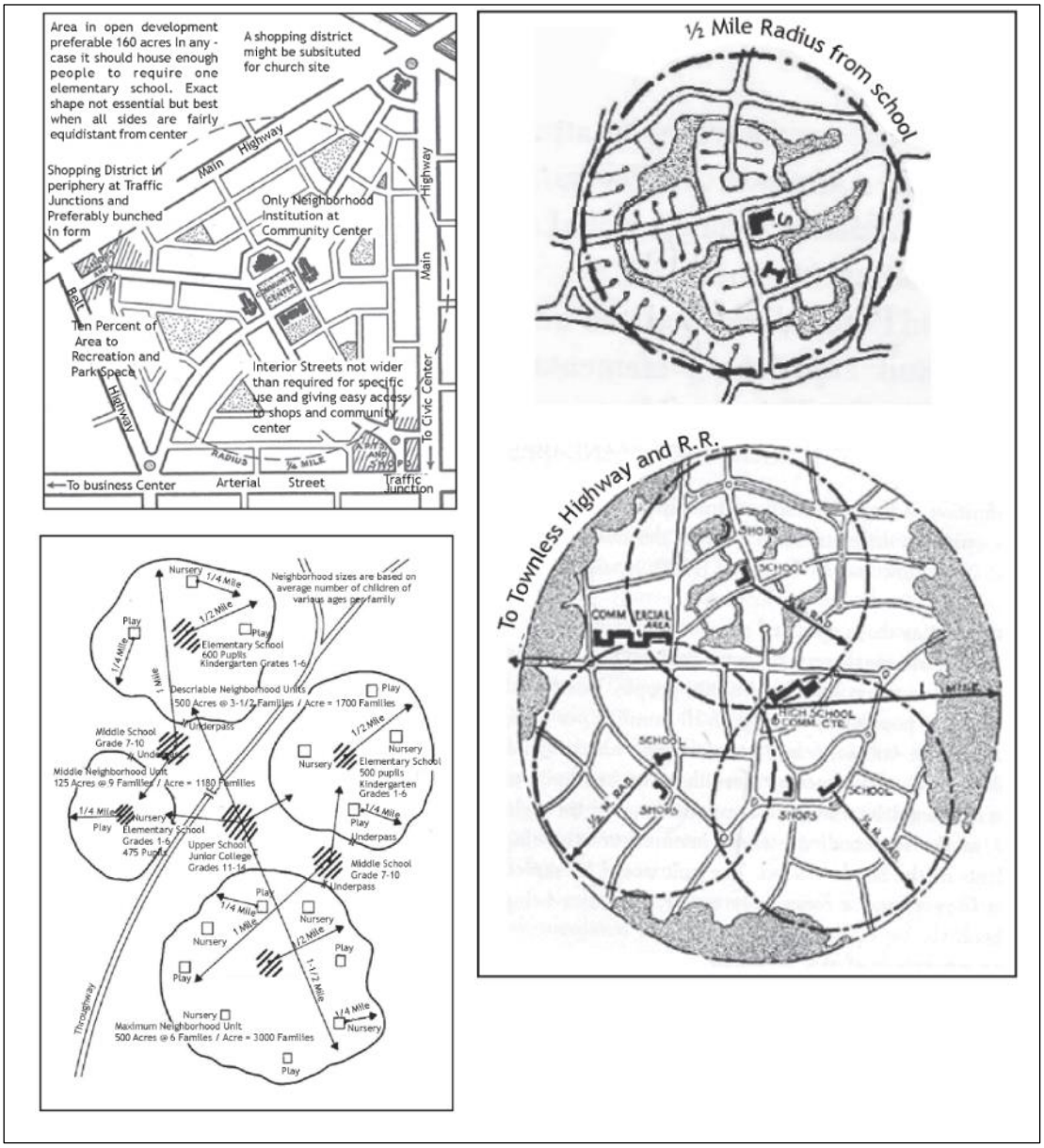
*Elements of neighborhood unit*




Note: (Shaikh H, Mahalle S, Sahu S. Towards creating an Ideal Neighbourhood. Int Res J Eng Technol [Internet]. 2019;6(3):6979–82. Available from: www.irjet.net).

**Figure A.3**

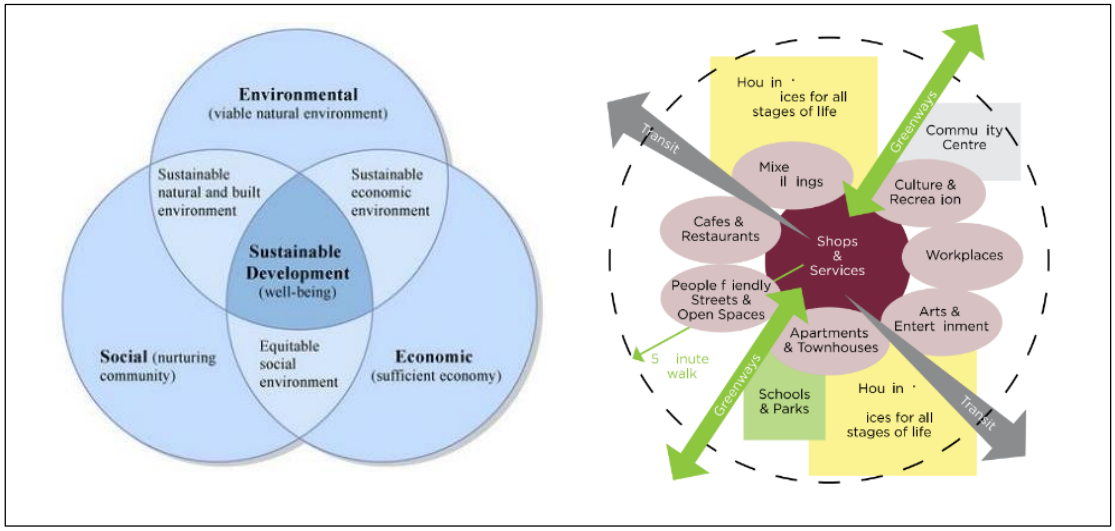
*Neighborhood unit model iterations*




Note: (first on left) by Perry,(last on left) by Engelhardt, and (on right) by Clarence Stein. (Sharifi A. From Garden City to Eco-urbanism: The quest for sustainable neighborhood development. Sustain Cities Soc [Internet]. 2016;20(1):1–16. Available from: http://dx.doi.org/10.1016/j.scs.2015.09.002).

**Figure A.4**

*Triple Bottom Line for Sustainability Development (left) & Design Principles of Sustainable Neighborhoods (right)*




Note: from (88) Modus planning, design and engagement inc. [Internet]. Available from: https://www.thinkmodus.ca/services.

**Figure A.5**

*Flow of ideas from chapter 1 to chapter 2*

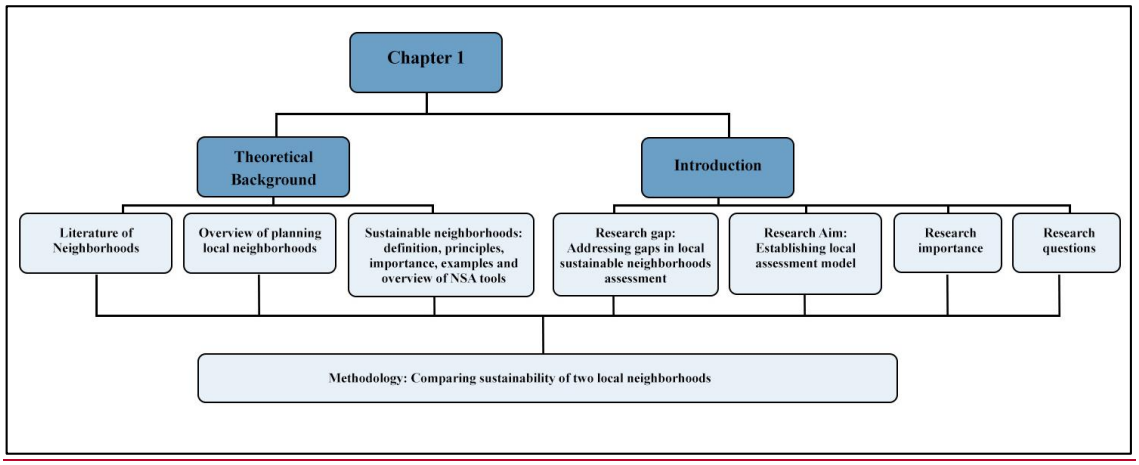


**Figure A.6**

*Thesis methodological framework.*

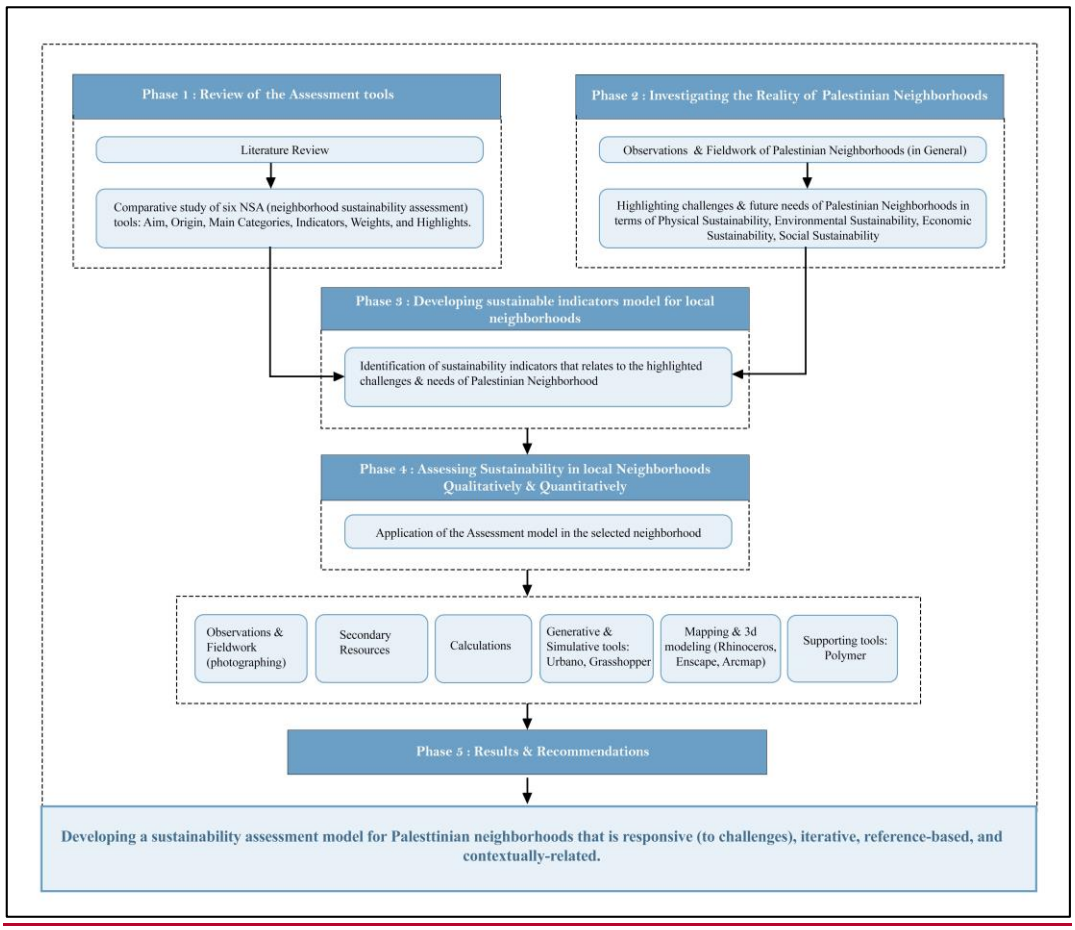



**Figure A.7**

*Relevancy of NSA tools to Palestinian Neighborhoods Need*

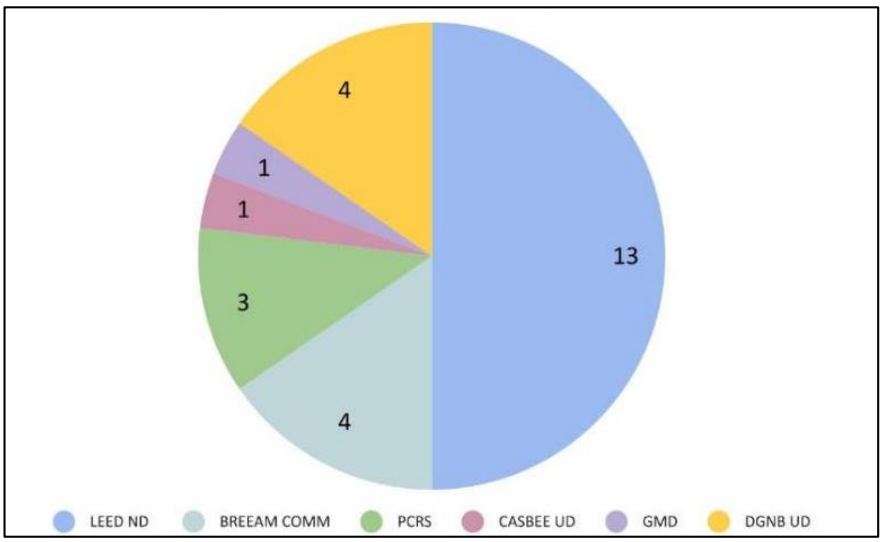


**Figure A.8**

*Sankey diagram showing the workflow of used methods per indicator, from Flourish.*

