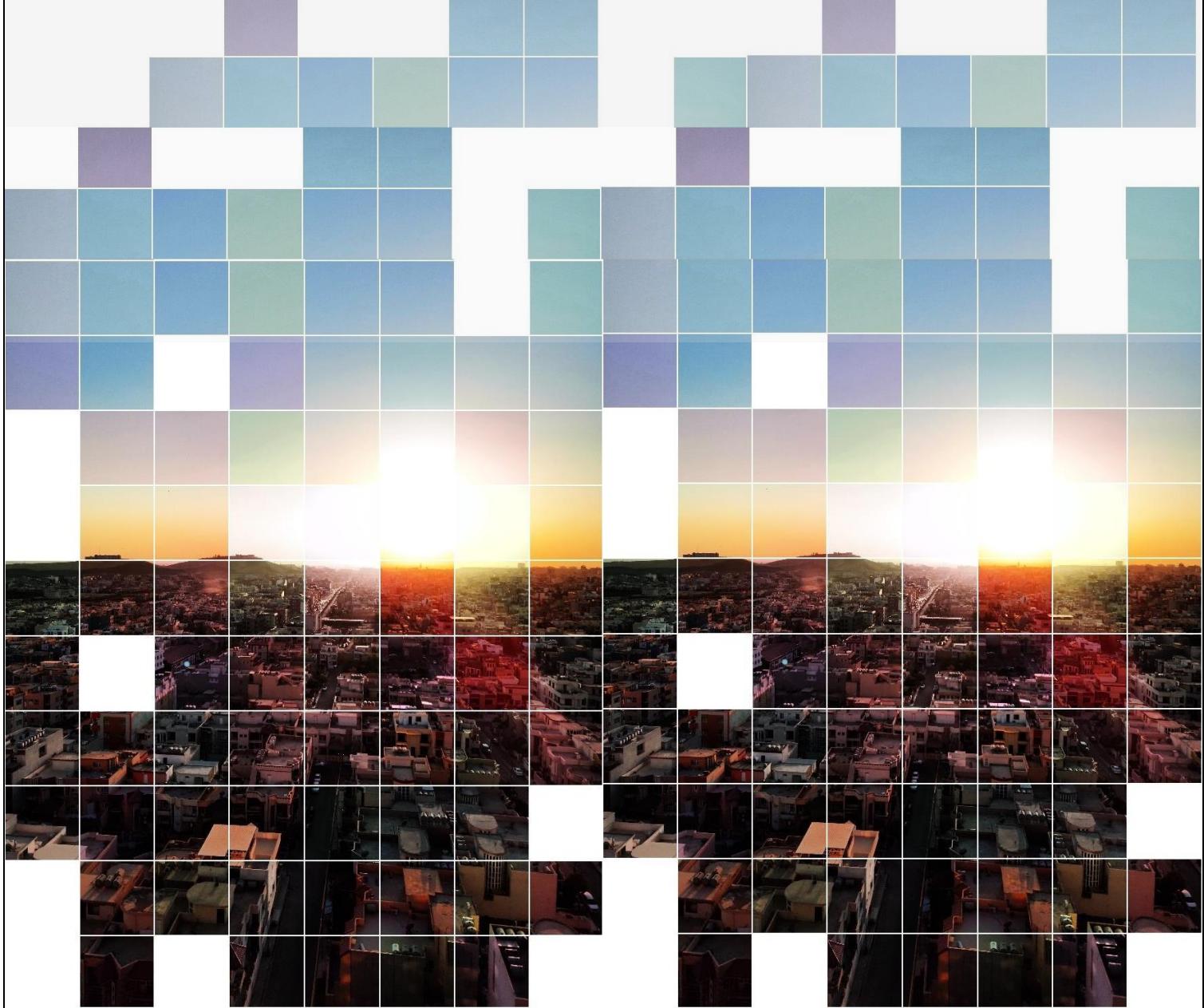


ASSESSMENT OF THE APPLIED REGULATIONS ON THE URBAN FORM IN NEIGHBORHOOD, DUHOK CITY

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University of Duhok, College of Spatial Planning, Department of Spatial Planning

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Spatial Planning College

Universities of Duhok & TU Dortmund

Assessment of the Applied Regulations on the Urban Form in Neighborhood, Duhok City



Prepared by:

Rozh Ali

Herman Mufti

Binak Jalal

Hayvgir Naji

Shahad Badie

Supervisors:

Mr. Qaidar Namo

Dr. Ismaeel Hajani

Table of Contents

Chapter One: Introduction	1
2021-2022	
1.1 Main Introduction	1
1.2 Problem Statement.....	4
1.3 Research Questions	5
1.4 Research Objective	5
1.5 Significance of the Study	5
1.7 Background of Study Area.....	6
Chapter Two: Literature Review	9
2.1 Sustainability of Urban Form of Environment	9
2.1.1 Introduction to Neighborhood	9
2.1.2 Sustainability of Neighborhood	12
2.1.3 Sustainable Dimensions of Neighborhoods.....	14
2.2 Understanding Urban Form & its Elements	19
2.2.1 Density and Urban Form.....	20
2.2.2 Urban Form and Land use.....	21
2.2.3 Transport Infrastructure and Urban Form	22
2.2.4 Housing/Building Type and Urban Form.....	23
2.2.5 Urban Layout	24
2.3 Urban Form Regulation	25
2.3.1 Standards	27
2.3.2 Creation and Implementation of Standards	28



2.4 Measuring Urban from Element Methods	32
2.4.1 Measuring Density	33
2.4.2 Measuring Land Use.....	34
2.4.3 Measuring Accessibility and Transport Infrastructure	35
2.4.4 Measuring Housing/Building Characteristics	36
2.4.5 Measuring Layout.....	37
2.5 Analysis of Urban Form Elements of Neighborhoods Austin, Texas.....	38
2.6 Conceptual Framework.....	48
Chapter Three: Methodology	49
3.1 Participant and Context	49
3.2 Structure of Data Collection Methods	49
3.2.1 Type of Data	49
3.2.2 Methods of Data Collection.....	50
3.3 Case Study & Selected Sample	52
3.3.1 Case Study	52
3.3.2 Justification of Sample Selection	56
3.3.3 Sampling Process	56
3.3.4 Participants.....	58
3.4 Strategy of Data Collection	60
3.5 Difficulties and Limitation	61
Chapter Four: Result & Discussion	62
 4.1 Density & Distribution of Housing Type of Urban Form Elements	64
 4.2 Planning Standards Regarding Land-Uses and Community Buildings	65
 4.3 Transportation Infrastructure Standards for Neighborhoods	69
 4.4 Characteristics of Building Types.....	71
 4.5 Planning Standards Regarding Urban Layout	71
 4.6 Standards Creation Procedure of Urban Elements in Neighborhoods in KRG	72
 4.6.1 Kurdistan Region Laws and Standards Process	72
 4.6.2 Iraqi Laws and Standards.....	73
 4.7 Standards Enforcement on Case-Studies.....	74



4.7.1 Density Element & Building Characteristics Analysis in Case Studies	74
4.7.3 Transportation Infrastructure of Case Studies.....	87
4.8 Questionnaire Analysis.....	106
1.1 Gender.....	107
1.2 Age.....	108
1.3 No. of People in the House.....	109
1.4 Number of Floors of the Dwelling	110
1.5 Education Level.....	111
1.1 Gender.....	112
1.2 Age.....	113
1.3 Number of People in the House	114
1.4 Number of Floors of the Dwelling	115
1.5 Education Level.....	116
1.1 Gender.....	117
1.2 Age.....	118
1.3 Number of People in the House	119
1.4 Number of Floors of the Dwelling	120
1.5 Education Level.....	121
B. Neighborhood Satisfaction Analysis	122
1.1 Building Type & Housing.....	122
1.1.1 The Uncomfortable of People in their Houses.....	122
1.1.2 The Size of Dwelling does not Fit the Number of People in House	123
1.1.3 People Building more Floors than Number Allowed in the Neighborhood.....	124
1.1.4 People Constructing Buildings Against Municipality Rules	125
1.2 Transportation	126
1.2.1 The Street Size Can Handle the Number of Cars in the Neighborhood	126
1.2.2 Enough Parking lots in Neighborhood.....	127
1.2.3 Public Transportation does not Appear in Neighborhood.....	128
1.2.4 Walking and Cycling Around Neighborhood is Safe.....	129
1.2.5 Crossing Main Street is Safe	130



1.2.6 All the Roads are Connected Together Within the Neighborhood	131
1.2.7 People have Access to Services Within the Neighborhood	132
1.3 Land Use	133
1.3.1 Each Block in Neighborhood has Multiple Land-Uses.....	133
1.3.2 All the Houses are Built Properly with Good Aesthetic View	134
1.1. Budling Type & Housing.....	136
1.1.1 The Uncomfortable of People in their Houses.....	136
1.1.2 The Size of Dwelling does not Fit the Number of People in House	137
1.1.3 People Building more Floors than Number Allowed in the Neighborhood.....	138
1.1.4 People Constructing Buildings Against Municipality Rules	139
1.2 Transportation	140
1.2.1 The Street Size Can Handle the Number of Cars in the Neighborhoods	140
1.2.2 Enough Parking lots in Neighborhood.....	141
1.2.3 Public Transportation does not Appear in Neighborhood.....	142
1.2.4 Walking and Cycling Around Neighborhood is Safe.....	143
1.2.5 Crossing Main Street is Safe	144
1.2.6 All the Roads are Connected Together Within the Neighborhood	145
1.2.7 People have Access to Services Within the Neighborhood	146
1.3 Land Use	147
1.3.1 Each Block in Neighborhood has Multiple Land-Uses.....	147
1.3.2 All the Houses are Built Properly with Good Aesthetic View	148
1.1 Budling Type & Housing.....	150
1.1.1 The Comfortability of People in their Houses	150
1.1.2 The Size of Dwelling does not Fit the Number of People in House	151
1.1.3 People Building more Floors than Number Allowed in the Neighborhood.....	152
1.1.4 People Constructing Buildings Against Municipality Rules	153
1.2 Transportation	154
1.2.1 The Street Size Can Handle the Number of Cars in the Neighborhoods	154
1.2.2 Enough Parking lots in Neighborhood.....	155
1.2.3 Public Transportation does not Appear in Neighborhood.....	156