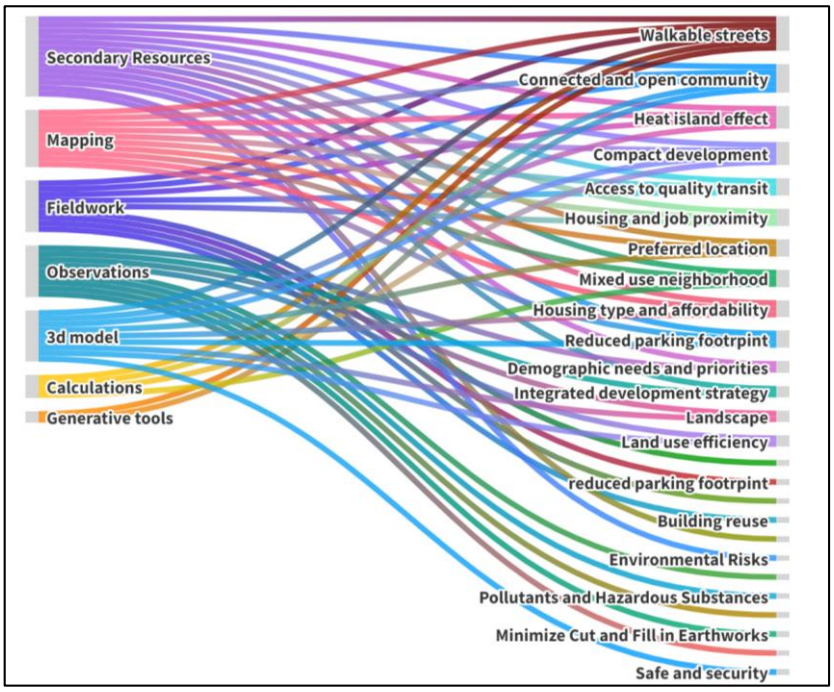



**Figure A.9**

*Methods associated to phase 3*

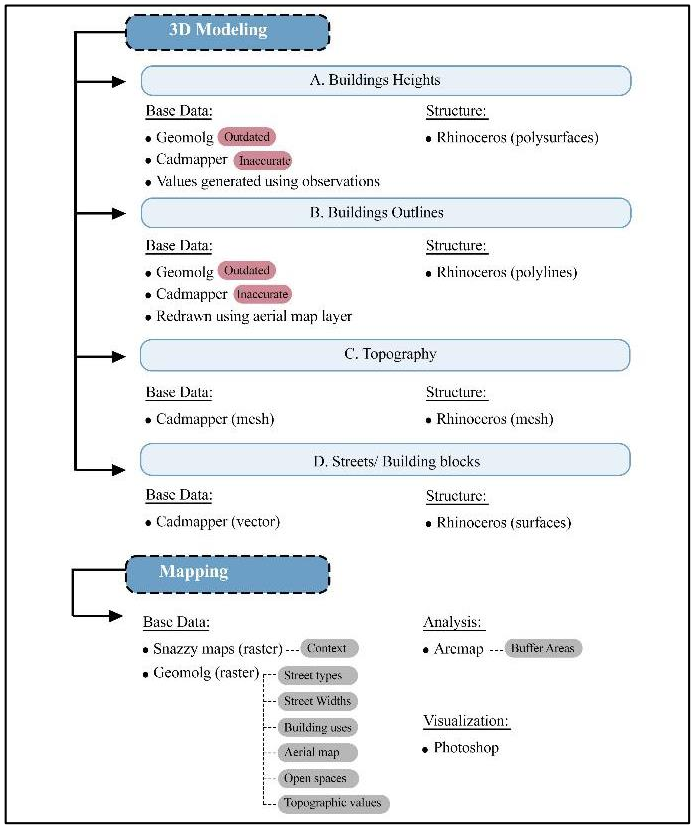
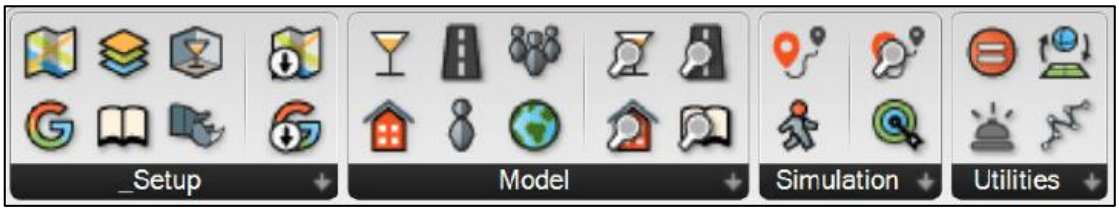


**Figure A.10**

*Toolbox of Urbano plugin*




Note: *From: https://www.urbano.io/.*

**Figure A.11**

*Script in Urbano*

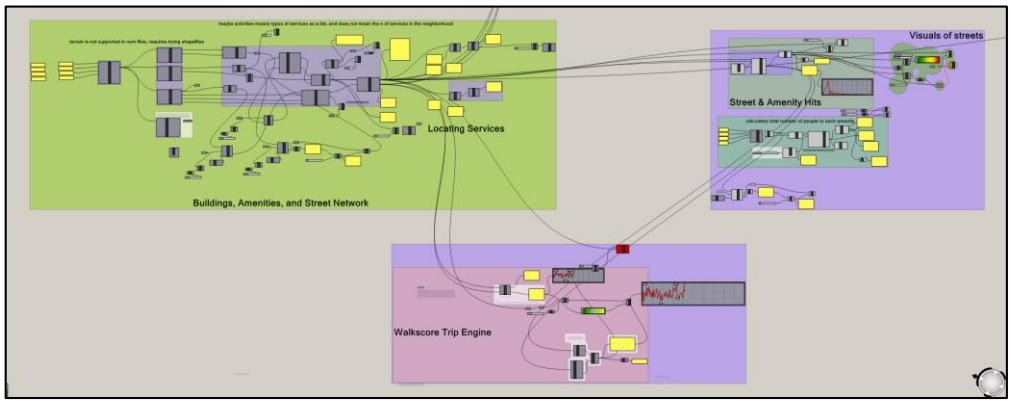



**Figure A.12**

*Script for measuring street hits & walkscore*

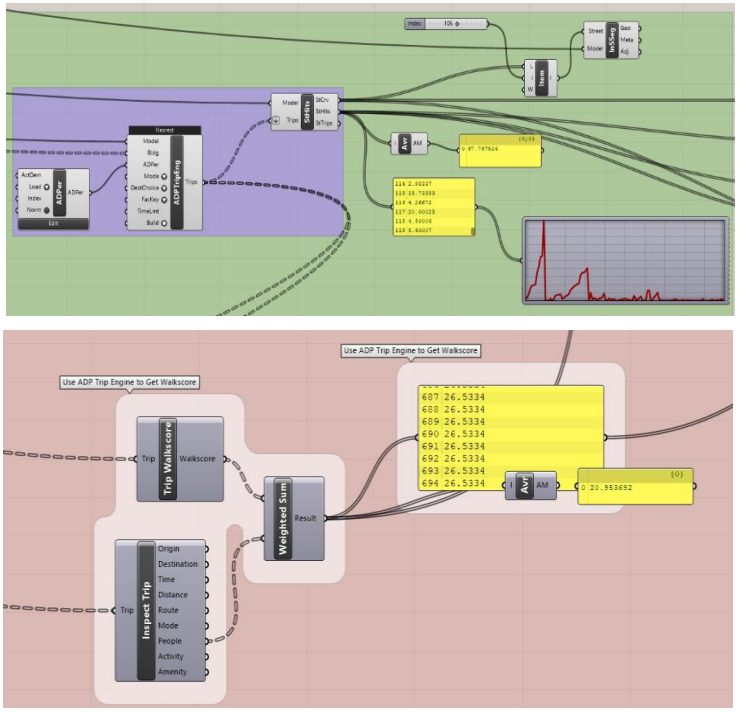


**Figure A.13**

*Reference about walk score results*

| Walk Score® | Description |
|---|---|
| 90–100 | **Walker's Paradise**<br>Daily errands do not require a car. |
| 70–89 | **Very Walkable**<br>Most errands can be accomplished on foot. |
| 50–69 | **Somewhat Walkable**<br>Some errands can be accomplished on foot. |
| 25–49 | **Car-Dependent**<br>Most errands require a car. |
| 0–24 | **Car-Dependent**<br>Almost all errands require a car. |

Note: From: Timur Dogan | Cornell AAP [Internet]. [cited 2024 Jan 15]. Available from: https://aap.cornell.edu/people/timur-dogan.

**Figure A.14**

*ADP trip Engine component & its parameters*

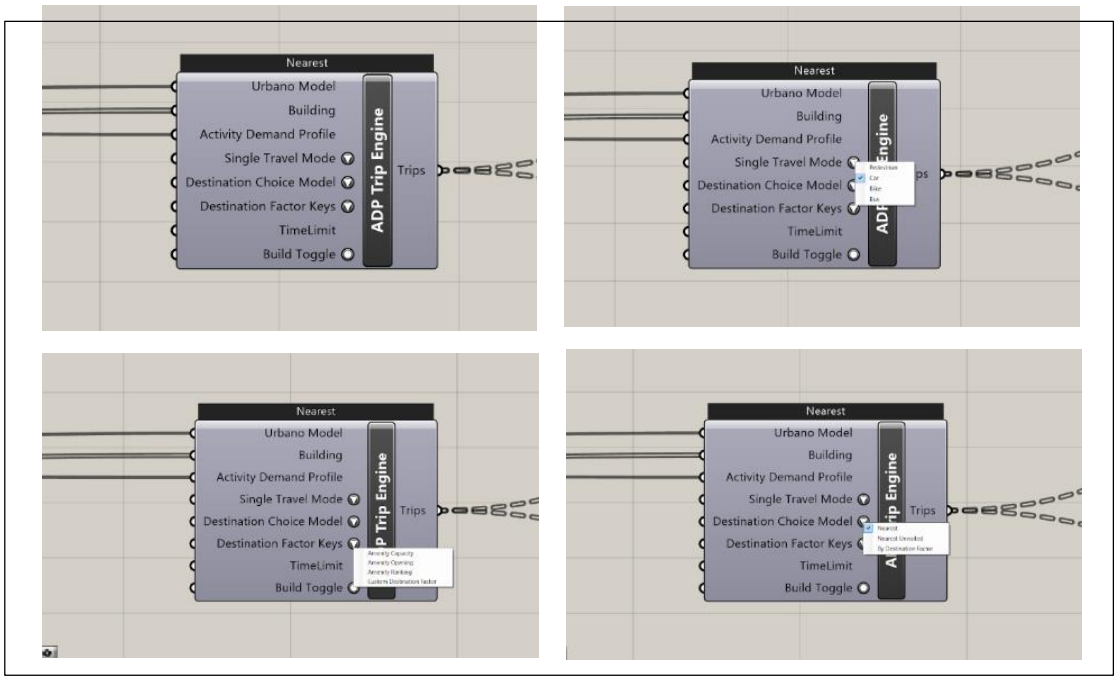


**Figure A.15**

*Activity Demand Profile /Persona component*

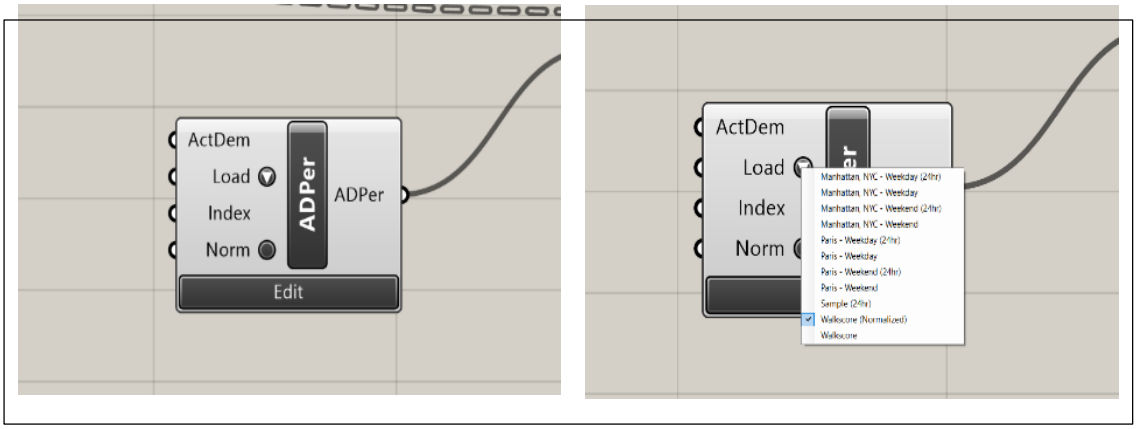
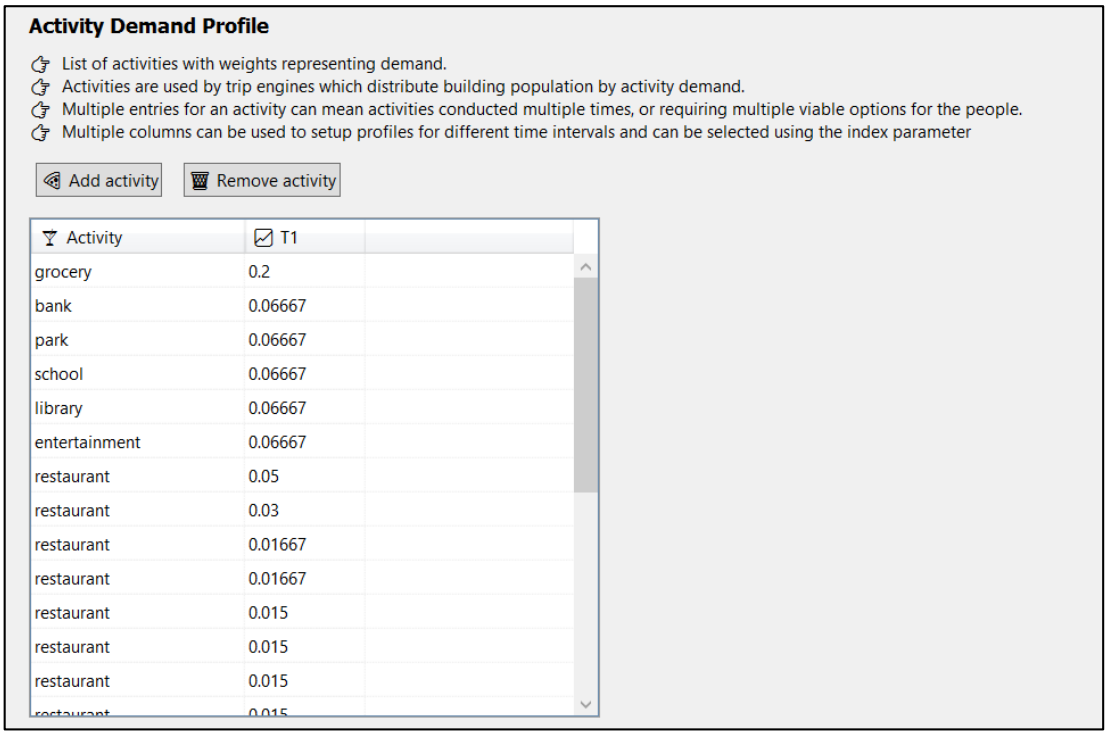



**Figure A.16**

*ADP Editor*




Note: From ADP component in Grasshopper interface.

**Figure A.17**

*Before & After editing data stored in OpenstreetMap*

**Figure A.18**

*Divisions of Areas of Al-Masaken*

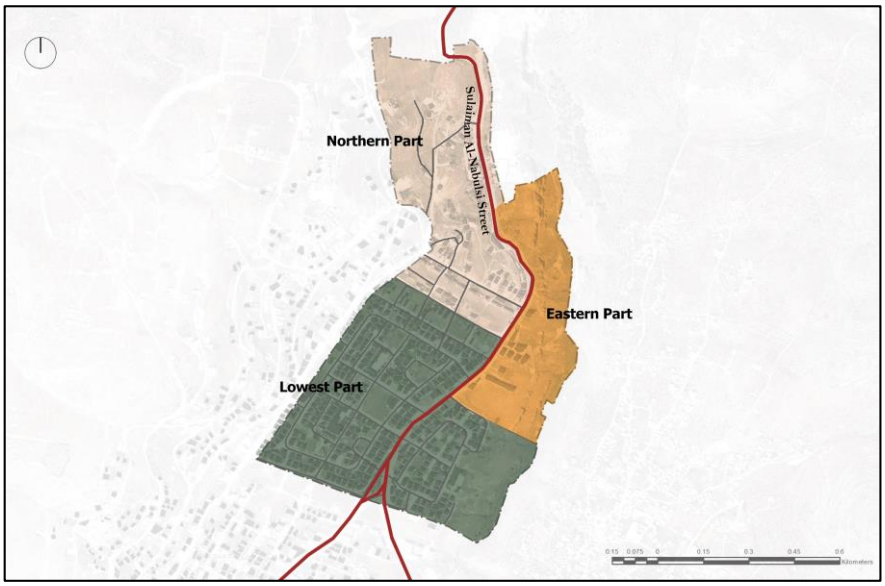



**Figure A.19**

*Featuring Active streets in Al-Mreij*


Note: (a) Rafidea, (b) Yaffa, (c) Tounis, (d) Faisal (respectively). Featuring Active streets in Al-Masaken: Ibrahim Al-Dweikat, Connecting street, Sulaiman Al-Nabulsi (respectively).

**Figure A.20**

*Accessibility to Active Street in Al-Mreij*

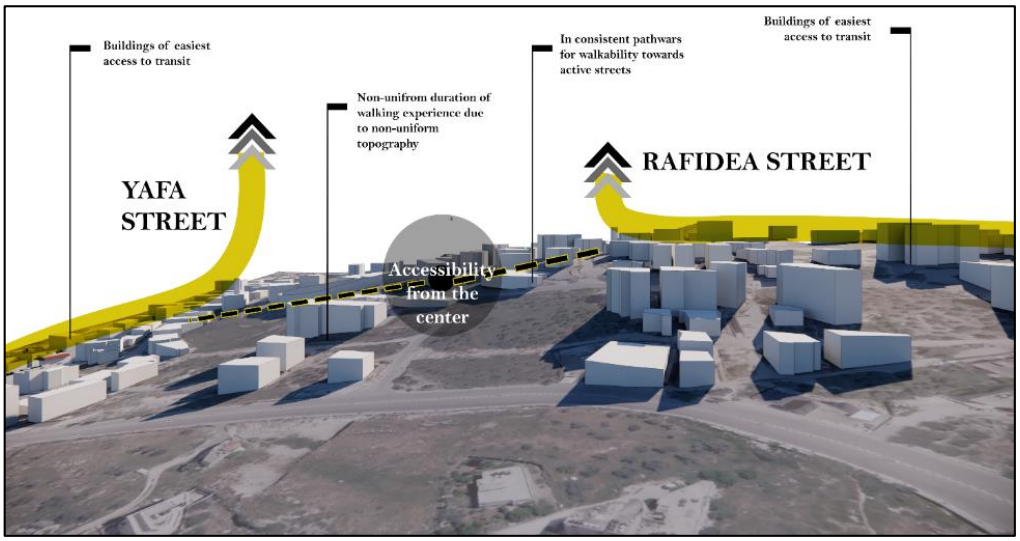



**Figure A.21**

*Road infrastructure in Al-Masaken*

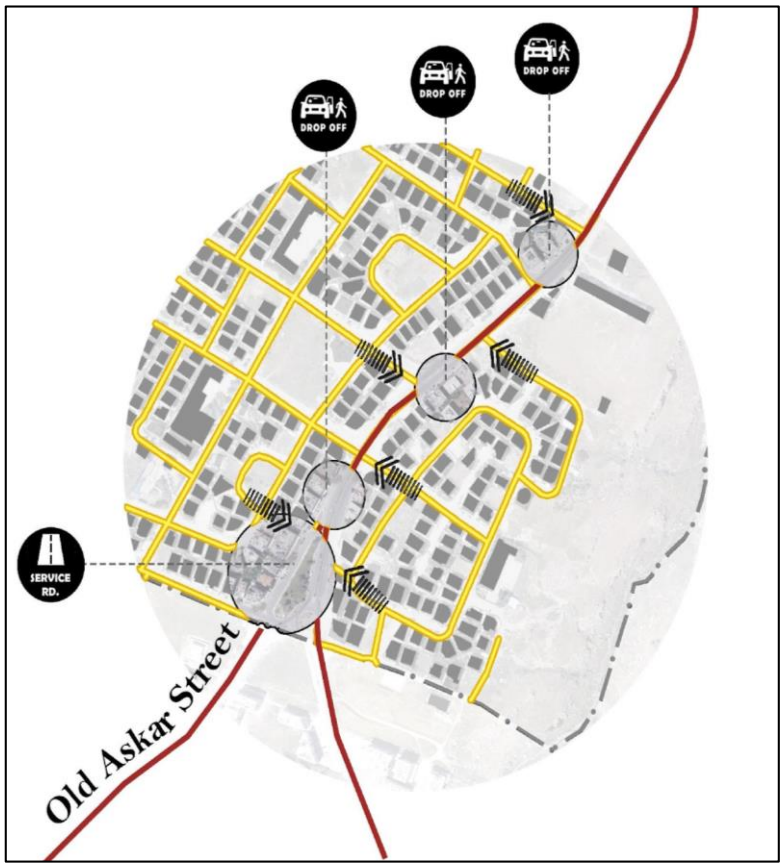
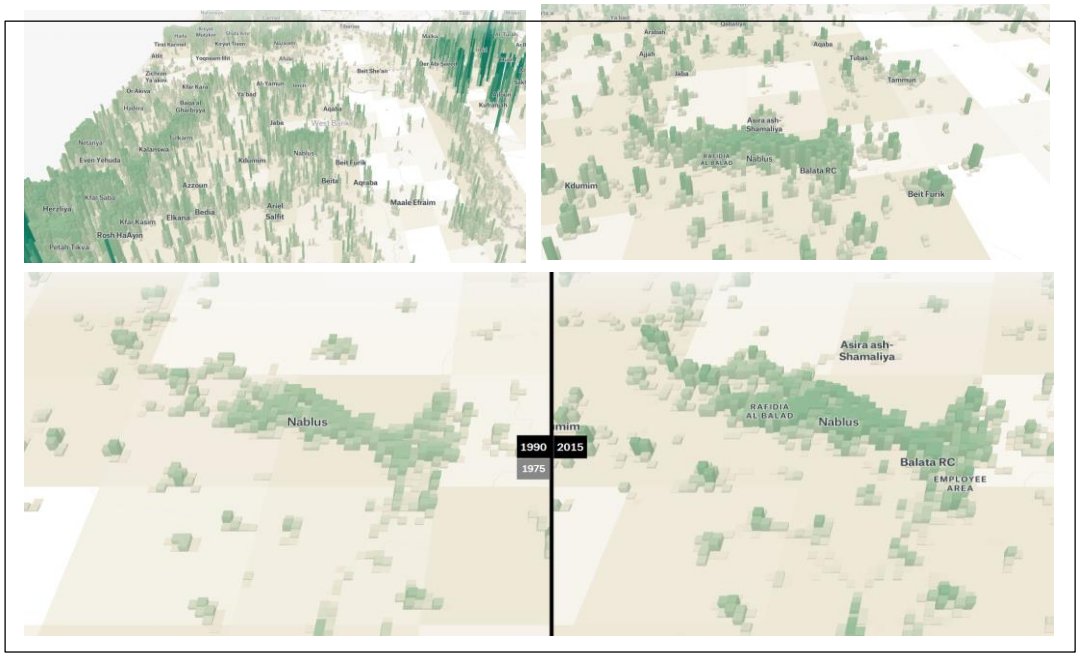


**Figure A.22**

*Means of Job Opportunities: mixed-use buildings (left), single shops (right)*

**Figure A.23**

*Mapping Human Terrain in 3D in Nablus*




Note: via the Pudding Website: https://pudding.cool/2018/10/city_3d/.

**Figure A.24**

*Measuring samples of density in Al-Mreij & Al-Masaken*

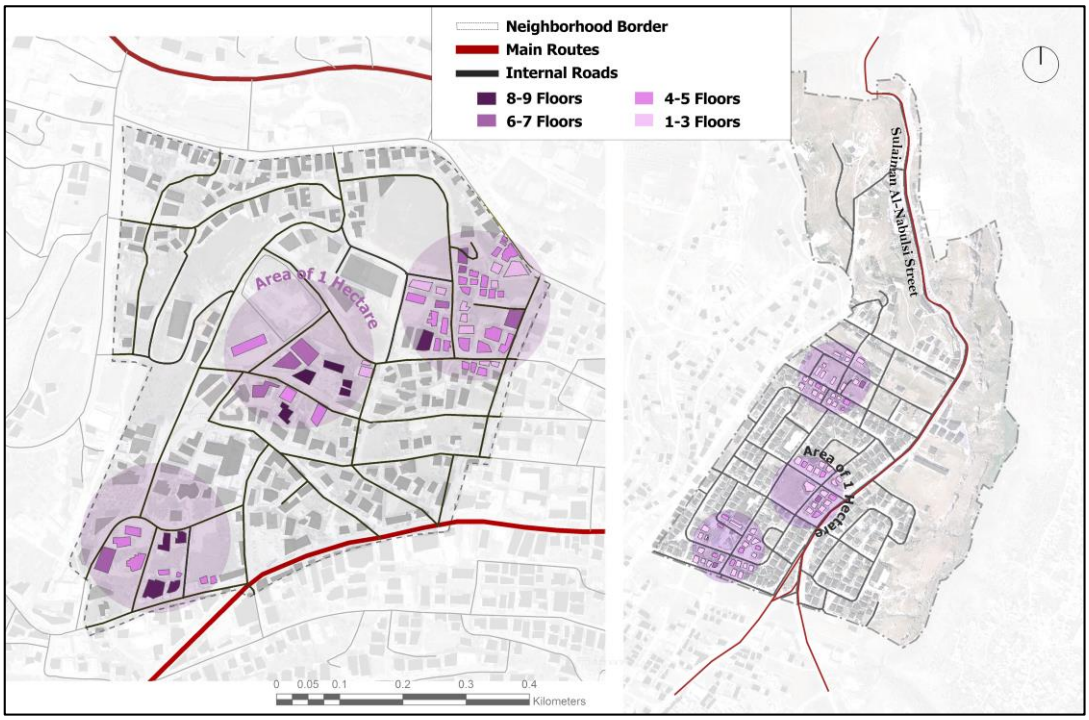
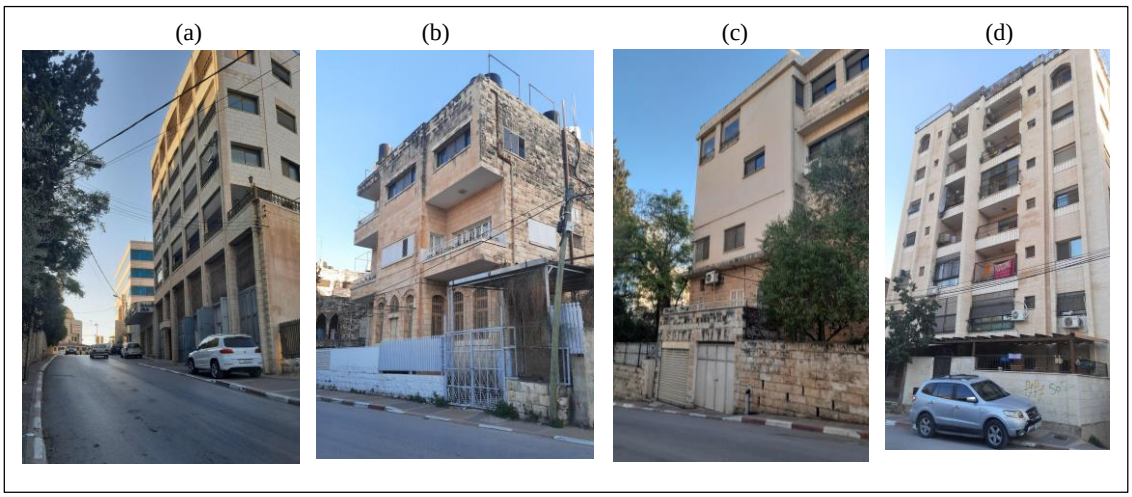



**Figure A.25**

*Patterns of building uses in Al-Mreij*




Note: (a) A building using all the ground floor frontages for retail use. (b) A low-density building with no retail use of building frontage. (c) A shop in a middle-density building. (d) A high-density building, where no retail use of building frontage.

**Figure A.26**

*Measuring user type based on services type*

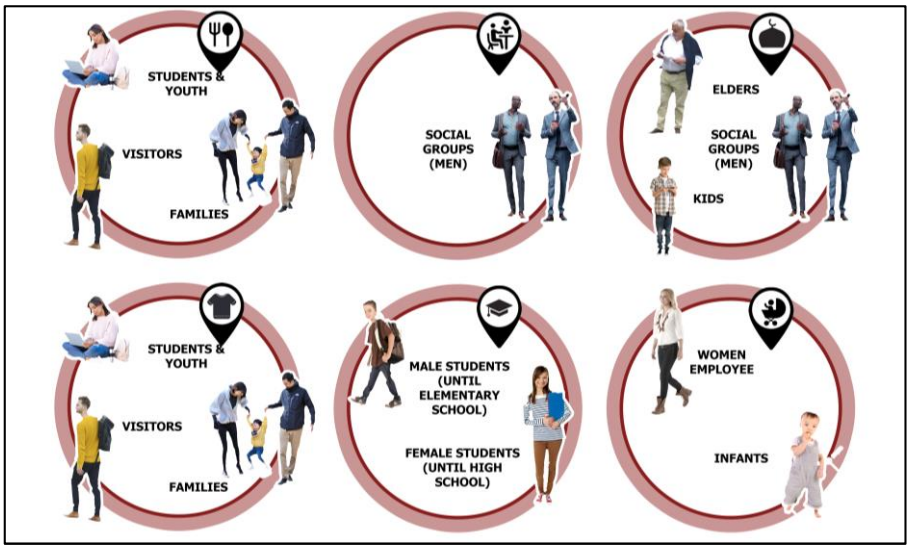
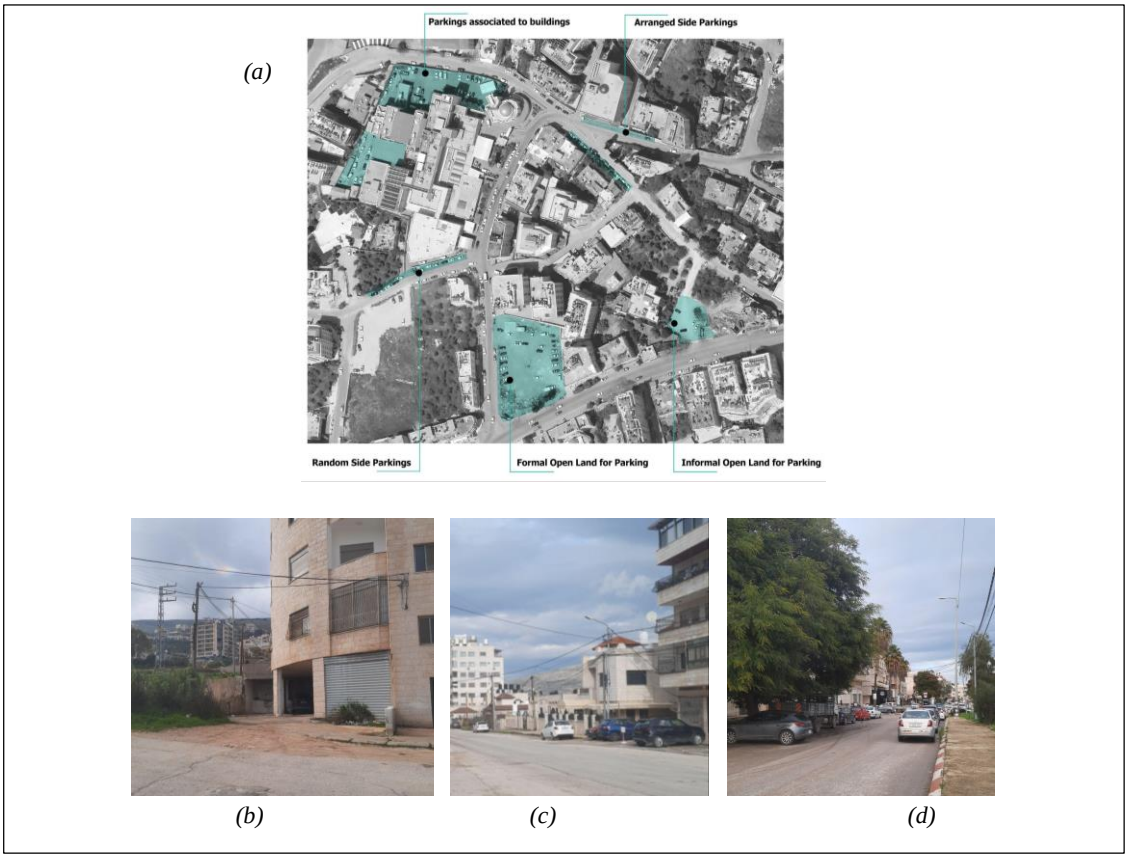



**Figure A.27**

*Classifying types of parking*




Note: (a) parking patterns in Al-Mreij. In Al-Masaken: (b) parking floors inside buildings, (c) parking at building entrances, (d) service road.