1.2.4 Walking and Cycling Around Neighborhood is Safe.....	157
1.2.5 Crossing Main Street is Safe	158
1.2.6 All the Roads are Connected Together Within the Neighborhood	159
1.2.7 People have Access to Services Within the Neighborhood	160
1.3 Land Use	161
1.3.1 Each Block in Neighborhood has Multiple Land-Uses.....	161
1.3.2 All the Houses are Built Properly with Good Aesthetic View	162
Chapter Five: Conclusion & Recommendations.....	164
5.1 Conclusion	164
5.2 Recommendations	166
5.2.1 Density Element	166
5.2.2 Land-Use Element.....	166
5.2.3 Transportation Infrastructure Element	166
5.2.4 Building Type/ Housing Element.....	166
5.2.5 Layout element.....	167
References.....	168
Appendix	173



List of Figures

Figure 1: Kurdistan – Duhok City Map.....	8
Figure 2: In planned Urban centers, a typical urban structure can be seen. (Phoenix, Arizona) .	12
Figure 3: In historic districts, a typical urban design. (Fes, Morocco)	13
Figure 4: Sustainability Dimensions.....	15
Figure 5: Sustainability level.....	16
Figure 6: Urban form elements.....	19
Figure 7: The relation between urban form and land use.....	22
Figure 8: Residential settlement types with face-to-face design according to building type...	23
Figure 9: A subdivision in Phoenix, Arizona, showing single-family housing and parking lots around parks, blocking access.....	26
Figure10: Existing pattern of zones around two parks in north central Phoenix, Arizona.....	26
Figure 11: Main elements of form-based code.....	29
Figure 12: Sidewalk Standards Design.....	29
Figure 13: Location of Seven Neighborhoods in Austin.....	38
Figure14: Hyde Park - real land usage and grid-based land use.....	40
Figure 15: East Austin - real land usage and grid-based land use.....	41
Figure 16: Govalle - real land usage and grid-based land use.....	41
Figure17: Stassney - real land usage and grid-based land use.....	42
Figure18: Spicewood - real land usage and grid-based land use.....	42
Figure19: Jollyville - real land usage and grid-based land use.....	43
Figure20: Nuckols - real land usage and grid-based land use.....	43
Figure 21: Key to Grid version of land-uses.....	44
Figure 22: Conceptual framework of the literature review.....	47
Figure 23: Duhok city neighborhoods.....	53
Figure 24: Selected case Studies.....	54



Figure 25: The development of Duhok city through three-time phases.....	55
Figure 26: Random Sampling.....	56
Figure 27: Cluster Sampling.....	56
Figure 28: Cross section of road 30m width.....	69
Figure 29: Cross section of road 20m width.....	69
Figure 30: Cross section of road 10-, 12-, And 15-meter width.....	70
Figure 31: Building orientation in case-studies.....	78
Figure 32: Land uses of Masike neighborhood.....	82
Figure 33: Land uses of Ashty neighborhood.....	82
Figure 34: Land uses of Shelle neighborhood.....	83
Figure 35: Transportation infrastructure of Masike neighborhood.....	87
Figure 36: Transportation infrastructure of Ashty neighborhood.....	88
Figure 37: Transportation infrastructure of Shelle neighborhood.....	89
Figure 38: Sidewalks of Ashty neighborhood.....	90
Figure 39: Sidewalks of Ashty neighborhood.....	90
Figure 40: Case study (Masike) transportation infrastructure conditions.....	91
Figure 41: Case study (Ashty) transportation infrastructure conditions.....	92
Figure 42: Case study (Shelle) transportation infrastructure conditions.....	93
Figure 43: Service access within Ashty neighborhood.....	95
Figure 44: Service access within Masike neighborhood.....	97
Figure 45: Service access within Shelle neighborhood.....	99
Figure 46: Layout of Masike neighborhood.....	101
Figure 47: Layout of Ashty neighborhood.....	101
Figure 48: Layout of Shelle neighborhood.....	101
Figure 49: Visual analysis of Masike neighborhood.....	102
Figure 50: Visual analysis of Ashty neighborhood.....	103



Figure 51: Visual analysis of Shelle neighborhood.....	103
Figure 52: Sampling Location map.....	105
Figure 53: Gender Percentage in Ashty Neighborhood.....	106
Figure 54: Age Percentage in Ashty Neighborhood.....	107
Figure 55: Percentage of People Number in the Houses in Ashty Neighborhood.....	108
Figure 56: Number of Floors of the dwelling in Ashty Neighborhood.....	109
Figure 57: Education Level in Ashty Neighborhood.....	110
Figure 58: Gender Percentage in Masike Neighborhood.....	111
Figure 59: Age Percentage in Masike Neighborhood.....	112
Figure 60: Percentage of People Number in the Houses in Masike Neighborhood.....	113
Figure 61: Number of Floors of the dwelling in Masike Neighborhood.....	114
Figure 62: Education Level in Masike Neighborhood.....	115
Figure 63: Gender Percentage in Shele Neighborhood.....	116
Figure 64: Age Percentage in Shele Neighborhood.....	117
Figure 65: Percentage of People Number in the Houses in Shele Neighborhood.....	118
Figure 66: Number of Floors of the dwelling in Shele Neighborhood.....	119
Figure 67: Education Level in Shele Neighborhood.....	120
Figure 68: Percentage comfortable of People in their Houses in Masike neighborhood.....	121
Figure 69: Size of Dwelling does not Fit the Number of People in Housed in Masike neighborhood.....	122
Figure 70: People Building more Floors than Number Allowed in the Masike neighborhood.....	123
Figure 71: People Constructing Buildings Against Municipality Rules in Masike neighborhood.....	124
Figure 72: The Street Size Can Handle the Number of Cars in the Masike Neighborhood.....	125
Figure 73: Enough Parking lots in Masike Neighborhood.....	126
Figure 74: Public Transportation does not Appear in Masike Neighborhood.....	127
Figure 75: Walking and Cycling Around Masike Neighborhood is Safe.....	128



Figure 76: Crossing Main Street is Safe in Masike neighborhood.....	129
Figure 77: All the Roads are Connected Together Within the Masike Neighborhood.....	130
Figure 78: People have Access to Services Within the Masike Neighborhood.....	131
Figure 79: Each Block in Neighborhood has Multiple Land-Uses in Masike neighborhood....	132
Figure 80: All the Houses are Built Properly with Good View in Masike neighborhood.....	133
Figure 81: Percentage comfortable of People in their Houses in Ashty neighborhood.....	135
Figure 82: Size of Dwelling does not Fit the Number of People in Housed in Ashty neighborhood.....	136
Figure 83: People Building more Floors than Number Allowed in the Ashty neighborhood.....	137
Figure 84: People Constructing Buildings Against Municipality Rules in Ashty neighborhood.....	138
Figure 85: The Street Size Can Handle the Number of Cars in the Ashty Neighborhood.....	139
Figure 86: Enough Parking lots in Ashty Neighborhood.....	140
Figure 87: Public Transportation does not Appear in Ashty Neighborhood.....	141
Figure 88: Walking and Cycling Around Ashty Neighborhood is Safe.....	142
Figure 89: Crossing Main Street is Safe in Ashty neighborhood.....	143
Figure 90: All the Roads are Connected Together Within the Ashty Neighborhood.....	144
Figure 91: People have Access to Services Within the Ashty Neighborhood.....	145
Figure 92: Each Block in Neighborhood has Multiple Land-Uses in Ashty neighborhood....	146
Figure 93: All the Houses are Built Properly with Good View in Ashty neighborhood.....	147
Figure 94: Percentage comfortable of People in their Houses in Shele neighborhood.....	149
Figure 95: Size of Dwelling does not Fit the Number of People in Housed in Shele neighborhood.....	150
Figure 96: People Building more Floors than Number Allowed in the Shele neighborhood.....	151
Figure 97: People Constructing Buildings Against Municipality Rules in Shele neighborhood.....	152



Figure 98: The Street Size Can Handle the Number of Cars in the Shele Neighborhood.....	153
Figure 99: Enough Parking lots in Shele Neighborhood.....	154
Figure 100: Public Transportation does not Appear in Shele Neighborhood.....	155
Figure 101: Walking and Cycling Around Shele Neighborhood is Safe.....	156
Figure 102: Crossing Main Street is Safe in Shele neighborhood.....	157
Figure 103: All the Roads are Connected Together Within the Shele Neighborhood.....	158
Figure 104: People have Access to Services Within the Shele Neighborhood.....	159
Figure 105: Each Block in Neighborhood has Multiple Land-Uses in Shele neighborhood.....	160
Figure 106: All the Houses are Built Properly with Good View in Shele neighborhood.....	161



List of Tables

Table 1: Population size of Duhok province (2015-2020).....	7
Table 2: Housing distribution of Duhok City.	7
Table 3: Density indicators.....	33
Table 4: Land-use indicators.....	35
Table 5: Accessibility indicators.....	36
Table 6: Building characteristic indicators.	37
Table 7: The number of neighborhoods and their population in the city of Duhok.	53
Table 8: Sampling equation.	59
Table 9: Sampling Size for Each Neighborhoods.....	60
Table 10: Strategy of Data Collection.....	60
Table 11: Neighborhood foundation.....	63
Table 12: Distribution of Housing types.....	64
Table 13: Neighborhood density.....	64
Table 14: Iraqi planning standards for community services (Mahala).	65
Table 15: Iraqi planning standards for community services (Neighborhood)	65
Table 16: Iraqi planning standards for community services (Sector).....	66
Table 17: community facilities-planning standards.....	67
Table 18: Obligatory plot area for one family houses.	68
Table 19: Width of roads according to the standards with sidewalk.	70
Table 20: Characteristics buildings in Masike.....	75
Table 21: Characteristics of buildings in Ashty.....	76
Table 22: Characteristics of buildings in Shelle.	78
Table 23: Measuring land uses of Masike neighborhood.	80
Table 24: Measuring land uses of Ashty neighborhood.	80
Table 25: Measuring land uses of Ashty neighborhood.	81
Table 26: services availability within the case studies..	83
Table 27: Required land for each service based on density of the cease study	84



Table 28: scales of the streets and sidewalks of the three neighborhood (Masike, Shele, and Ashti)	100
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Chapter One: Introduction

1.1 Main Introduction

As cities and metropolitan regions continue to change and grow dynamically, there are evident consequences for the urban ecosystem and personal well-being. Understanding the development process of a certain urban setting, the rate of urbanization and urban growth, and the major causes affecting the urban environment are critical (Hajani, 2019). The primary factor for urban expansion is the migration of people from rural to urban regions (UN-DEAS, 2001).

As a result of population growth, metropolitan areas must expand geographically in order to meet increased demands for housing, infrastructure, and facilities. In order to accommodate new development efforts, cities must enlarge and raise in relations of land scope (Oktay & Conteh, 2007). The settlement expands in two ways: outside as a spatial growth and internally as a physical expansion. Individual growth increases the inner urban population and built-up area (Mobaraki, Mohammadi, & Zarabi, 2012). Therefore, the process of controlling growth is a task of policies, regulations by a method through which a local authority governs the density, kind, and amount of new building within a specified region by imposing a set of restrictions (Albayrak & Eryilmaz, 2021).

The shape, size, density, and layout of the settlements are all physical characteristics of the urban form. It is visible from regional to urban, neighborhood, 'block,' and road levels. The city's metropolitan area has evolved since human settlement began and is constantly being shaped by policies in various sectors in answer to community, conservational, financial, and technical loans (Albayrak & Eryilmaz, 2021).

Sustainability is defined as meeting today's needs while remaining mindful of the capability to encounter the needs of coming generations. The goal of sustainable urban development is to ensure that urban growth is compatible with the environment. This effort has three components. These are the principles of spatial expansion, environmental-ecologic progress and socio-economic growth. Even as spatial development of neighborhoods, which includes strategies focusing on neighborhood urban form, addresses urban growth primarily within the urban sprawling-compact growth dilemma, socio-economic development focuses on production, quality of life, human



development, livable neighborhood and a healthy society. Environmental-ecologic values, which are prioritized from the environmental standpoint, seek to minimize the harm done to the ecosystem while also protecting ecological protection. With the combination of these three dimensions, sustainable urban development within the neighborhood can be achieved (Albayrak & Eryilmaz, 2021).

In order to achieve sustainability goals, urban policy has progressively prioritized smaller cities and greater density urban forms. Urban Design and planning are important influences in achieving sustainable outcomes. The importance of urban form rules in setting the basis for lengthy urban development is crucial. The purpose of the sustainable urban development process is to acquire the status of "Sustainability" for urban communities. In other words, the goal is to develop or strengthen the characteristics of sustainability in the city's neighborhood's economic, social, cultural, and environmental life (Ahmedi et al., 2011).

Over the last five decades, Iraq has been subjected to a sequence of conflicts and additional political struggles, which have rendered the country unbalanced and hampered the achievement of planning organizations, physical development designs, and the damage of social and physical infrastructure. As a consequence, cities in the Kurdistan Region, as well as throughout Iraq, failed to keep a record of wise planning schedules, resulting in numerous disputes in city shape and organization and having minimal impact on land use pattern, a requirement of vital infrastructure, and the reliability of the urban fabric. The consequences of such change and transformation are visible in the form of a slew of effects on social, economic, and environmental dimensions. During the last fifteen years, the Kurdistan District and the metropolitan city of Duhok experienced rapid building and construction phases that were unmanageable and poorly planned; consequently, this has resulted in a type of urban form and structure that is malfunctioning and not user-friendly (Hajani, 2019).

There are essentially no good laws in Kurdistan's urban development legislation and policy to manage urban form and structure, as well as the development process. As a result, considerable information gaps exist. In Kurdistan, there is no established data to determine if aspects of sustainable cities, such as layout, density, ease of access, and availability of green areas, influence



the sustainability of towns and cities. Similarly, no examination of current urban structures (e.g., vast communities expanding from the city center) has been conducted to illustrate how they may negatively affect inhabitants' access to utilities and services, hence affecting the quality of the urban built environment. Layout, block type, open space, land use pattern, and street pattern are all aspects of urban shape and structure that have an influence on social and environmental sustainability. The social and environmental elements in Iraqi and Kurdistan cities were not explored early in the development phases, though, unless genuine physical impacts on the shape and structure of the city were observed and became chronic urban issues (Hajani, 2019).



1.2 Problem Statement

In the city, the negative consequences of urban form are widely acknowledged. The past two decades of rapid urban growth have led to many issues in Duhok city. The weaknesses of each urban element affect each other, leading to urban form disastrous consequences that are directly connected with the lack of planning standards & codes.

Population density has a negative impact on the city's urban form. Over two decades in Duhok city, variations in population density, unbalanced distribution of population density, and population growth contributed to an unmanageable city. Therefore, land-use demands increased and developing the infrastructure connected with land-use problems created neighborhoods that lack open spaces and recreational areas such as parks, Infrastructure overcrowding, service accessibility, invasion of the natural regions, and depressing urban landscapes.

The problem in the building feature relies on building age, type, and height. The new residential complexes, projects, residential housing of the city are constructed randomly without specific height and type, and without preserving the living circumstances in nearby communities, particularly the privacy, sun access, and individuality of surrounding dwellings

The transportation infrastructure and network shape the spatial organization of the city. The existing transport infrastructure is not Effective and efficient that serves all needs of a community by offering transport infrastructure for pedestrians, vehicles, bicycle ways, and car parking. Also, it doesn't consider safe sidewalks, walkable streets. And this issue has followed the rapid urbanization that occurred in the city which led to developing quick transport infrastructure. As for the city's old neighborhoods, some parts suffer from adequate maintenance of the existing infrastructure, all of which contribute to a poorly regulated layout of the urban form.

Duhok city doesn't evolve to reflect and respond to significant changes. It doesn't react to intra-urban challenges that focus on planning regulations such as growth management, coordinating land use plans, and promoting affordable public transportation its infrastructure with incentives for maintenance.



1.3 Research Questions

The main research question is:

To what extent are the regulations of urban forms applicable?

1. To what extend the Iraqi national housing standards are contributed in shaping urban form?
2. What strategies and mechanism are used to enforce regulations by planning institutions?
3. To what extent are the rules and standards of urban form elements enforced in the current case study?

1.4 Research Objective

The research aims to identify the guidelines of urban form elements to provide a sustainable neighborhood/ city neighborhoods' livability for future housing developments.

- Identifying the regulations, codes, and standards that affect the creation and transformation of urban form.
- To determine the challenges that imposed regulations are not enforced applied on the ground appropriate.
- To provide recommendations of the urban form flaws in Duhok city to stakeholders & decision-makers regarding further city developments.

1.5 Significance of the Study

This project was carried out to provide assessments of the city of Dohuk's urban form. The current situation has been impaired by irrelevant reviews, regulations, policies, and standards. Studying and presenting assessments and regulations according to standards results in creating a plan that will assist the government, stakeholders, and the relevant authorities resolve the problem. Residents of Duhok are subjected to random and inappropriate designs, so fixing or assisting in resolving them can significantly improve residents' lives and make better use of plans.



1.7 Background of Study Area

Kurdistan Territory in northern Iraq is an independent region. It is bordered on the east by Iran's Kurdish areas, on the north by Turkey, on the west by Syria, and on the south with the rest of Iraq. Erbil, also known as Hewlêr in Kurdish, is the regional capital. Erbil's Citadel is thought to be the world's oldest continually inhabited settlement. Slemani and Duhok are the next two largest cities. The Kurdistan Regional Government is in charge of the region (KRG). The region covers approximately 40,000 square kilometers and has a population of 5.2 million people. This excludes parts of Kurdistan that are not under KRG administration, such as Kirkuk. Geographically, the region is varied, ranging from hot and arid plains to cooler alpine areas with natural springs and winter snowfall (Kurdistan in brief, 2021).

Duhok is located in northwest Iraq, in the western portion of the Kurdistan region, approximately 470 kilometers north of Baghdad, at a height of 430-450 meters above sea level. Duhok city is part of the Duhok governorate, which also includes the districts of Sumeal, Zakho, Amedy, Sheikhan, and Akre. The city is crossed by two rivers: the Duhok River and the Heshkarow River, smaller and seasonal. Both rivers meet in the city's southwest corner, and the water is primarily used for irrigation, which helps preserve the city's green spaces (Duhok Private Technical Institute, 2015).

Over the last two decades, Duhok province has faced a rapid expansion with a population growth rate of 2.6% (see table 1). with a family size of 6.8 in urban areas and 6.9 members per family in rural areas. Rural-urban migration and refugee returns have also resulted in significant population growth. For example, between 1978 and 1989, the Anfal campaigns against Kurds in various parts of Iraqi Kurdistan deported thousands of people. Population shift has resulted in the city's unplanned expansion from the south, west, and east. Immigrants have mostly settled in the city (Duhok Private Technical Institute, 2015).