**Figure A.28**

*Example of parking lot*

**Figure A.29**

*A single-family housing sits opposite to high-density buildings*

**Figure A.30**

*Street Widths in Al-Mreij & Al-Masaken*

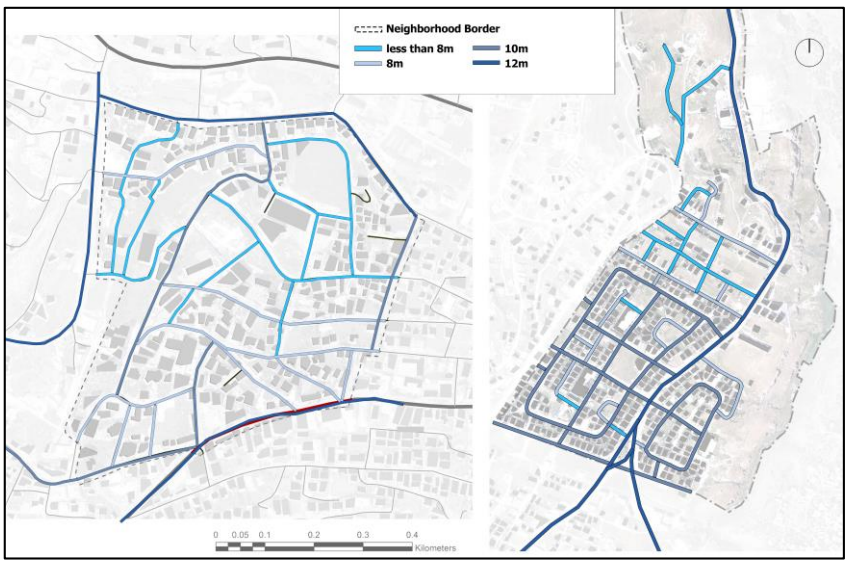
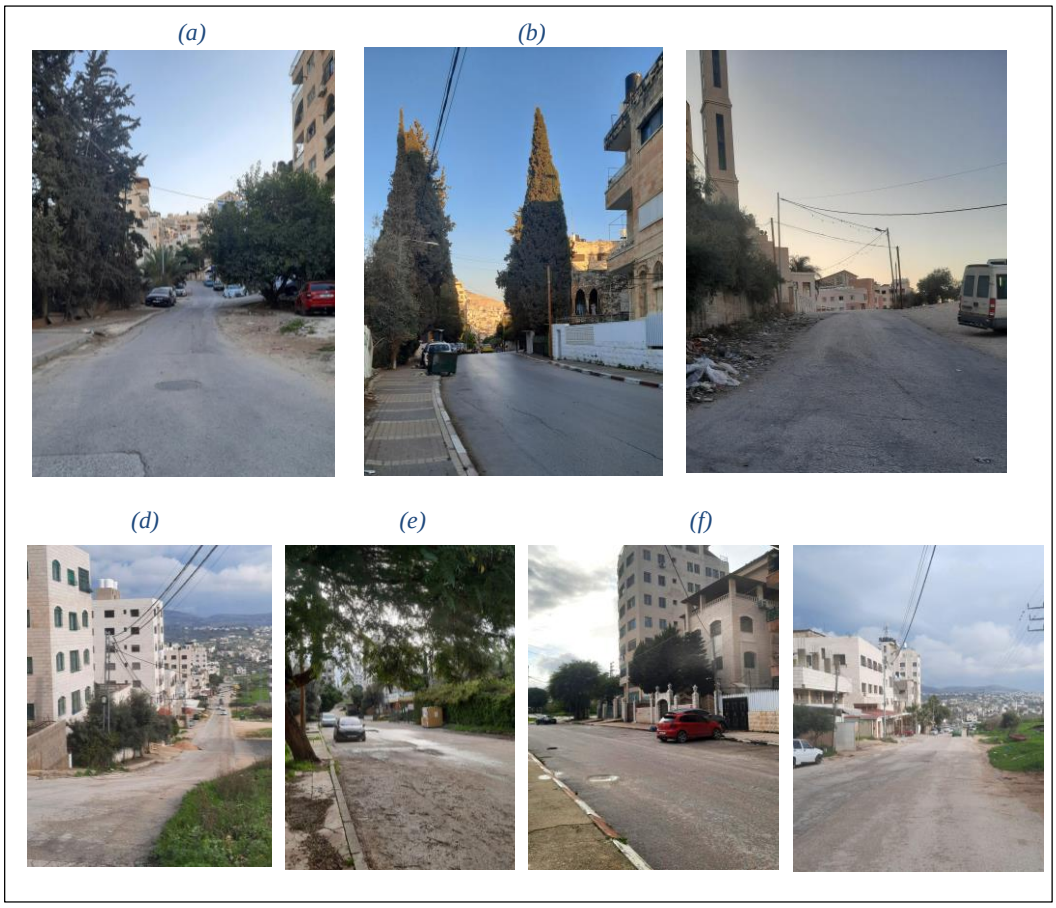


**Figure A.31**

*Patterns of Sidewalks in Al-Mreij*




Note: (a) 1 sidewalk pattern, and discontinuous. (b) 2 sidewalks pattern and continuous. (c) no sidewalks at both sides. & Patterns of Sidewalks in Al-Masaken. (d) 1 sidewalk pattern, and discontinuous. (e) 1 sidewalks pattern and continuous. (f)2 sidewalks and continuous, (g) no sidewalks at both sidewalks.

**Figure A.32**

*Walkability measures in Al-Mreij*


Note: (a) Streets Intersections with no crosswalks. (b) Lack of sidewalks around one of the neighborhood mosques. (c) Distinctive sidewalks used materials. Location opposite to school.

**Figure A.33**

*Result of Walk Score, using Urbano tool in Al-Mreij & Al-Masaken*

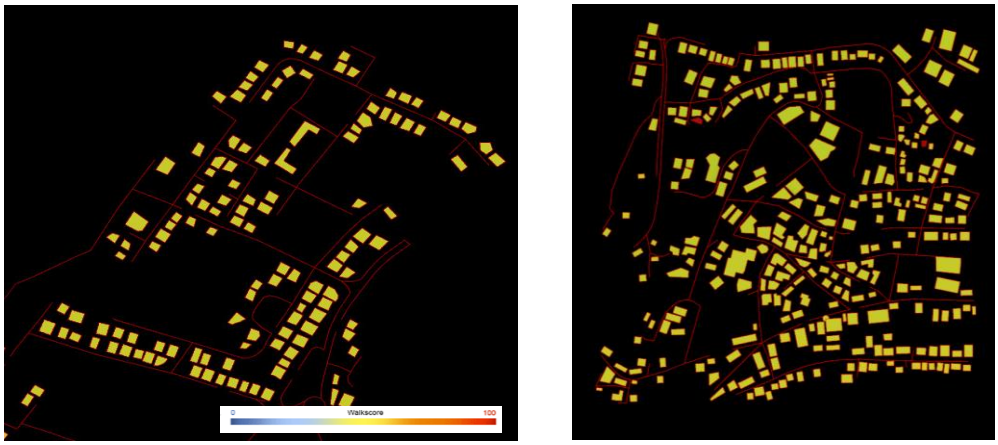



**Figure A.34**

*Street score Quantitative Investigation in Al-Mreij, using Urbano tool, Pedestrian (left), Car (right)*

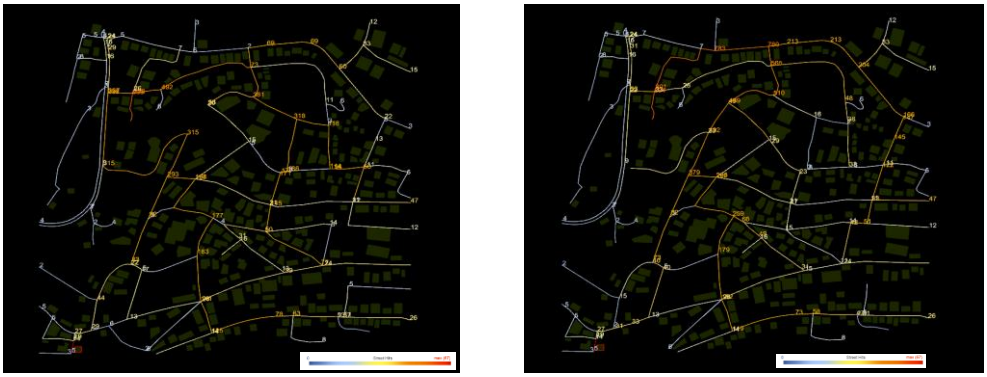
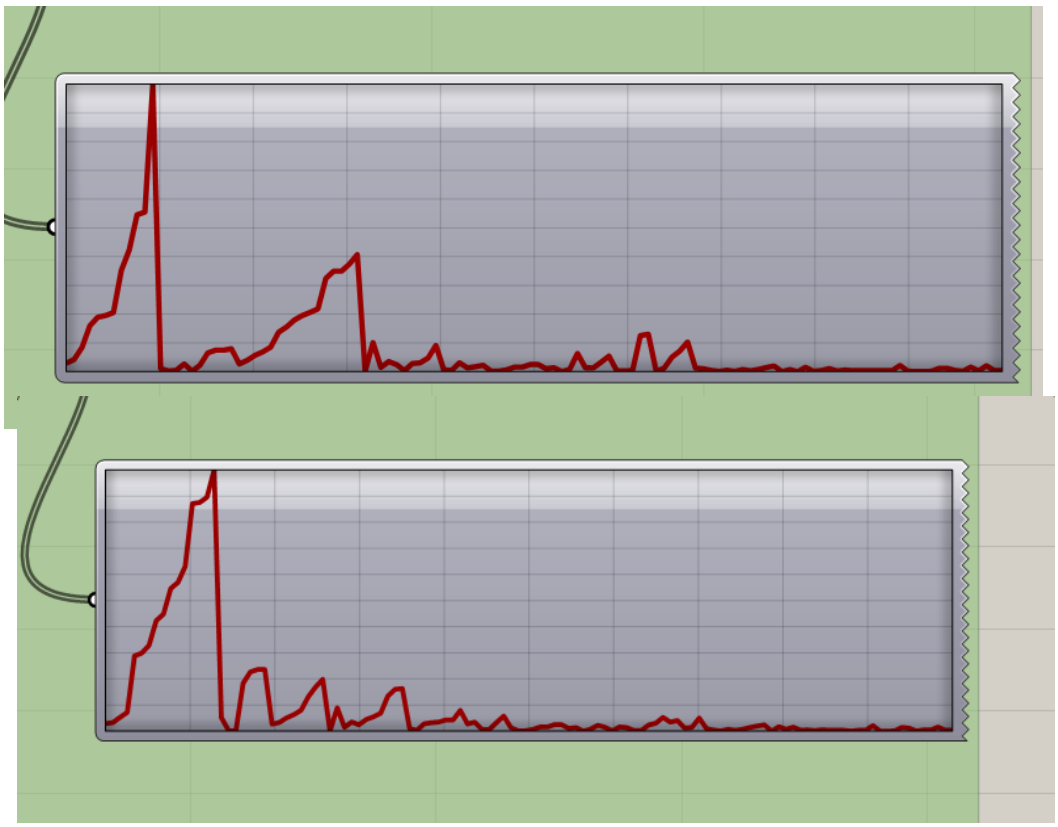


**Figure A.35**

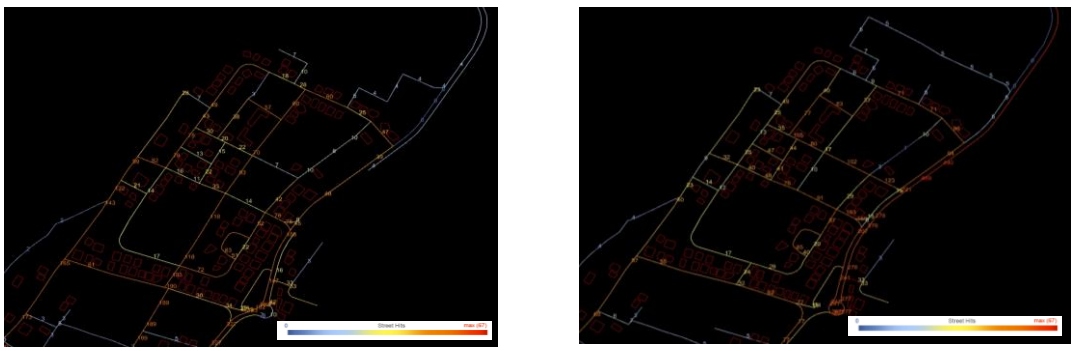
*Line graph of streetscore results, using Urbano tool in Al-Mreij*



Note: (a) pedestrian, (b) car.