Table 1:Population size of Duhok province (2015-2020). **Source:** (<https://www.mop.gov.iq/>).

Year	Duhok province population	Duhok city population
2015	1,193,815	314,840
2016	1,226,250	323,391
2017	1,259,150	332,069
2018	1,292,535	340,871
2019	1,326,562	349,848
2020	1,361,052	358,943

Table 2:Housing distribution of Duhok City. **Source:** (<https://www.unfpa.org/>).

Houses distribution	Houses	Apartments	Clay house	Others	Total
Duhok city occupants	89.4%	8.4%	1.9%	0.2%	100%

Nevertheless, the city's urban areas have seen rapid expansion. Most urban developments occurred between 1973 and 1984, between 1986 and 1994, and especially after 2006. For example, the city's urban area grew from 10.25 hectares in 1923 to 224.58 hectares in 1977, then from 535.83 hectares in 1987 to 2794.6 hectares in 2007. Such occurrences have disastrous consequences for various city sectors (Duhok Private Technical Institute, 2015).

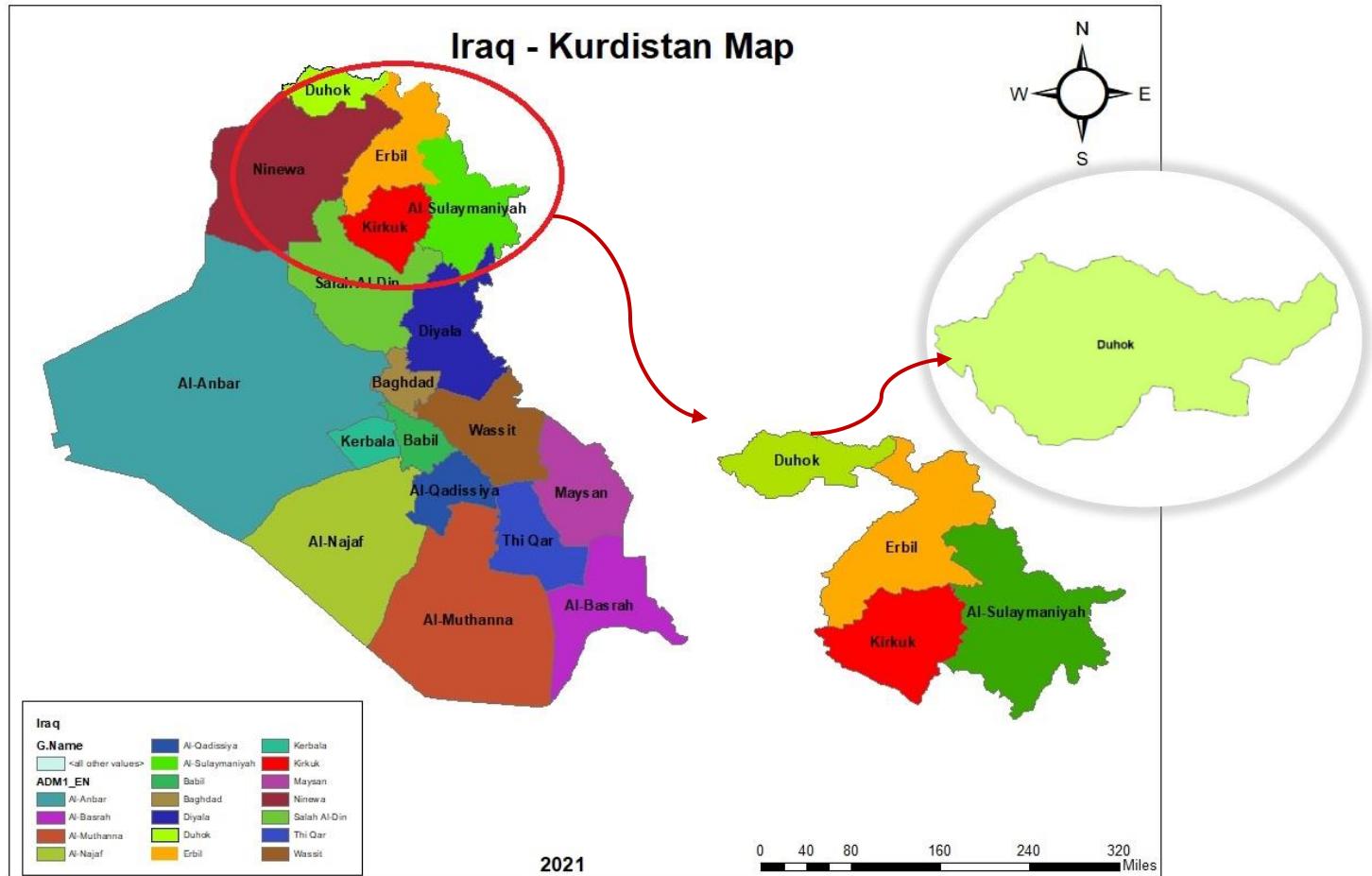


Figure 1: Kurdistan – Duhok City Map. Source: (Researcher Via ArcMap, 2021).



Chapter Two: Literature Review

2.1 Sustainability of Urban Form of Environment

Through overall, sustainable urban form can be characterized as reaching sustainable urbanization by arranging its form, feature, and ability to adapt to evolve over time, and that sustainable urban form is applicable to residents' behavior within the constructed environment, encouraging residents to be more active and to favorably apply urban spaces. A sustainable urban form includes various aspects of urban sustainability in dwelling, purchasing, and generating (Ahmed, 2017).

The overarching goal is to strike a stability between environmental, social, and economic sustainability. The primary goal is to make life better in addition to have a sustainable neighborhood while remaining within the carrying capacity of supporting ecosystems (Shaheen, 2009).

2.1.1 Introduction to Neighborhood

A neighborhood is a geographically delimited community within a larger city, town, suburban, or rural location, or a gathering of dwellings or constructions that are tied together as a neighborhood or as a unit. Neighborhoods are often social societies with a high level of face-to-face interactions among residents. A neighborhood is described both physically as a geographical location and practically as a collection of social relationships. Neighborhoods are the geographical divisions in which face-to-face social communications occur – the personal surroundings and circumstances in which residents try to reach common points, socialize children, and maintain successful public control (Neighborhood, 2019).

As a consequence of the residents who stay there and their surroundings, neighborhoods typically have their own character or "style." People may come from similar families, have equivalent finances, and have identical levels of education. In neighborhoods, you can find restaurants, bookstores, and parks (Neighborhood, 2019).



- **Category of Neighborhood**

The concept "neighborhood" has several multiple interpretations and applications. For instance, the term "neighborhood" might show to a small group of dwellings close or a broader area with similar housing styles and market prices. A neighborhood is frequently considered as an area around a local institution frequented by inhabitants, including a chapel, school, or community services agency. It can also be determined by a governmental area or unit. The neighborhood term incorporates either geographic (location) and social (individuals) features (SOCIETY, 2022).

- **Types of the Neighborhood**

1. **Master-planned communities:** supermarket chains, stores, restaurants, and parks are samples. Fitness center, a golf course, walks, handball and basketball, and interior and exterior activities are among the extra attractions.
2. **Urban neighborhood:** those set near a city's business district. They are very accessible, have easy access to public transportation and major highways, are characterized by high condo complexes, and have dense populations. these communities attract to people who want to live in a fast-walked environment. They also have better access to leisure, restaurants, and workplace and don't mind living in a high-rise or tower.
3. **Suburban neighborhood:** many suburban societies use their own center shopping and entertainment areas. Most D.C. suburb also feature town centers with a plethora of purchasing, entertainment, and food selections for people seeking a break from the typical American neighborhood. Suburban neighborhoods frequently have much more greenery and are less walkable to daily essentials.
4. **Pocket neighborhood:** classically, the phrase "pocket neighborhood" relates to a mini-community within a bigger neighborhood. Pocket neighborhoods provide a close-knit society with neighbors close. They also offer attractive green area external, which is success and career in cities. Pocket neighborhoods in Chicago are almost often tucked away in a corner.
5. **Historic neighborhoods:** the United States Department of Justice regulates whether a neighborhood is historically. Local-level cultural zones are also achieved at the county or municipal level. Those typically follow harder laws, such as restrictions on house repairs or architectural elements in the neighborhood.



6. **Active adult communities:** a large number of master-planned societies (MPCs) are regularly active adult neighborhoods. These communities are age-restricted, usually 55 and up, and provide opportunities to maintain an active personal and social life expectancy. Residents are self-sufficient and enjoy living in these communities because of the social clubs and activities.
7. **Unincorporated area:** non-incorporated settlements are frequently confused with cities, but they are quite common. For instance, Paradise, Nevada, is frequently misidentified as Las Vegas, despite the fact that it is unorganized. Extra over half of Los Angeles County is covered of unincorporated areas.

Source: (Hynes. K, 2020).

2.1.2 Sustainability of Neighborhood

People prefer to live in a sustainable neighborhood either present or in the coming. Neighborhoods are serious to achieving global sustainability. Numerous assessment methodologies have been created globally through the last decade to evaluate the ability of an expanding quantity of neighborhood (re)development programs. This shows a rising realization between planners and decision-makers of the relevance of neighborhoods in sustainable expansion planning. Originally, the examination of the physical environment's sustainability was limited to the building level (Sharifi.A, 2013).

The limits of a neighborhood can be determined objectively or informally, and residents can determine the conceptual borders of the area. Residents' views of neighborhood boundaries can be used to map them. Official borders, such as current wards or districts and census collection districts, can also be used to establish neighborhoods. It should be highlighted, however, that administratively selected neighborhood borders do not necessarily correlate with bounds defined by other standards such as perception, aesthetics, or purpose (Sharifi.A, 2013).

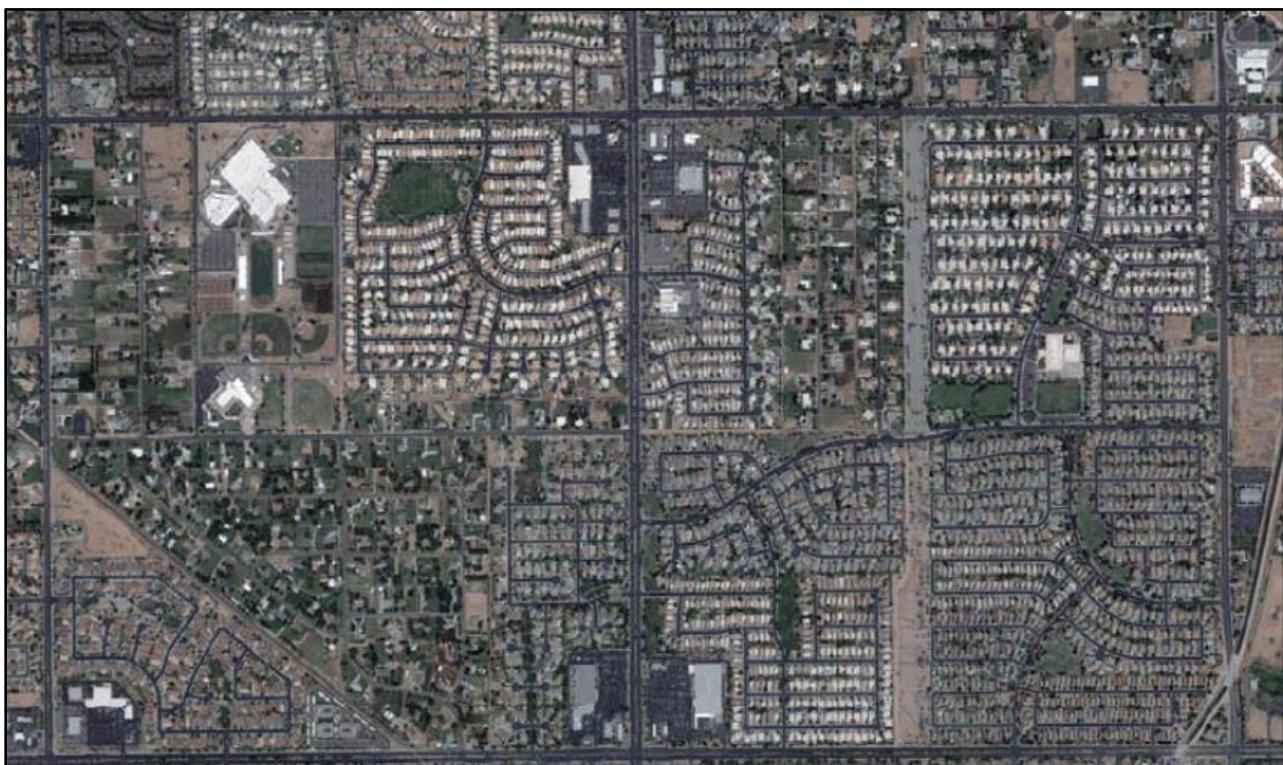


Figure 2: In planned Urban centers, a typical urban structure can be seen. (Phoenix, Arizona). Source: (Sharifi.A, 2013).



Figure 3: In historic districts, a typical urban design. (Fes, Morocco). **Source:** (Sharifi.A, 2013).

The Phoenix City Map (Figure 2) demonstrates that boundary neighborhoods are constructed within facilities (roads, green area). The topography of the northeastern Moroccan city (Fes) (see figure 3) displays that there are no neighborhood limitations, and that households and buildings are built at random without respect for project (Sharifi.A, 2013).



2.1.3 Sustainable Dimensions of Neighborhoods

Sustainable development in a neighborhood comprises the growth of neighborhoods while taking into account three interdependent principles of sustainability: environmental, social, and economic requirements (Dehghanmongabadi, A,2014). As three interconnected circles display, both the social and economic sectors are human constructions that are in need of on the natural environment (Minneapolis,1999).

1.Environmental Sustainability: is described as a high-quality combination of physical qualities and community design that can certify and preserve the presence of a healthy neighborhood environment for inhabitants and the surrounding habitat (Teriman, 2012). The maintenance of capital assets as a source of economic resources produced by natural capital is required for environmental sustainability (BASIAGO, 2021). As well as a total economic absorber defined as (wastes). Extract rates for resources should be kept within recovery charges at the "source site." Waste pollutants from industrial operations must be managed at the 'sink location' so that they do not exceed the environment's tendency to process them without causing harm (BASIAGO, 2021).

2.Economic Sustainability: is characterized as the standard of living in a location (neighborhood) where resources are handled effectively, monetary capital is supplied and preserved, and human capital is employed (Teriman, 2012). Furthermore "economic sustainability" relates to a manufacture system that fulfills current consumption rates without negatively compromising coming demands, expressed as the number of money one can spend over a period while remaining in the same financial status at the conclusion of the duration (BASIAGO, 2021).

3.Social Sustainability: is the state of existing in a place (neighborhood) capable of delivering and sustaining a high standard of living justice of access to important services, security, and social stability (Teriman, 2012). The notions of a society's demands, necessities, and income underpin social sustainability. Human behaviors are employed to address human needs while considering the interdependent process among society and nature, with a focus on the 'man-nature' link on 'human agency' (BASIAGO, 2021).

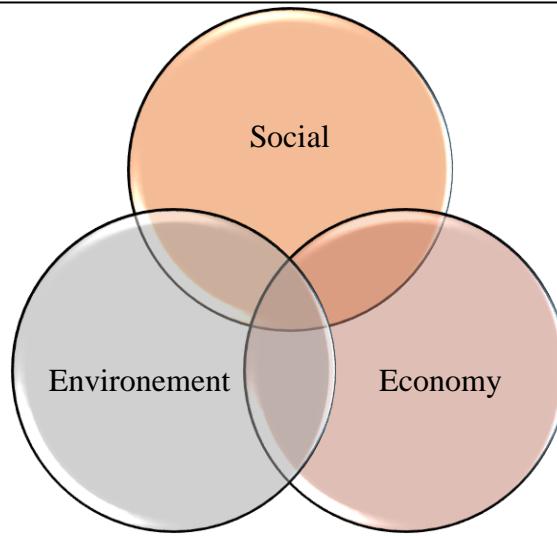


Figure 4: Sustainability Dimensions. **Source:** (Via researchers, 2022).

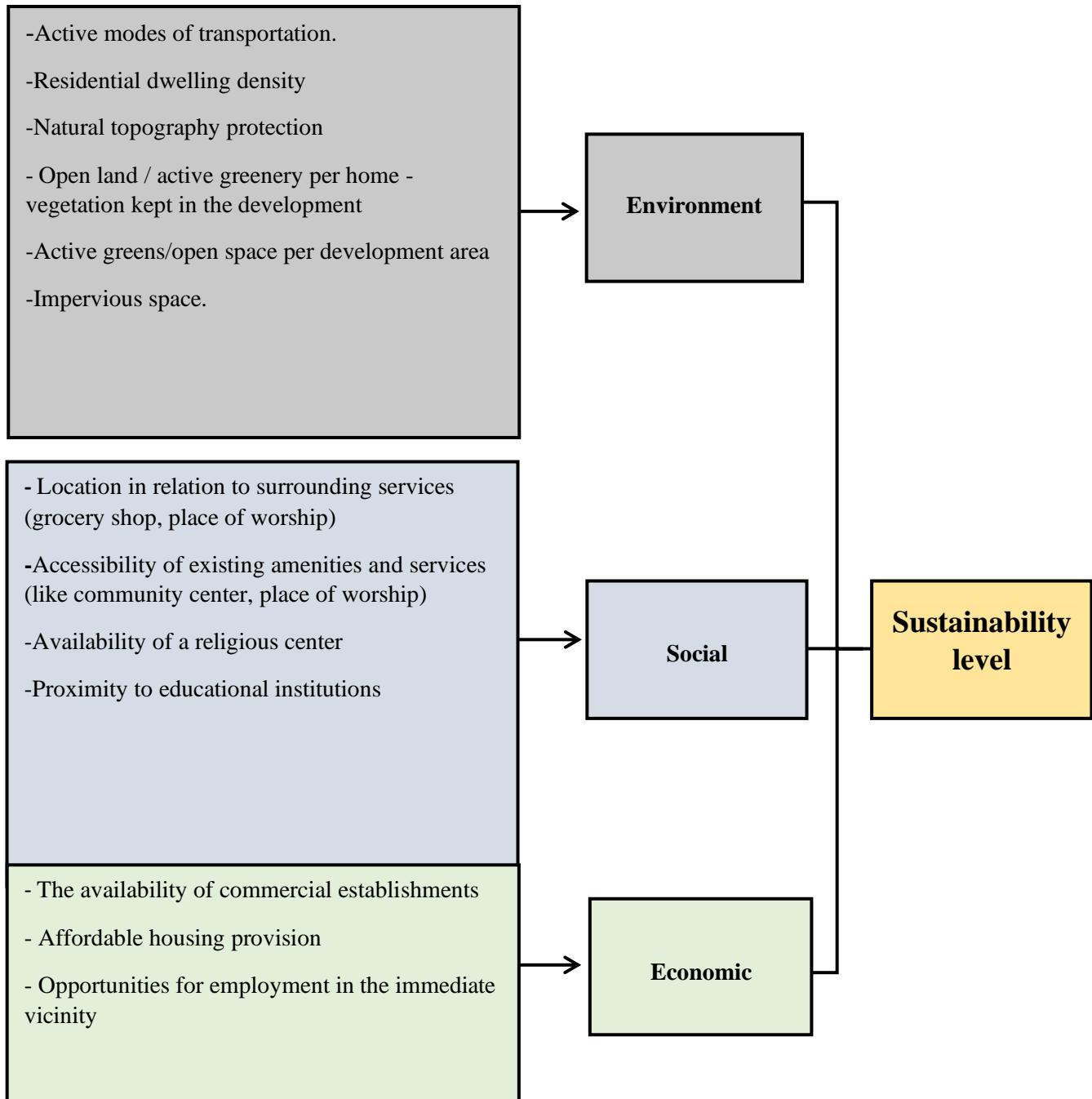


Figure 5: Sustainability level *Source:* (Teriman, 2012).