**Figure A.36**

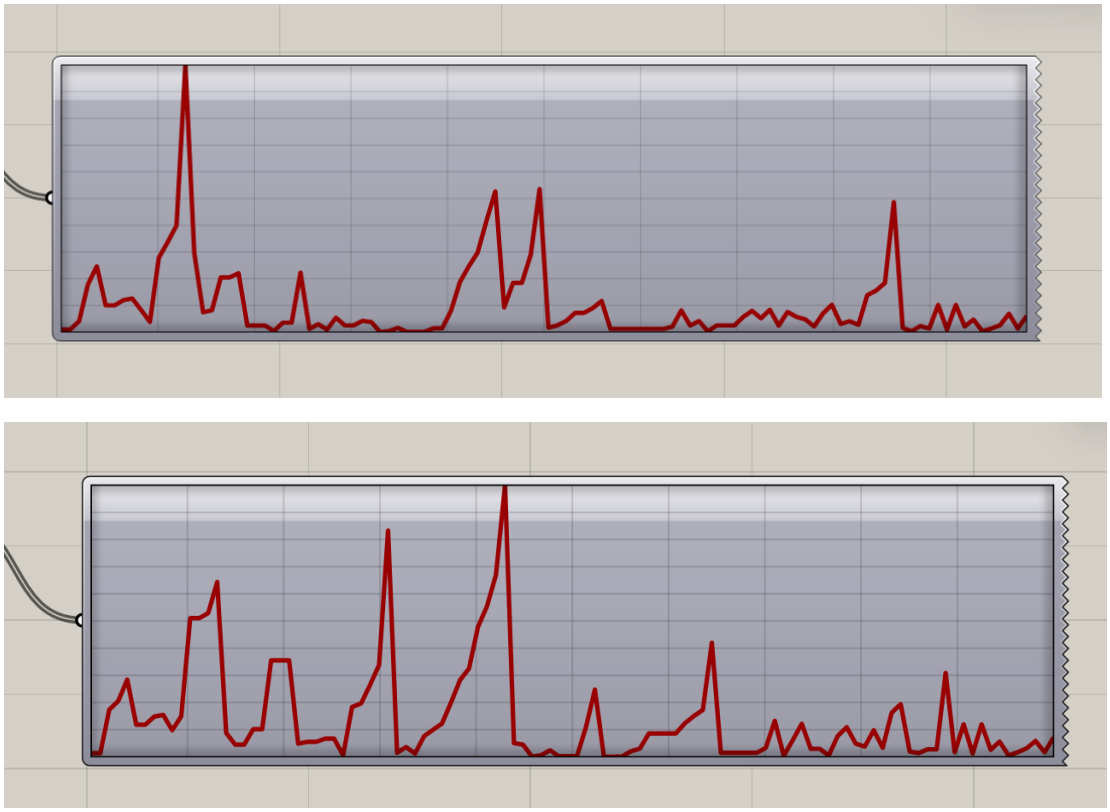
*Streetscore Quantitative Investigation in Al-Masaken, using Urbano tool*



Note: (left) pedestrian. (right) car.

**Figure A.37**

*Line graph of streetscore results, using Urbano tool in Al-Masaken*



Note: (a) pedestrian, (b) car.

**Figure A.38**

*Buffer area of park in Al-Masaken*

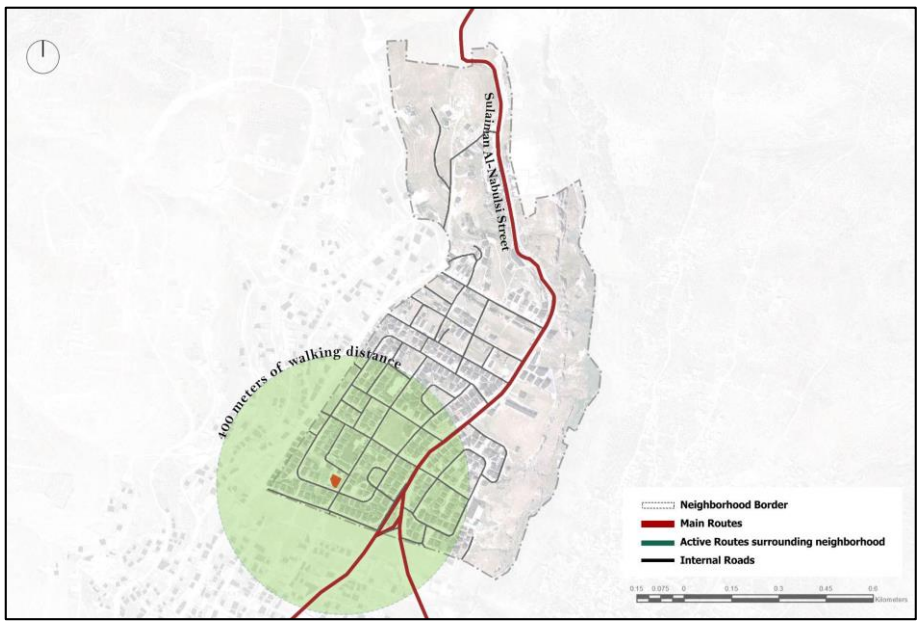


**Figure A.39**

*Featuring the only park in Al-Masaken*

(a) (b) (c)

Note: (a) Identification of park. (b) Entrance of park (c) Context surrounding park.

**Figure A.40**

*Observations of open space types in Al-Mreij*

(a) (b) (c) (d)

(e) (f) (g) (h)

Note: (a) Youth using one of the neighborhood's open spaces. (b) Open area at neighborhood periphery, next to one of the grocery shops. (c) Vacant land opposite to a kindergarten. (d) Open space, inclined in level.& Observations of open space types in Al-Masaken. (e) Cultural landscape (f) Unused open space. (g) Open space used as parking. (h) Green pavements.

**Figure A.41**

*Observations of abandoned buildings in Al-Mreij*

(a)  (b) 

Note: (a) A neglected building situated in adjacency to newer buildings. (b) An underutilized old building.

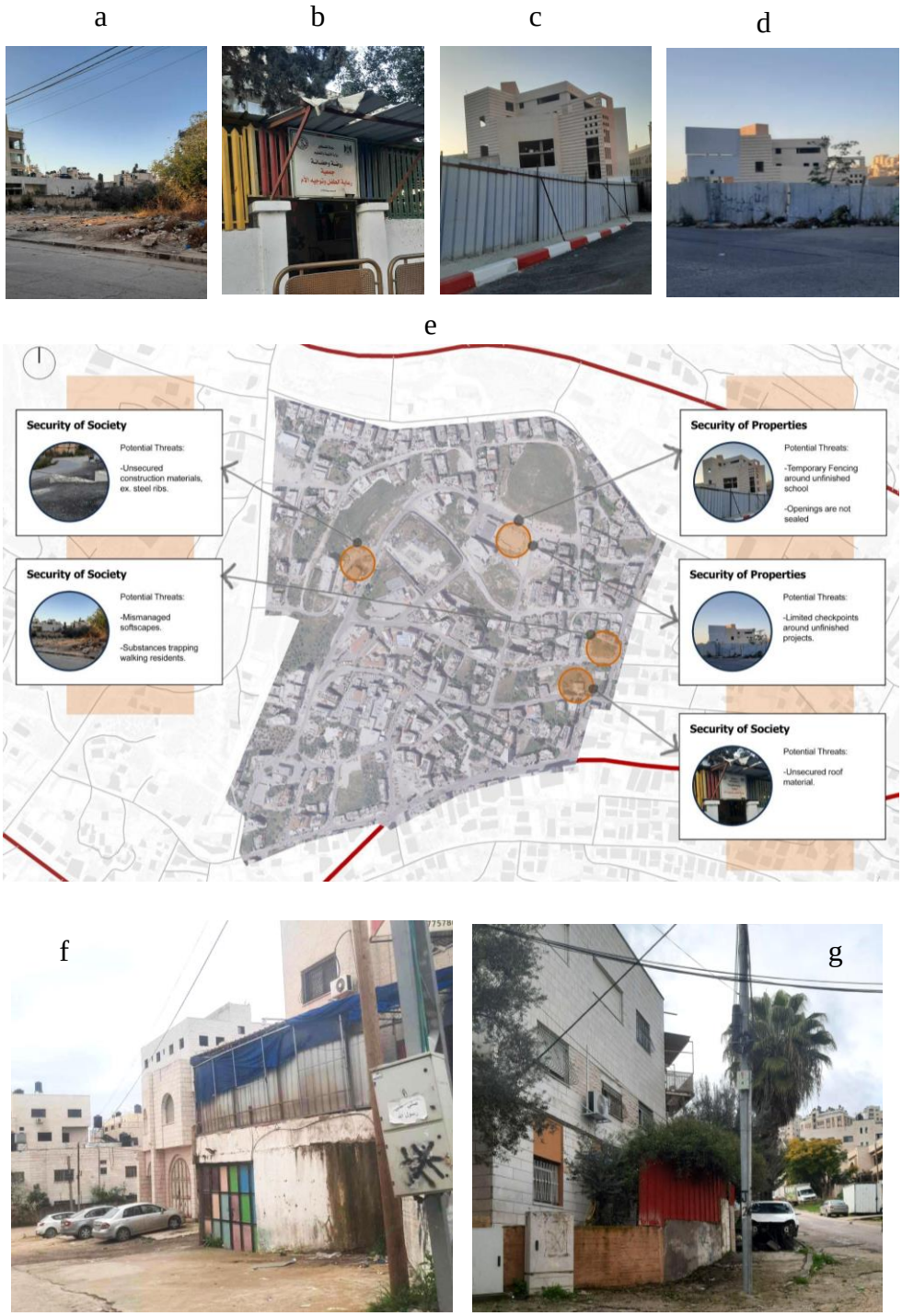
**Figure A.42**

*Vegetation condition in Al-Masaken & Types of Landscape in Al-Masaken*


Note: (a) good condition (b) bad condition. (c) Vertical Landscape (d) Horizontal Landscape.

**Figure A.43**

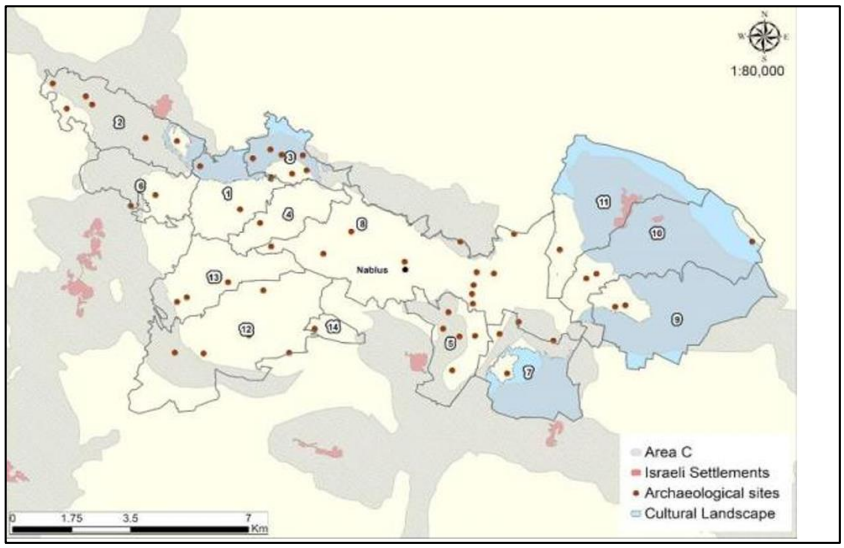
*Aspects impacting safety and security in Al-Mreij*




Note: (a) open land with low safe measures of walkability. (b) Inadequate material of roof type. (c) Un-sealed openings at unfinished projects. (d) Temporary fences around unfinished projects. (e) Location of aspects impacting safety and security in Al-Mreij. Aspects impacting safety and security in Al-Masaken; use of zinco (f) horizontally for roofs (g) vertically for walls.

**Figure A.44**

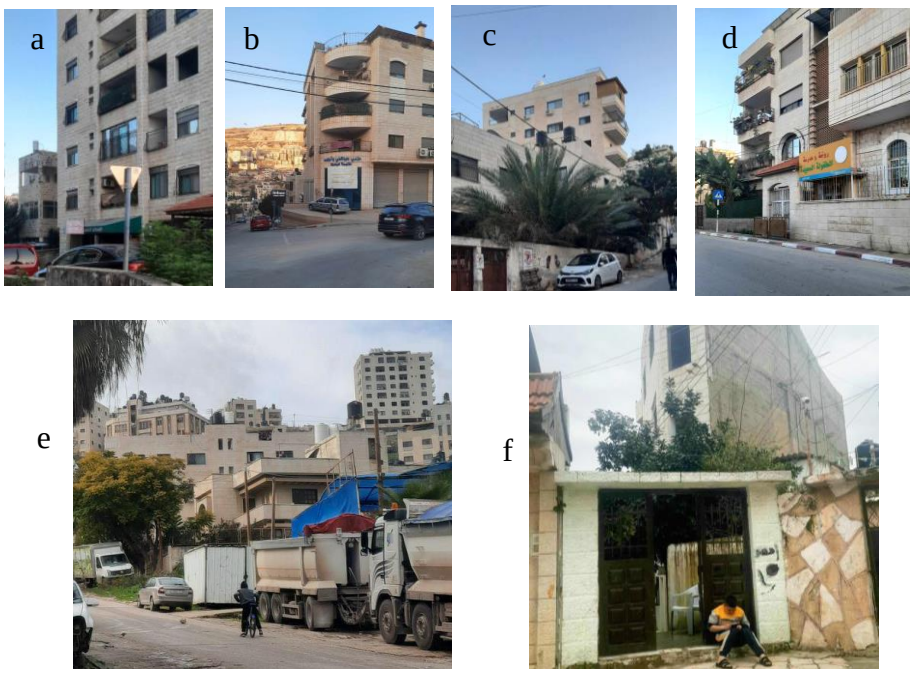
*Archeological sites and cultural landscape in Nablus Urban Area*




**Note:** . *(Map taken from environmental and social management plan for Nablus urban area pilot project, Integrated cities and urban Development (ICUD) project, 2021.*

**Figure A.45**

*Cultural Treatment of Balconies*




Note: (a) Addition of Opaque Surface. (b) Cleaning Purposes & Carpet/Clothes Pinning. (c) Addition of enclosures and transferring the balcony to an expanded interior chamber. (d) Unconventional (innovative) Treatment of Balconies: Addition of visible gardening activity, colorful pots, and use of a variety of materials and forms in the facade. Featuring the culture of using urban space in Al-Masaken. (e) & (f).

**Figure A.46**

*Industrial Uses in one of the open spaces in Al-Masaken*

**Figure A.47**

*Assigned guidelines for building sustainable neighborhoods.*

| Guidelines for building sustainable local neighborhoods | | |
|---|---|---|
| 1- Structure: **Start with a national plan (vision- assigned with a targeted period), then apply strategies and policies that include designers, citizens, and government.**<br>2- Characteristics: **Allow a systematic methodology of iterating, experimenting, and validating.**<br>3- Target: **Allow national awareness and facilitation of incorporating sustainable culture and practice.**<br>4- Publication: **Spread the plan, document the actions and make it well-announced** | | |
| | **Actions** | **Participatory parties** |
| Size | Revised to be based on the **physical characteristics** (topography) and other real influences on **accessibility, demographics priorities, socioeconomic** conditions | Designers & engineers |
| | Requires observations of cultural patterns of using space | Citizens |
| Streets | The hierarchy of streets is attained locally<br>**Quality** of streets must be enhanced; walkable, safe, furnished, and shaded streets | Governmental role<br>Designers & engineers |
| | Incorporate public and efficient transit means | Governmental role<br>Designers & engineers |
| | Activeness of streets | Citizens |
| Building Layouts | Stimulating policies for new **building technologies**, new **architectural typologies**, and **inclusive, diverse, flexible, and mixed-use buildings**. | Governmental role<br>Designers & engineers |
| | Better relation of buildings with the surrounding urbanism | Designers & engineers |
| | Designing buildings on a national level | Governmental role |
| | Revision of building environmental performances; features, orientation, etc. | Governmental role<br>Designers & engineers |
| | Regulate investment in buildings | Governmental role |
| | Allow public participation on the shape and outline of buildings | Governmental role<br>Designers & engineers |
| | Better allocation of building sizes, layouts for expected density | Governmental role |
| Facilities | Planning services on a national scale | Governmental role |
| | Incorporate social, cultural indoor and outdoor services | Governmental role<br>Designers & engineers<br>Citizens |
| | Increase economic impact of public spaces | Governmental role |
| | Requires observations of cultural patterns of using space | Citizens |