- **Main Principles of Sustainable Neighborhoods**

Great communities develop from proper planning and intelligent design, consequential in areas that are sustainable, accessible, social, lively, and attractive, enhance the quality of life for residents of all generations and economic levels. Great communities contribute to the success of our city by bringing in new people, business opportunities, and generating energy, all while allowing the city to adjust to change over period. Great neighborhoods are the foundation of a fantastic city (Lodewyk, 2013).

As main planning principles for a sustainable neighborhood, UN-Habitat advocated five pillars: "enough area for streets and an efficient street network, high density, social diversity, and diverse land-use" (Dehghanmongabadi, A,2014).

➤ ***Adequate Space for Streets and an Efficient Street Network***

This approach seeks to build an effective and adequate level of a road system capable of accommodating autos, public transit, and, most significantly, walking and cycling. In addition, the road network is important in the construction and reshaping of the neighborhood structure. As a consequence, this principle serves as the foundation for long-term neighborhood development, as well as to establish a sustainable neighborhood by emphasizing movement (Dehghanmongabadi, A,2014).

➤ ***High Density***

Since the problems caused by fast development, worldwide population growth, and urban expansion, obtaining high density is vital since it is the cornerstone of a sustainable neighborhood. Increased density refers to a concentration of population and their occupations. There are various economic, social, and environmental benefits to high-density expansion (Dehghanmongabadi, A,2014).

➤ ***Social Mix***

This idea strives to create cohesion and connection among diverse social groups within the same neighborhood by designing different residential houses and providing equal access to available urban amenities. A social mix can be achieved through diverse land use and proper



legislation. Furthermore, career opportunities for a wide range of citizens with various incomes are developed (Dehghanmongabadi, A,2014).

➤ ***Mixed Land-use***

This concept works to encourage a diverse range of well-coordinated occupations and land uses close to one another in acceptable and adaptable sites. In addition, different land use has aimed to provide "jobs and businesses, promote economic development, minimize car consumption, encourage walkers, minimize landscape fragmentation, and promote mixed communities." As a consequence, people from various socioeconomic backgrounds live or work in the similar neighborhood, building a social network. As a reason, when various aspects coexist in the same area, dwelling and economic activity must be well-balanced and quite well (Dehghanmongabadi, A,2014).

2.2 Understanding Urban Form & its Elements

There appear to be several efforts to describe the word "urban form." However, there is no uniform definition of urban form, and different experts have interpreted it in various ways (Anderson et al, 1996). Describe urban form as the configuration of various fixed components within a territory. This encompasses a wide range of components such as street layout, housing layouts, urban spaces, land usage, and so on.

Previously (Lynch, 1960). Urban form is defined as the spatial arrangement of a city's big, inert, persistent physical things (Jabareen, 2006). Expanded on the term by stating that urban form is the consequence of merging many aspects and notions of the urban pattern. In clearer words, urban structure is described as the size, shape, and intensity of urban settlements, as well as the spatial institution of various forms of land use. It is also described as the proportion and structure of human habitation inside the city region, with the main factors being density, shape, degree of dispersal or ability to focus, and the quality of public infrastructure (Jabareen, 2006).

In the debate of creating sustainable urban form, urban form is often a composite of a number of factors including land use and land cover, transport networks, and urban planning. As urban form changes, it is important to include all of these factors; other notions to complete an outstanding urban form have evolved, such as 'new urbanism,' 'smart growth' & 'compact city,' (Handy, 1996).

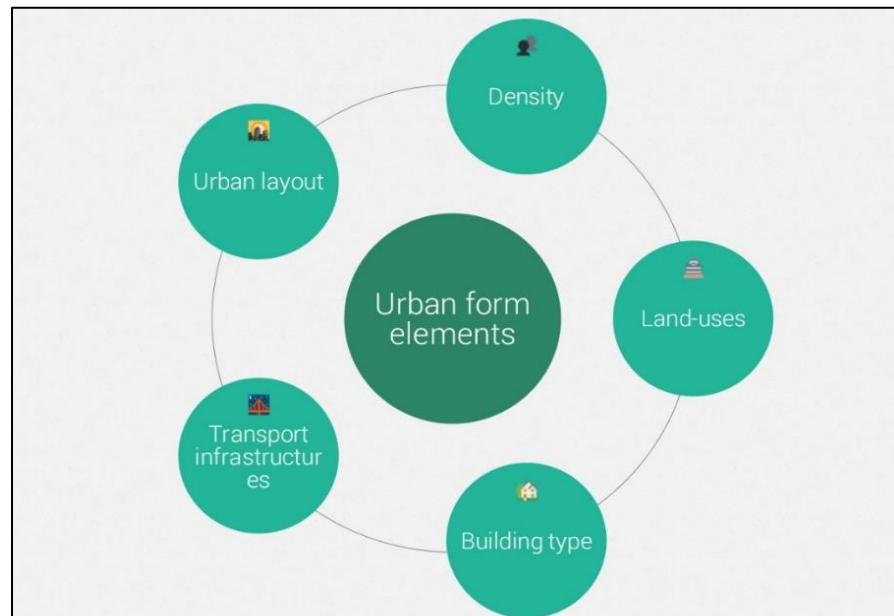




Figure 6: Urban form elements. Source: (Via researchers).

2.2.1 Density and Urban Form

Density is a surprisingly complicated notion with several interconnected aspects. Though it may offer an impartial, locational-based assessment of the number of individuals (dwelling) in a specific region, it is also subjectively appraised, it is a communal explanation based on individual traits, and so may change from one resident to the next (Dempsey, 2008).

There is no universally agreed or accepted metric of population among nations. Density metrics differ in general depending on how the numerators and denominators are defined. Some nations use the number of inhabitants per square kilometer to determine densities (population density). Others, on the other hand, use the number of residential units or the building mass per unit area to describe it (Floor Space Index, or land-use intensity) (Pont & Haupt, 2009). Density may be quantified and defined in a variety of ways, each of which has its own set of applications. In all circumstances, density is stated as a proportion in which the numerator characterizes a specific land base and the denominator reflects an amount of human influence — population, employment, or constructed form. Density is usually measured in terms of a specific unit of land areas, such as housing units per hectare or people per square kilometer. (Shaping the Toronto Region, 2014).



2.2.2 Urban Form and Land use

To satisfy the needs of shifting populations, stimulate neighborhood revitalization, prepare for diversified open spaces, and reinvigorate commercial areas and corridors, urban form and land usage decisions must be properly constructed. These fundamental objectives provide the basis for the General Plan's urban shape and land-use principles (The built environment, 2021).

Urban form refers to the physical equipment and buildings that influence how we experience an area, such as streetscape and the systemic circuit, the shape and size (or "massing") of buildings, block lengths, average residential density, and average non-residential intensity, which are all common indicators and the accessibility of a specific area. Policies that define a pleasant urban form help to create pedestrian encounters that enhance liveliness (The built environment, 2021).

As vision becomes a reality in the physical world, urban form manifests land use. By categorizing these design features, the town's consistency can be measured, and the natural progression from rural to suburban to urban can be identified. Traditionally, the elements of urban form are governed by the society's zoning ordinance, subdivision ordinance, engineering drawings, or architectural design standards (Kyova, 2013).

The term "land use" refers to the various types of activities in a given area. Exact land use classifications will be withheld while development plans and their environmental consequences are reviewed (The built environment, 2021). The built environment is built on the foundation of land use. It establishes the variety, mixture, and general placement of uses inside neighborhoods, as well as the borders for neighborhoods, retail hubs, and employment areas when a community develops a future land use map as part of a comprehensive plan, it makes an effort to impact land-use patterns. A comprehensive plan usually represents the community's vision for promoting local growth and prosperity (Kyova, 2013).

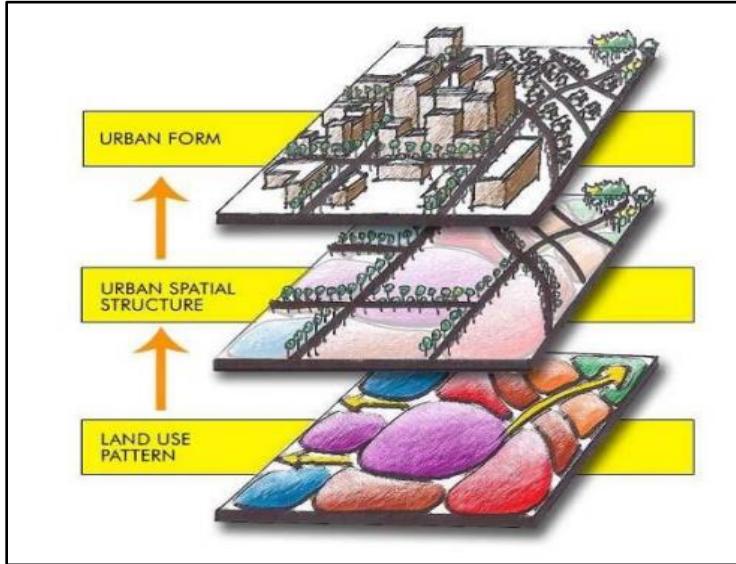


Figure 7: The relation between urban form and land use.
Source: (KYOVA, 2013).