**Figure A.48**

*Suggested recommendations for local sustainable neighborhoods.*

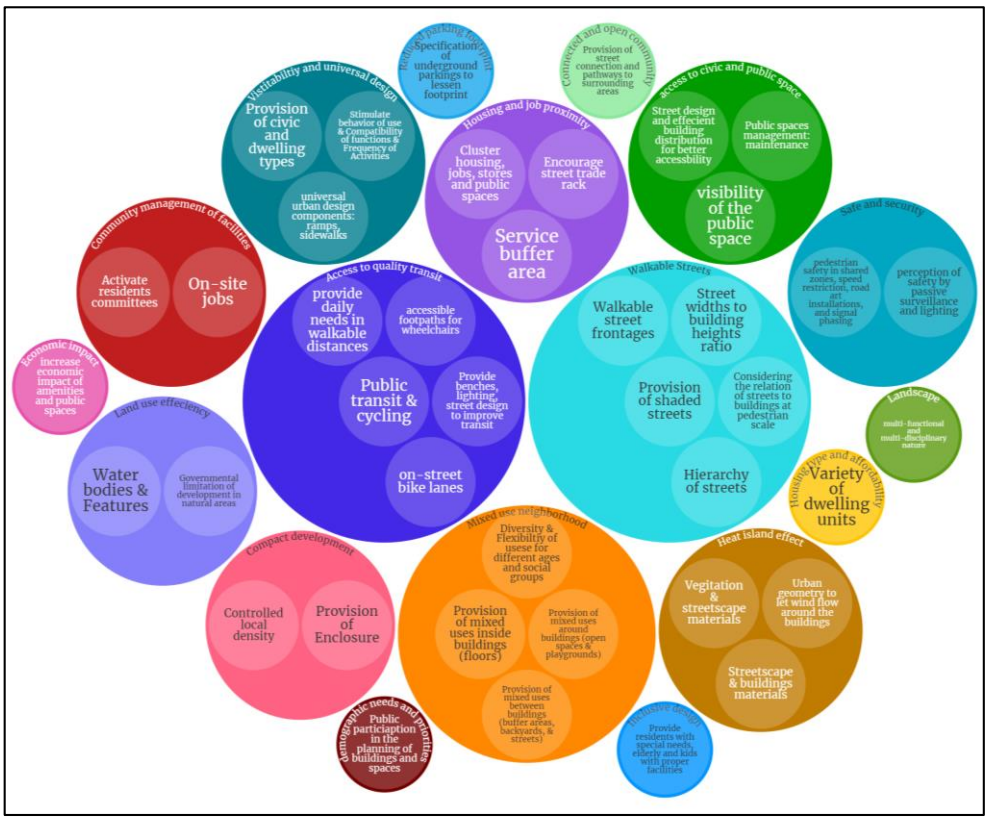



**Figure A.49**

*Overview of cases urban attributes*

**Figure A.50**

*Structuring Al-Mreij Neighborhood model*

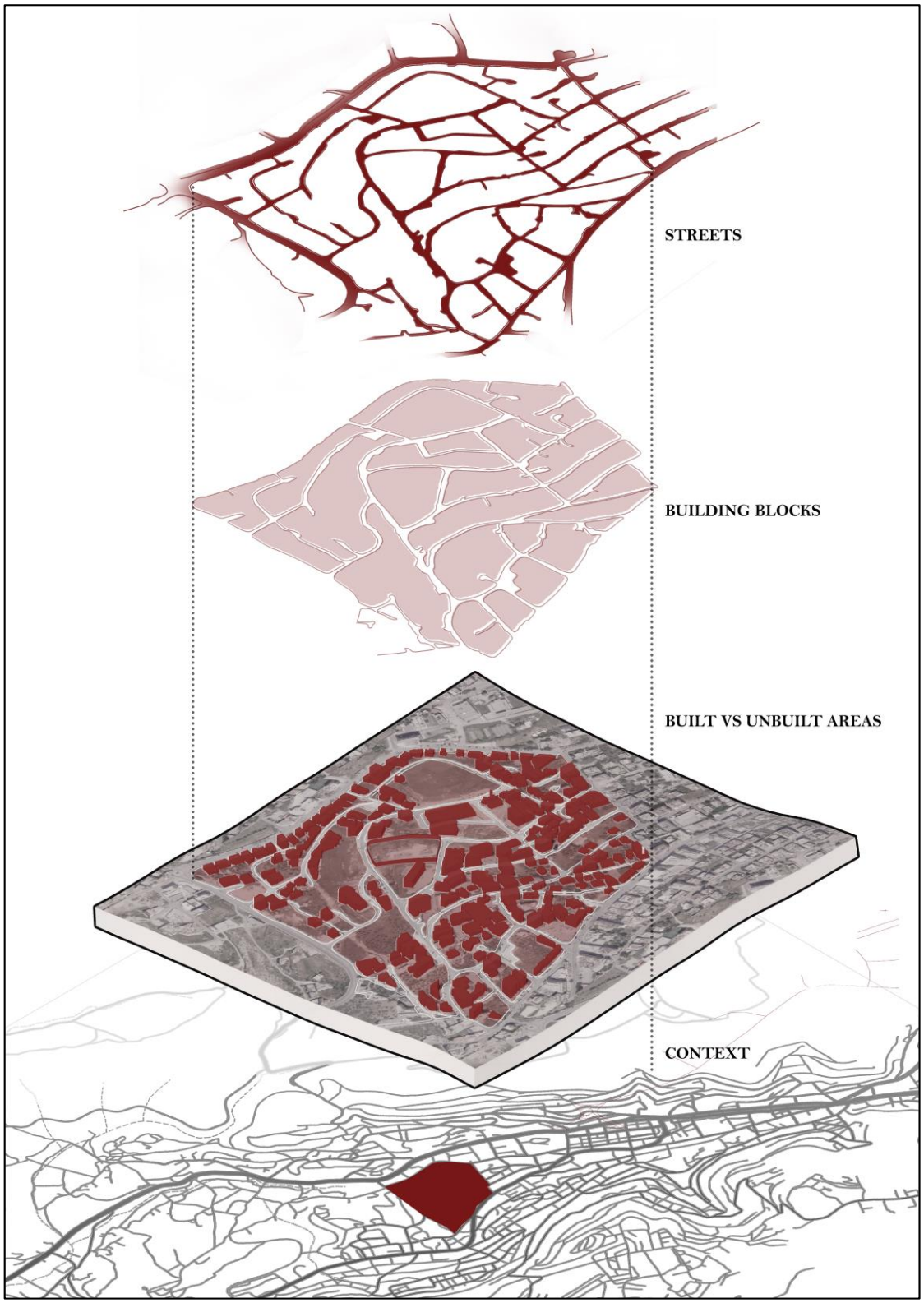


**Figure A.51**

*Structuring Al Masaken Neighborhood model*

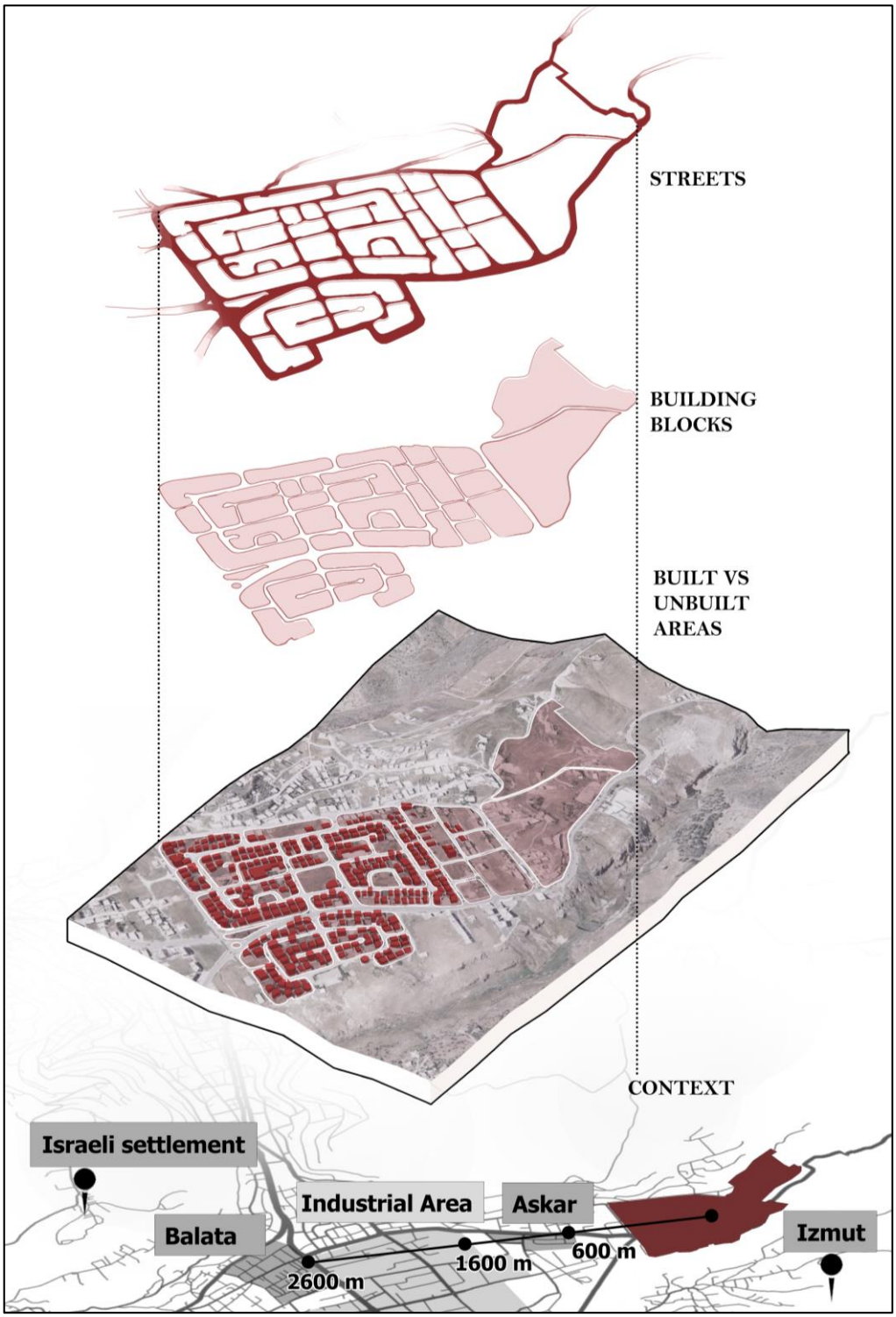


**Figure A.52**

*Sections from Al-Mreij Neighborhood*

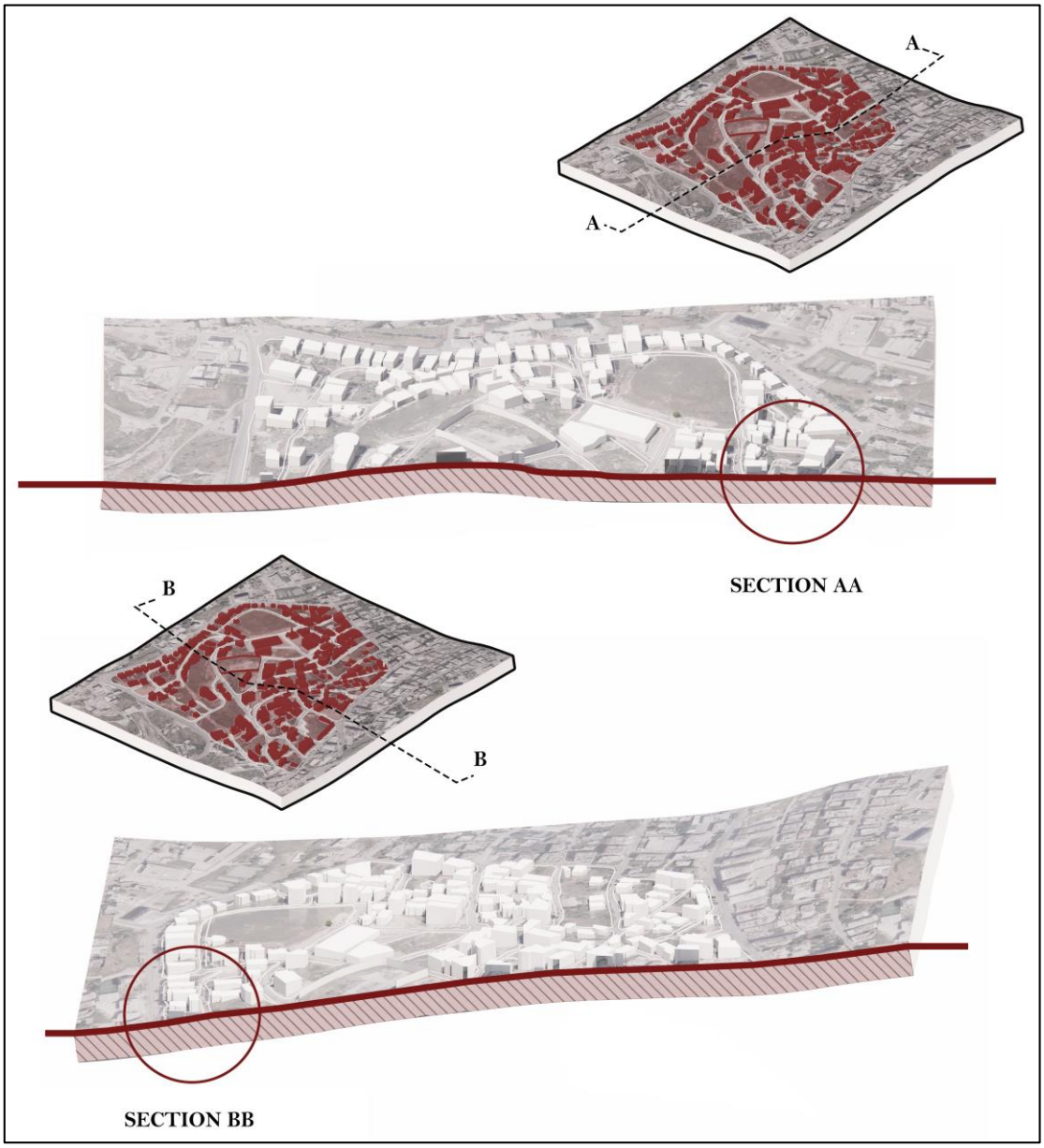


**Figure A.53**

*Close-up into building block of Section AA*

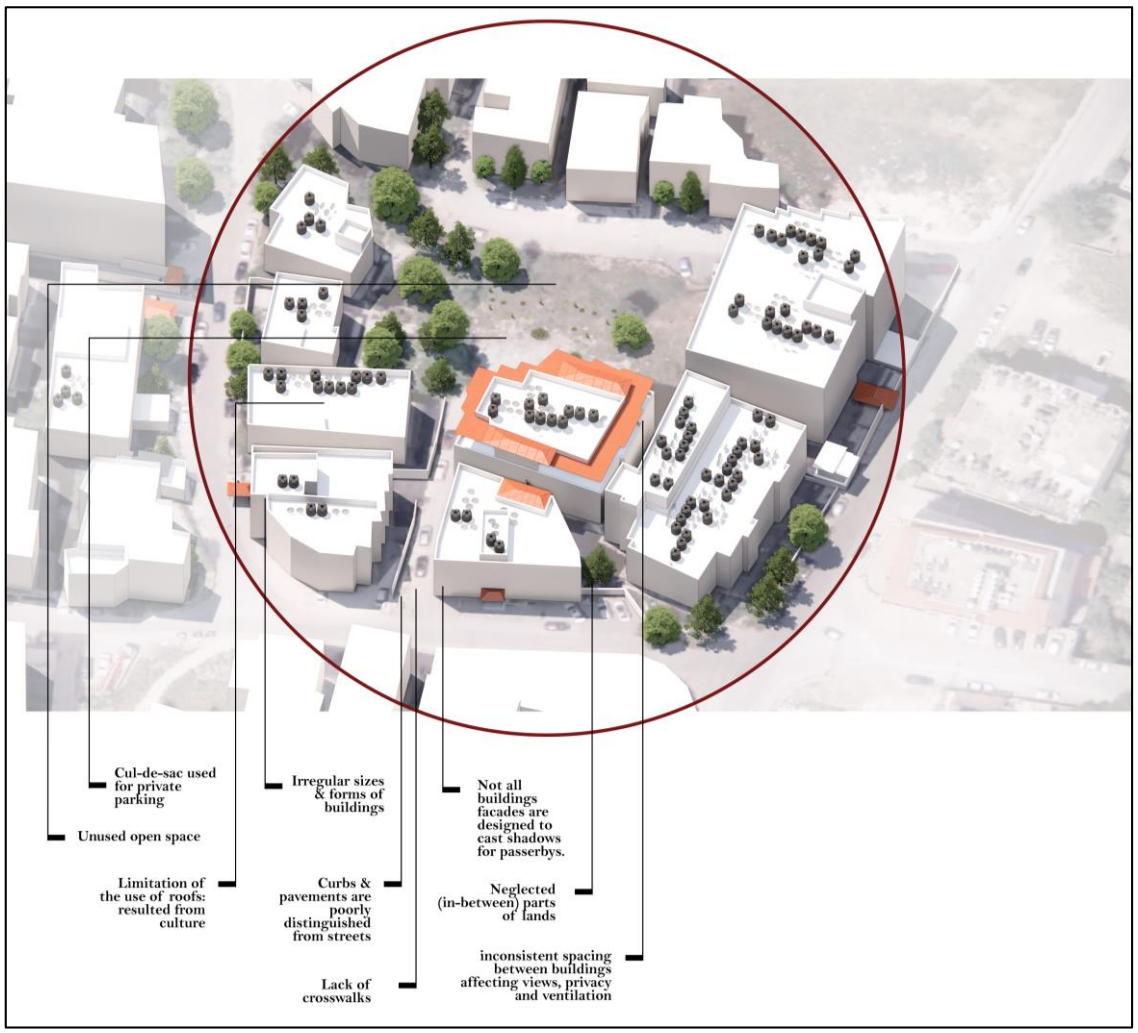


**Figure A.54**

*Close-up into portion of Section BB*

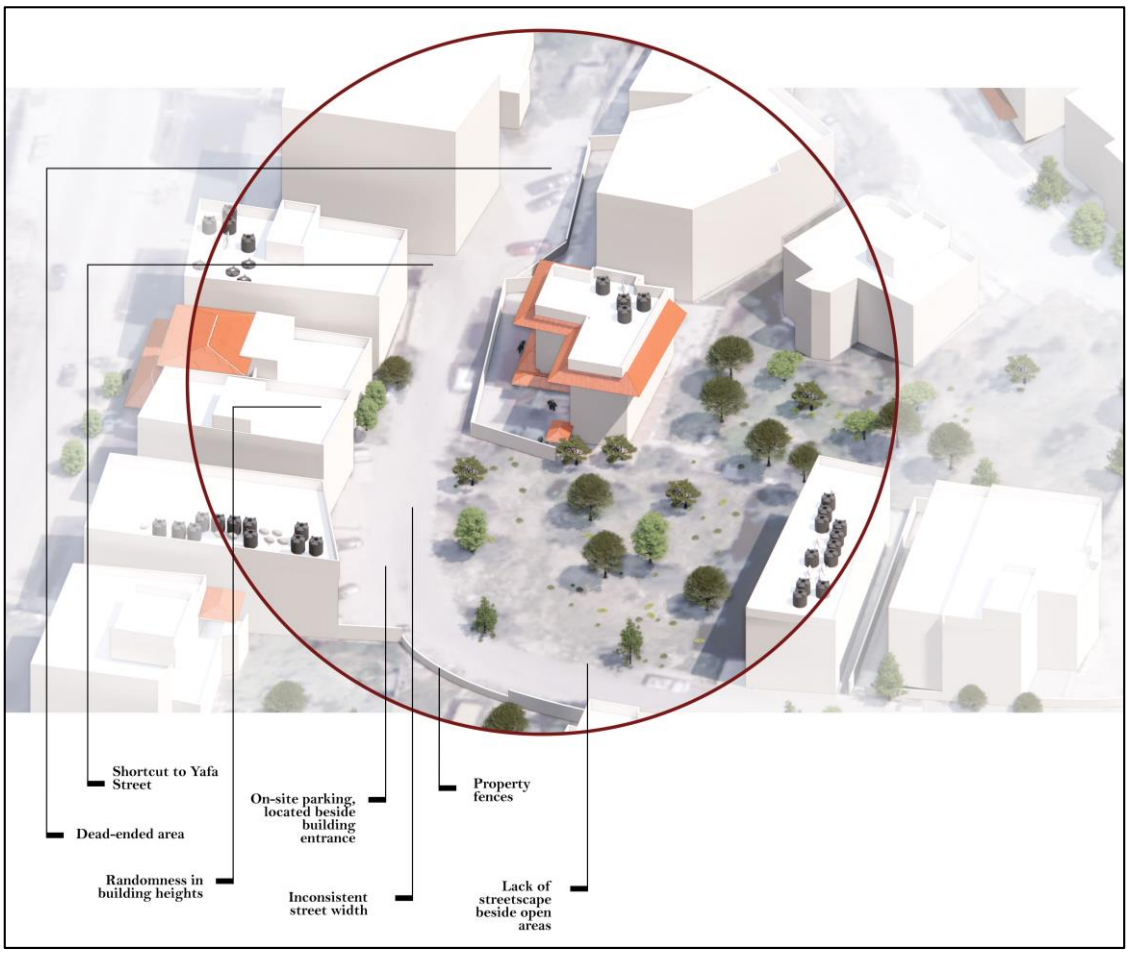


**Figure A.55**

*Rendered Maquette featuring portion of Al-Mreij neighborhood*

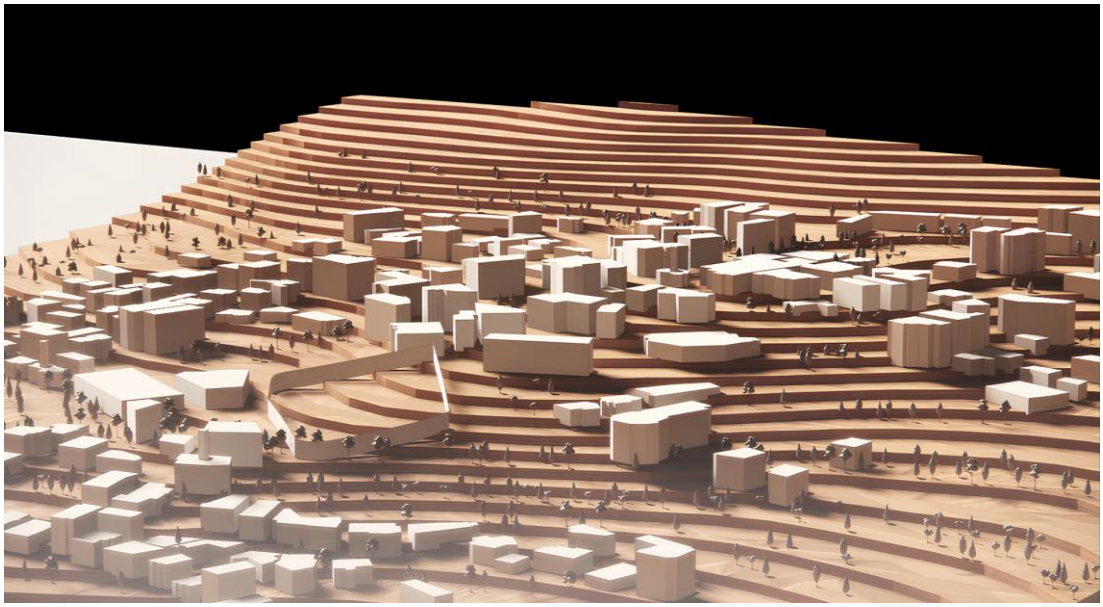
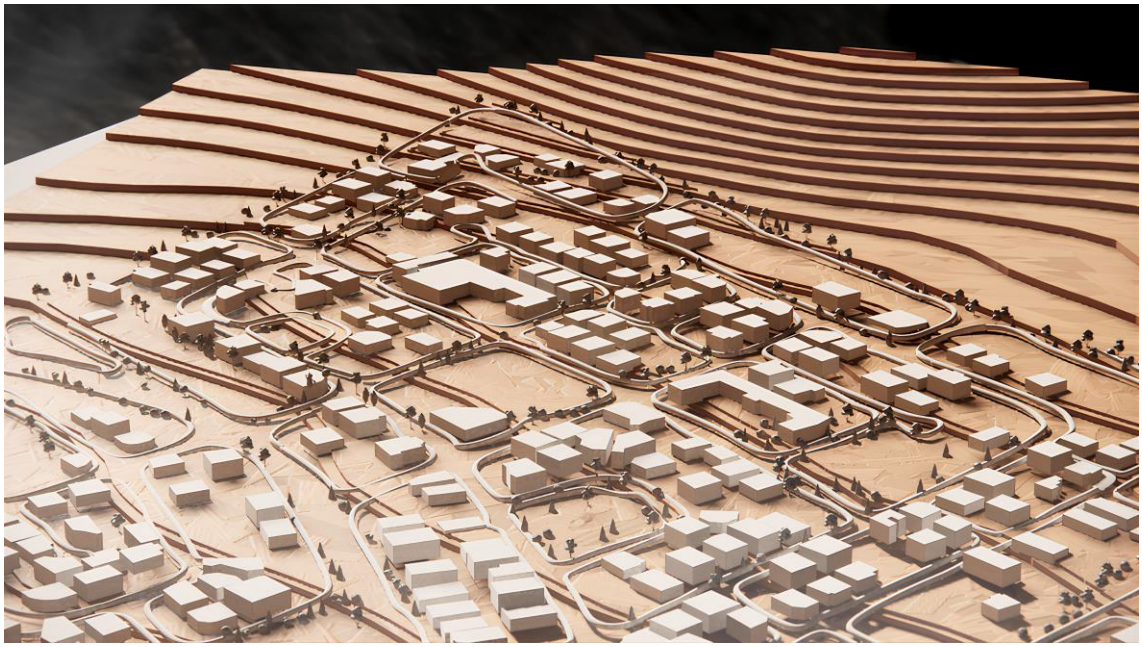


**Figure A.56**

*Rendered Maquette featuring portion of Al-Masaken neighborhood*



# Appendix B

## Tables

**Table B.1**

*Calculating density in Al-Mreij*

45 building x 1 (n.of floors) x 3 = 135 housing unit
93 building x 2 (n.of floors) x 3 = 558 housing unit
38 building x 3 (n.of floors ) x 3 = 342 housing unit
36 building x 4 (n.of floors) x 3 = 432 housing unit
16 building x 5 (n.of floors) x 3 = 240 housing unit
9 building x 6 (n.of floors) x 3 = 162 housing unit
7 building x 7(n.of floors) x 3 = 147 housing unit
6 building x 8 (n.of floors) x 3 = 288 housing unit
7 building x 9 (n.of floors) x 3 = 189 housing unit
1 building x 11 (n.of floors) x 3 = 33 housing unit

| | |
|---|---|
| Sum of units= 2526 units | Population Density/Hectare 301.4 |
| Estimated neighborhood population = (2526 x 5)= 12630 | |

**Table B.2**

*Calculating density in Al-Masaken*

10 building x 1 (n.of floors) x 3 = 30 housing unit
111 building x 2 (n.of floors) x 3 = 666 housing unit
117 building x 3 (n.of floors ) x 3 = 1053 housing unit
72 building x 4 (n.of floors) x 3 = 864 housing unit
12 building x 5 (n.of floors) x 3 = 180 housing unit
14 building x 6 (n.of floors) x 3 = 252 housing unit
7 building x 7(n.of floors) x 3 = 147 housing unit
1 building x 8 (n.of floors) x 3 = 24 housing unit

| | |
|---|---|
| Sum of units= 3216 units | Population Density/Hectare 180 |
| Estimated neighborhood population = (3216 x 5)= 16080 | |

**Table B.3**

*Classification of Housing ownership in Al-Mreij, collected from PCBS*

| Purchased units | Rented units | Provided from work | Total Units |
|---|---|---|---|
| 783 | 107 | 1 | 891 |

**Table B.4**

*Employment Rate in Al-Masaken, collected from PCBS*

| Economically Active | | Inactive Economically | Not clear | Total | Unemployment Rate |
|---|---|---|---|---|---|
| Employed | Unemployed | | | | |
| 1663 | 161 | 2026 | 0 | 3850 | 33% |