2.2.3 Transport Infrastructure and Urban Form

Transportation is the movement of humans, animals, and products from one point to another. Modes of transportation include air, train, roadway, sea, wire, pipeline, and space. The field may be separated into three categories: infrastructure, vehicles, and operations. Transportation is vital because it enables investors to exchange with each other, which is essential for societies to progress. It includes the required infrastructure like roads, rail lines, airlines, bus stops, shipping containers, truckload stations, resupply depots, seaports, and terminals such as airports, railway stations, bus stations, and warehouses, trucking terminals, refueling depots, and seaports, as well as access points such as airlines, subway stations, bus stops, and warehouses, trucking terminals, refueling depots, and seaports. Both passengers and cargo exchange and repair can be done at terminals (Transport and infrastructure, 2016).

Such networks can accommodate automobiles, bikes, buses, railways, trucks, humans, aircraft, boats, spaceships, and airplanes. The manner in which the trucks are run, as well as the processes in place for this goal, such as funding, laws, and regulations, are all considered part of management. Infrastructure management and administration can be communal or private, based on the nation and form of transportation. Human transit can be communal or private, with planned services offered by businesses. Though bulk transportation is still employed for huge amounts of

durable products, containerization has become the standard in freight transit. Despite the fact that transportation is essential for economic growth and internationalization, a large percentage of forms cause pollution and consume a significant amount of land. Governments extensively fund transportation, but excellent management is necessary to keep traffic flowing and minimize urban expansion. (Transport and infrastructure, 2016).

2.2.4 Housing/Building Type and Urban Form

In urban communities, dwellings and also other building characteristics can have a substantial influence on daily living. Residents in low-density detached houses with vast gardens will have a different urban environment perception than residents of high-rise city center apartments, as previously stated. Building elements, on the other hand, have an influence that goes beyond urban density. Building, elevation, and age may all have an impact on a range of difficulties. These may include the direction of a building as well as its exposure to sunlight and daylight (Dempsey, 2021).

Residential settlement forms include one-family pavilion settlements, flat and elevated buildings, terrace settlement form of row homes, and pavilion courtyard settlement style of older structures. Figure (8) depicts the various building types (Tereci & Erhart, 2010).

The pavilion settlement type of one-family houses, apartment and high-rise blocks, terrace settlement form of row houses, and pavilion courtyard settlement type of older buildings are the residential settlement types. Figure (8) depicts the various building types (Tereci & Erhart, 2010).

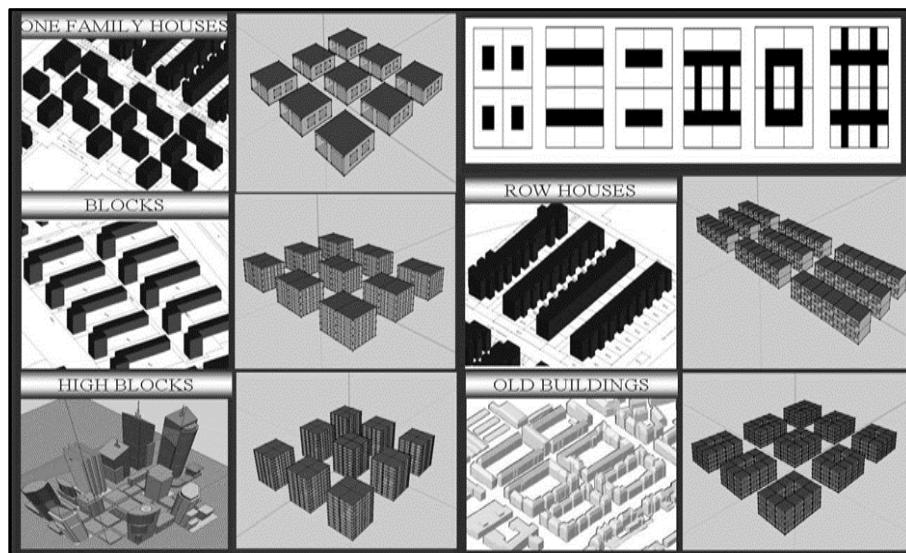




Figure8: Residential settlement types with face-to-face design according to building type. Source: (Tereci & Erhart, 2010).

2.2.5 Urban Layout

Layout refers to the spatial arrangement and configuration of streets, blocks, and buildings, which is often referred to as the street scale. The layouts of today's cities are largely the result of historical development and planning and building regulations. The street network's configuration, in terms of urban block sizes, overall location within the city, and pedestrian and vehicular connectivity, can impact how a city functions, for example, by influencing the location intensity of activities (Dempsey, 2010).

The physical design and structure of roadways, squares, and houses, sometimes known as the street scale, is referred to as layout. Today's city designs are mostly the product of historical growth, as well as planning and construction rules. The architecture of a city's street network, in terms of urban block sizes, general position inside the city, and pedestrian and vehicular connection, can have an influence on how a city runs, for example, by determining activity position concentration (Dempsey, 2010).



2.3 Urban Form Regulation

In order to maximize access, rules can be pretty helpful. An essential element of successful urbanism is that smaller blocks, higher densities, and a narrower pattern enhance the number of people who have access to facilities. Rules influence urban form in a variety of ways, both big and minor. A basic regulation, such as the need for apartments have a second means of escape, can impact building size and shape and how people notice cities. A public commission may be required to agree to a bay window, making bay windows increasingly infrequent. Perhaps a specific density level prompts a design review, leading to lower densities. Minimum step distance rules may determine the number of units in front of a roadway. Laws may encourage the use of specific supplies, examples as brick & steel, which affect the stylishness of urban form. The quantity of car parks spaces necessary for individually housing element influences building layout (Talen, 2012).

Even if a rule is directed, it is designed to address a specific aspect of urban form; it may have unintended consequences. Another difficulty is that what is created is sometimes substantially less than what is allowed by the rules. Many other types of laws have an indirect impact on location; they affect it as a by-product of another goal. The most important are (1) building rules, (2) financing rules, and (3) government funding rules (Talen, 2012).

Frequently, rules have been written to prevent rather than be needful. There are very few circumstances in which specific uses are proactively required to complete a neighborhood. Zoning had a democratic touch to it, with the idea that neighborhoods should have the right to defend themselves from greed, pollution, and speculation and that zoning rules would give that protection. The size and dimensions of lots and blocks were affected by development regulations. These seem to be driven by opposite motivations. On the one hand, larger lots and blocks excluded individuals who could not afford them, and planners were aware that lot size and coverage regulations promoted "unnecessary" class division. On the other hand, minimum standards were thought to be an issue of social justice, resulting in higher requirements for poorer neighborhoods (Talen, 2012).

The pattern would be prioritized for those who are most in need, according to the rules. One example is people who do not have access to outside living space, such as those who live in apartments (Talen, 2012).

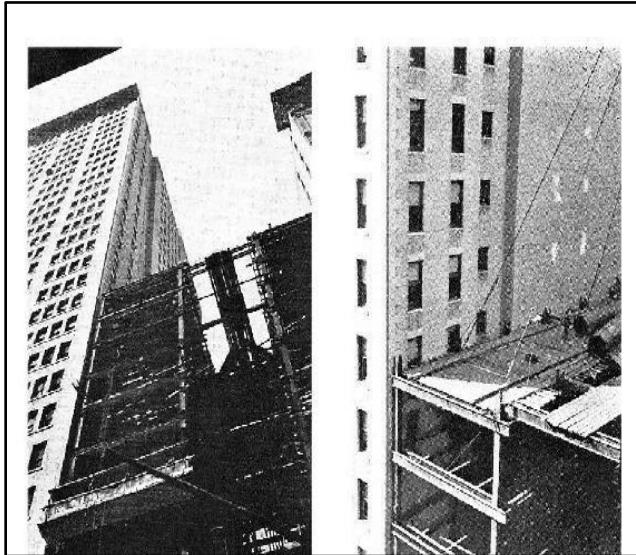


Figure9: A subdivision in Phoenix, Arizona, showing single-family housing and parking lots around parks, blocking access. **Source:** (Talen, 2012).

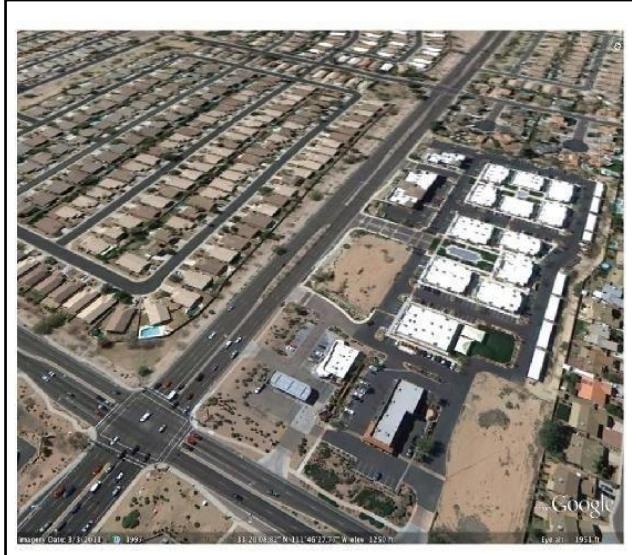


Figure10: Existing pattern of zones around two parks in north central Phoenix, Arizona. **Source:** (Talen, 2012).

The link between proximity and need, on the other hand, is often inverted. Figure (9) shows a region in Phoenix that is designated single-family residential and is surrounded by two gorgeous parks. Maximum allowed densities, maximum building coverages, and maximum height are determined by rules that limit building intensity surrounding this park (Talen, 2012).

Figure (10) shows the on-the-ground effect in a different Phoenix neighborhood. Only low-density single-family housing near public open space is permitted in the subdivision shown. Combined with the huge school and parking lots on the opposite side, the design ensures that apartment tenants' access to public open space is restricted (Talen, 2012).