**Table B.5**

*Employment Rate in Al-Mreij, collected from PCBS*

| Economically Active | | Inactive Economically | Not clear | Total | Unemployment Rate |
|---|---|---|---|---|---|
| Employed | Unemployed | | | | |
| 1216 | 80 | 1429 | 109 | 2835 | 18% |

**Table B.6**

*Classification of Housing ownership in Al-Masaken, collected from PCBS*

| Purchased units | Rented units | Provided from work | Total Units |
|---|---|---|---|
| 1069 | 140 | 62 | 1276 |

**Table B.7**

*SWOT of LEED ND selected indicators*

| | | Al-Mreij | Al-Masaken |
|---|---|---|---|
| Preferred Location | Location within city | West | East |
| | Land use | Commercial, Residential (B) | Industrial, Residential (B) |
| | Positive attributes of location | Closeness to active streets<br>Landmarks availability<br>Central location | Calmness<br>Attraction to its surroundings (impact on others)<br>Homogenous inclination |
| | Negative attributes of location | Steep inclination | Poor management of waste<br>Peripheral location |
| Access to Qualit | Flow of Transportation | Consistent flow | Lower flow |
| | Diversity of vehicle type | | Higher |

| | | | |
|---|---|---|---|
| | Location of Transit | Both have the transit passing in active and main streets and not in internal streets | |
| | Width of streets | Both have wide active streets; primary, secondary and tertiary streets | |
| | Impact of streets pattern to transit | Resulting pattern allows maximum accessibility from buildings to some locations. | Street patterns follow a clear grid of linear shapes, and almost all of them are parallel. Thus, the accessibility of residents to transit routes is efficient, easier, clearer, and closer than irregular patterns |
| | | Though organic and twisted streets are preferable for better walkability, locally they may lead to longer trips and inconsistent pathways | |
| | Visibility | Accessible from multiple internal streets and is visible | The direction of the neighborhood's internal streets all leads to the main street in a clear path |
| | Road infrastructure | | Roundabouts, service roads, and multiple car drop-offs regulate the transit of vehicles |
| | Impact of Topography on accessibility of transit | Higher -Duration of walkability is generally non-uniform, especially from center to corners | Less radical |
| Housing and Job proximity | Job proximity | Both satisfy the quantitative reference of proximity | |
| | Job Activity | Higher | Lower - shops were either closed or had few visitors |
| | Job efficiency | Job census is lower than building units. - not all buildings use their frontages for jobs.<br><br>There is barely any indication of floors for job uses in the buildings. | |
| | Job accessibility | Inconsistent topography, the accessibility to jobs might vary from an area to another | Incline in one direction, which lowers the inadequacy of walkability and therefore does not majorly affect the accessibility to jobs |
| | Job distribution | Active streets are active with job opportunities | |
| | Job diversity & typology | More diverse | Not inclusive, limited types: either to industrial zone or outside the neighborhood |
| | Job sufficiency | Do not restrict jobs to residents of the neighborhood | |
| | Potential to surrounding areas | Surrounding areas are almost the same | Closeness to industrial area |
| Compact Devel | Compactness | Satisfies the quantitative reference of needed dwelling units | |
| | Population density | Higher population density | Lower population density |

| | | | |
|---|---|---|---|
| | Attributes of density | Lower units – lower horizontal spread | Higher units – high horizontal spread |
| | Built-up density | Higher built-up density | Lower built-up density |
| | Impact of density | More confiscation between buildings | More open spaces and lower confiscation between the buildings |
| Mixed-use | Distribution of services | Not distributed in coordination with each other | Better distribution |
| | Accessibility to services | Both have services within 400meters, which complies under the local guidelines of distance to services in neighborhoods | |
| | Coordination of services | No specific coordination of building density with type or number of allowed shops | |
| | Services density | More | Less |
| | Service type | Both are Diverse | |
| | Hierarchy of Use (residential,commercial, public buildings) | Both are the Same | |
| Housing Types and Affordability | Housing Typologies | High variations | Low variations |
| | Affordablilityspecificities | No assigned typologies | |
| Visitability and Universal Design | Existence & Size of Landmark | More Landmarks | Fewer Landmarks |
| | Diversity of Landmarks | No diverse communal spaces for women or elders | |
| | Boundaries of Influence | Strongly linked to the city | Askar camp |
| Reduced parking Footprint | Type of Parking | The majority is on-street parking | |
| | Off-street availability | Existent | Non-existent |
| | Allocation to street type | More side parking is allocated along active streets, more than internal streets | |
| | Scope of Servicing | The neighborhood and its surrounding | Only to neighborhood |
| | Potential for enhancing Arrangement of Parking | Lower | Got more potential (availability of service roads & vegetation nearby) |
| | Rate of Parking & Vehicle activity | High | Low |
| | Impact on the urban scheme | Higher (Reduce building compactness) | Lower (only to the scheme of the streetscape) |
| Walkable Streets | Height to street width | Inconsistent due to the instabilities of building heights | Less inconsistency |
| | Number of block not satisfying the ratio | 1/22 | 4/37 |

| | | | |
|---|---|---|---|
| | | | Result of the low density of buildings and the buildings count per block space. |
| | Sidewalk pattern | Inconsistent | |
| | Sidewalk condition | Inconsistent | |
| | Sidewalk continuity | Inconsistent | |
| | Streets safety | General lack of crosswalks within streets and around intersections. | Have got potential due to current streets widths |
| | Walkability (walkscore) measure | 22.5/100 – Green, yellowish | 6.51/100 - Green |
| | Impact of topography to walkability | Inconsistent impact | Not major |
| Connected and open community | Satisfaction of surrounding connectivity – n.of intersections | Satisfy the quantitative reference of intersections | Does not satisfy the quantitative reference of intersections |
| | Pedestrian street score | Majority of streets have moderate street score<br>Avg – 67.77<br>(due to more street segments & lower walking distances) | Avg. 46.11<br>(due to longer street segments) |
| | Car street score | Higher than pedestrian streetscore and higher than Al-Masaken<br>Avg- 84.94 | Avg.67.94<br>(due to location) |
| | Inconsistency of values of both pedestrian and car | Both pedestrian and car street score are inconsistent | More inconstancy than Al-Mreij<br>(indicates more safety and space privacy) |
| Access to and civic public spaces | Existence of public spaces | Non-Existent | Existent (Park) |
| | Scope of Servicing | | Not whole neighborhood |
| | The future potential of open spaces | Less (due to less n. of open spaces) | Higher (due to higher n. of open spaces) |
| Island Heat Reduction | Ratio of empty areas | 20% | 34% - higher |
| | Role of Building materials & coatings | No specific coatings are assigned to mitigate the impact.<br>Low consideration of light-colored materials for pavements. | |
| | Role of streetscape | No shading systems | Few shading systems<br>Existence of vegetation and green pavements |
| Building reuse | Existence of abandoned buildings | Only in Al-Mreij – Potenial for reuse | |

Note: Green represents strengths, Red represents weaknesses.

**Table B.8**

*SWOT of BREEAM COMM selected indicators*

| | | | |
|---|---|---|---|
| Community management of facilities | Existence of addressed facilities | Spread of community facilities is generally low across urban fabrics | |
| | Potential in existing facilities | None | A cultural center is under establishment |
| Economic Impact | Existence of supporting facilities | No facility dedicated to job creation or training | |
| Demographics needs and priorities | Employment rate | 42.9% | 43.2% |
| | Housing ownership rate | 88% | 84% |
| | Reflection of census on urban spaces | No reflection; Majority of projects are led by the private sector and investors, which may not be part of a national plan. | |
| | Reflection of census on neighborhood identity | Their current physical attributes, especially architectural massing and functions, attained from economic or socioeconomic resources are not defining a neighborhood from another. | |
| Inclusive design | Condition of inclusive design | In both, there are no distinguished building typologies & few strategies in transportation are set for an inclusive accessibility | |
| | Potential for inclusivity | Lower due to existing density | Higher due to open spaces and width of streets |
| Landscape | Role of new development to consider landscape | Developments are not keen on preserving features and components of landscapes. | |
| | Type of integrated Landscape elements | A lack of diverse green infrastructure and used landscapes | |
| | Condition of existing landscape | Low percentage of vegetation is noticed | More due to the diversity of vegetation in open spaces and empty areas |
| | Location of existing landscape | Null | Nurtured in areas that require healthy environments, such as school<br><br>Dense in internal streets |
| | Potential influence of the landscape on the sustainability | | Landscape runs adjacent to adequate and walkable streets |

Note: Green represents strengths, Red represents weaknesses.

**Table B.9**

*SWOT of PCRS selected indicators*

| | | | |
|---|---|---|---|
| Integrated development strategy | Condition of integration | Local developments are not based on ensuring harmony and compatibility or studying the impact of projects on each other.<br><br>Fragmentation of construction as a process and as a product. | |
| | Integration of parties | Limited in both | |
| | Matching to the assigned master plan | More violations exist:<br>Two areas assigned as a park are used as a stadium and hospital. | Less violations exist:<br>Three areas assigned as parks are open spaces |
| | Potential for integrated development strategy | | Open lands can be studied and used in a managed flow. |
| Safe and Secure Community | Allocation of safety facilities | Healthcare facilities | Non-existent<br>Location affects safety measures |
| | Sufficiency of Facilities | Not sufficient – both miss security typologies | |
| | Consideration of streets | Internal roads do not have service areas for drop-off in front of any building, and neither internal nor external roads are wide enough or dedicate specific lanes for emergencies. | |
| | Potential threat from/to buildings | Both have inadequate materials that are used in some buildings, for example corrugated sheet roofs | |
| | Potential Threat from/ to streetscapes | Substances and soft scapes like rocks and disposable and indisposable waste affect the walkability of residents<br><br>Under-construction, buildings are left without surveillance | |
| | Potential Threat from location | | Calmness and peripheral location<br><br>Allocation of industrial uses<br><br>Passing of occupation |
| Showcase of Regional & Cultural Practice | Allocation of current culturally related facilities | Non-existent | |
| | Allocation of archeological and cultural landscapes | Existent – might bring in tourism and cultural activeness | Non-existent |
| | Impact of culture on urban elements | Restricted use of balconies & roofs | |
| | | | More usage of space for recreational purposes – informal uses |
| | Impact of culture on buildings | Both have restricted cladding material | |

Note: Green represents strengths, Red represents weaknesses.

**Table B.10**

*SWOT of DGNB UD, GMD, CASBEE UD selected indicators*

| | | | |
|---|---|---|---|
| Pollutants and Hazardous materials | Local Priority | Majority of implementations favor saving the cost of materials rather than studying the long-term effects of using a specific material. | |
| | Impact from buildings | Both are the same, as local materials are generally similar | |
| | Exposure of pollutants substances to urban and architectural schemes. | | Higher – due to industrial & informal practices of using open lands and cultural landscapes & closeness to the industrial area |
| Lifecycle cost | Condition of cost | Both are impacted by the conventional notion of high construction cost | |
| Land use Efficiency | Condition of efficiency | Both are under high prices of lands, the excessive purchase of lands from individuals, and the use of lands for private sectors. | |
| | Public Use of Lands | Buildings: Schools | Buildings: Schools<br>Open space: Park |
| | Potential for Better Efficiency | Lower | Higher (in case of public purchase of the private open spaces) |
| Environmental Risk | Allocation of Emergency Plans | No environmental risk management plan and an emergency plan | |
| | Allocation of emergency centers | No emergency centers or police stations | |
| Minimize Cut and Fill in Earthwork | Level of excavations | Deep excavations | Low excavations |
| | Exposure to excavations | High | Low |
| | Impact of Setbacks on Land Use | Setbacks control the horizontal use of lands in both | |
| Rainwater utilization | Preparedness of streetscape specification and design for rainfall | Local pavements are not made of permeable material, | |
| | Preparedness of open lands for rainfall | Vacant lands are left with no boundaries to their surroundings, rainwater is observed mixing with nonporous ground surfaces | |
| | Usage of Rainwater for rooftops | Strategies for rooftop greening are not adopted. | |
| | Usage of Rainwater for buildings | Gutters or any convenience system connecting buildings' roofs to ground levels lead water to the streets. | More potential- due to the single buildings |

Note: Green represents strengths, Red represents weaknesses.

جامعة النجاح الوطنية

كليا الدراسات العليا

# نموذج تصميم مستدام لتقييم الأحياء السكنية: حالة مدينة نابلس

إعداد

ديانا عبد الناصر عمر عناب

إشراف

د. زهراء زواوي

د. سامح منى

قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في برنامج الهندسة المعمارية، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

2024

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## الملخص

يلعب التصـــميم العمراني المســـتدام للأحياء الســـكنية دوراً مهماً في الجهود المبذولة لتحقيق أهداف التنمية المســـــتدامة والتخفيف من آثار تغير المناخ. تهدف هذه الأطروحة إلى تطوير نموذج تقييم للتصـــــميم الحضـري المسـتدام للأحياء السـكنية المحلية، وهو مفقود في الممارسـة المحلية الحالية. تم بناء النموذج على العديد من أدوات تقييم استدامة الأحياء الدولية، استناداً إلى مراجعة أدوات التقييم الحالية، لدراسة حالة اسـتدامة الأحياء الفلسـطينية، وتطوير نموذج مؤشـر مسـتدام لتقييم الأحياء المحلية المسـتدامة. تتم مقارنة حالة استدامة حيين حسب موقعهما وحالة التخطيط؛ المريج والمساكن. يتم استخدام أدوات الكمبيوتر مثل أدوات (Urbano) ونظم المعلومات الجغرافية وكذلك طرق التقييم النوعي .أظهرت نتائج دراســة الحالة أن الموقع وحالة التخطيط يؤثران على مســتوى الاســتدامة لكل حي، ويتضــح ذلك من خلال عدد نقاط القوة والضـــــعف. أدى الموقع الغربي للمريج إلى زيادة إمكانية الحصـــــول على فرص عمل، كما أدى الموقع المحيطي لحي المسـاكن إلى زيادة تعرضــه لعدم الأمان. بنفس القدر من الأهمية هو نمط التخطيط، الذي يؤثر على مؤشرات الشوارع التي يمكن السير فيها والوصول إلى العبور الجيد في كلا الحيين. علاوة على ذلك، وجد تقييم المؤشرات المقاسة أن بعض المؤشرات من أدوات استدامة الأحياء الدولية قد تم الوفاء بها جزئياً أو كلياً، وظهرت بعض الثغرات بســبب عدم وجود نقاط قوة في المؤشــرات المختارة للأدوات الدولية عند اســـــتخدامها للجوانب الاجتماعية والبيئية والحكومية المحلية، و وجود قضـــــايا في إدراج العناصـــــر الاقتصـــادية والبيئية في التكوينات الحضـــرية الحالية. يقدم النموذج المحلي المقترح رؤى قيمة للحكومات المحلية والبلديات ومطوري البناء.

**الكلمات المفتاحية:** تصميم مستدام؛ الاحياء السكنية؛ مدينة نابلس