Although design guidelines, architectural review boards, and heritage preservation regulations can greatly impact urban form, they are not included here since guidelines and review processes are more advisory than regulating. Instead of implementing a desirable vision, historic district laws focus on identifying what establishes an unacceptable modification of a historic building. When design rules have been translated into code, there is an exception to this in clearness; for example,



in the 1970s, a few of the principles of San Francisco's urban design plan were translated into a new zoning regulation, which was passed in 1979. Neighborhoods today appear to be indifferent about the random and disorderly patterns that their rules produce. Zoning rules now seem incomprehensible when compared to the simplicity and clarity of earlier zoning codes. Land division restrictions, roadway width and layout, and the spatial organization of zoning districts all impact urban form. The goal of some guidelines was to ensure a certain density or degree of compact (Talen, 2012).

2.3.1 Standards

A standard is a means of doing something in a consistent, planned, agreement, and published manner. Standards, which will be used on a regular basis, as a rule, guideline, or description, are restricted in terms of practical requirements or other precise values. Standards improve the dependability and efficacy of many of the goods and services we use, improving the quality of life. Standards are produced via the collaboration of professionals in a field and agree at the time of development (IRENA, 2021).

Regulations serve as a kind of consumer rights. While government legislation or consumer rights groups provide visible consumer rights, regulations provide an extra layer of security with which most clients are familiar. This is especially true when consumers have little or no say over what they are provided (IRENA, 2021).

➤ ***The Purpose of a Standard is to Provide Individuals with a Trustworthy Foundation; this Aids in Decision-Making:***

1. An environmental management standard to aid in reducing ecological consequences and the development of more sustainable practices.
2. A building code to assist in the construction of a house.
3. Accessibility.
4. Guideline that aims to make buildings more accessible to people with disabilities

Source: (BSI, 2021).



2.3.2 Creation and Implementation of Standards

The creative design of high-quality buildings and public spaces is serious for improving the standard of living and working environment in renewal regions and for creating economic value for the area. Furthermore, the quality of the built environment design that is combined into the planning process is critical to the success of regeneration creativities. It is commonly known, for example, that well-designed open spaces add significant value to residential houses (The Worker Bank, 2021).

To attract the creative class, the present economic trend supporting creative sectors requires active mixed-use areas. The great urban design may also offer social and environmental value by transforming urban space into a location where people can "mix and mingle" while integrating the neighborhoods with their surroundings. The process of how the design will be negotiated must be handled and provided for in the additional agreement throughout the life of the regeneration project. However, the public and private sectors must recognize that this is a shared responsibility (The Worker Bank, 2021).

- Building Form Standards**

The forms which make up a busy major street are different from those that make up a quiet residential street. Building Structure Regulations are applicable design standards that limit the sorts of structures that can be built and their influence on society's land. These Regulations are related to streets on a Regulating Plan. The location of buildings concerning the street, their proximity to walkways, and the accessibility and availability of building entryways (FBCI, 2016).

Building Form Standards can control minimum and maximum building elevations, minimum and maximum lot front coverage, minimum and maximum quantities of window coverage on facades, physical components necessary on buildings (e.g., stoops, porches, kinds of permitted balconies), and the general usage of floors. (e.g., office, residential, or retail). These rules are more concerned with how structures shape public areas than with architectural styles and designs. Architectural Standards should be created in addition to Building Form Standards if a local authority desires to regulate the quality of architecture, such as maintaining the historic appearance (FBCI, 2016).

Five Main Elements of Form-Based Codes



Figure 11: Main elements of form-based code. Source: (FBCI, 2021).

- **Public Space Standards**

Public space standards are governed by squares, parks, the general correct of streets, and other public areas. Public places are often managed by departments such as public projects, playgrounds, and roads. Streets are the most severely managed public spaces in a community because they are the most often regulated (FBCI, 2016).

Dimensioned cross-sections and/or plan views of streets are frequently used to depict traffic lane lengths, sidewalk widths, street tree and street lamp location, transit lane placements, and architectural layout. Plan view drawings showing the spacing of street trees and lighting, as well as the regions of street angle curves, may also be included (FBCI, 2016).



Figure 12: Sidewalk Standards Design. Source: (Helch, 2019).



- **Implementation of Standards**

Processes related to the putting out, execution, or practice of a strategy, method, or any notion, idea, model, specification, standard, or policy for doing anything. As a result, if anything happens, execution is the action that must follow after any preparatory thought (Ehrens, 2021).

➤ ***The Key Steps of Implementing a Standards***

Planning is required in implementing a standard; the steps below show the process of implementing the standards:

1. **Understand system requirements (Plan):** The first stage in implementation is to seek understanding before taking action.
2. **Plan the process (Plan):** A corrective measures program's planning process is when decisions are taken on the system's architecture and dynamics, as well as how to incorporate it into present operations.
3. **Develop and document (Do):** Formal documenting of policies, processes, and responsibilities for system caretakers and users is one of the activities at this stage.
4. **Conduct training (Do):** Any new system can cause significant commotion to the (status quo), causing worry among those affected. Management changes are required for something as large as a corrective action system that spans multiple business operations. Interactive learning activities that are directly related to professional responsibilities and include hands-on practice, such as on-the-job learning sessions, tabletop simulations, case studies, or a combination of all three, should be included in the training.
5. **Implement (Do):** Any proposed program can wreak havoc on the (status quo), prompting concern in those who are impacted. For anything as vast as a corrective measures system that encompasses several corporate functions, management adjustments are necessary. Interactive educational activities, like learning sessions, tabletop simulations, case studies, or a mix of all three, that are immediately related to professional obligations and also include hands-on experience, should be incorporated in the exercises.
6. **Test the system (Check):** The corrective measures plan (standards) must be applied as quickly as possible following training to bridge the gap among exercise and actual use of skills and



expertise. At this level, discipline processes are initiated, and framework processes are fully operational. There are processes and strategies in place for designated personnel to effectively handle corrective efforts.

7. **Adjust and improve (Act):** Non-conformances are identified and corrected using the corrective measures process. By incorporating the Plan-Do-Check-Act cycle into implementation processes, and effective corrective measures system (standards) may be launched.

Source: (Brooks, 2020).



2.4 Measuring Urban from Element Methods

While it's useful to consider these elements separate, it's also clear that they're interconnected. For example, the density of an urban settlement and the layout and extent of mixed uses within it are all factors that influence accessibility. A neighborhood is inaccessible if it lacks viable services and facilities for residents to use. It is also inaccessible without networks of pedestrian, public transportation, and cycling connecting the neighborhood to internal and external services. The proposed density of a site must dictate housing type and size while planning and building new residential neighborhoods. This would provide a diverse range of land uses (which included a lot of facilities, open space, and services) as well as a linked and permeable urban layout (Ewing et al., 2002)

A two-pronged data collection process can be used to analyze urban form elements to strongly measure the urban form features described in the previous section of the research. To begin, current datasets like the Census of Study Area can be inspected to even provide information on non-domestic properties, initial density measures, and their location, among other things. Second, information on building heights and transportation infrastructure (such as bus station locations and types of vehicle parking) can be gathered through site surveys in specific neighborhoods (Gray, 2004).



2.4.1 Measuring Density

The density of a given area can be calculated using a variety of different measurements, like dwellings per hectare (dph), persons per hectare (pph), and so on (Jenks and Dempsey, 2005). A variety of density pointers can be used to get a full photo of the overall density of the study area whilst taking into account the various scales of urban form (city, sub-area, neighborhood, and street). Table 3 contains examples of these Indicators (Cutsinger et al, 2004).

Measurement	Description	Examples of aspects/features measured
Gross Density (City)	The ratio of persons, households, or dwelling units to the entire area of the city regardless of land use.	Total city population, No. of households, No. of dwellings, City area
Gross Density (Neighborhood)	Number of persons, households, or dwelling units per hectare of the total neighborhood area.	Total population, No. of households, No. of dwellings, Case study area
Gross Residential Density (Sub-area)	Number of persons, households, or dwelling units per hectare of the total sub-area area.	Total population, No. of households, No. of dwellings, Sub-area
Net Residential Density (Neighborhood)	Number of persons, households or dwellings per hectare of the total land area devoted to residential land use.	Total population, No. of households, No. of dwellings, Total residential land area
Net Residential Density (Sub-area)	Number of persons, households or dwellings per hectare of the total land area devoted to residential land use within the sub-area.	Total population, No. of households, No. of dwellings, Total residential land area
Net Residential Density (Street & Plot)	Number of dwellings per plot.	No. of dwellings per plot, Plot area

Table 3: Density indicators. Source: (Cutsinger et al, 2004).



2.4.2 Measuring Land Use

To assess the extent of mixed land uses in the study area neighborhoods, a number of appropriate land uses should be chosen. Secondary data sources do not always provide information on various specific services and facilities (e.g., supermarkets, bookshops, and kid's nursery names), indicating the essential for primary data collection. To account for 'edge effect,' each case study area must have a 'buffer zone' of approximately four hound tread M (about five minutes walking distance). Household members on the outskirts of a case study area could be nearer to amenities just beyond the boundary. Researchers can capture and investigate the usage of specific facilities and services, such as post office and food shops, by establishing a buffer zone around the neighborhood. Table 4 shows some of the land-use indicators that were used in the research (Cutsinger et al, 2004).

Measurement	Description	Examples of aspects/features measured
Residential land use (Individual dwellings)	Residential, institutional and communal accommodation	Sheltered accommodation, Care homes, University halls of residence
Commercial and retail land use (Individual buildings)	Properties housing all commercial uses	Retails & Supermarkets, Shops, Storage & Warehouses, Restaurants/cafés
Offices (Individual buildings)	Office space	Business parks, Banks and building societies, other offices
Industrial (Individual buildings)	Industrial properties including industrial storage and warehouses	Factories/Workshops, Industrial storage facilities (depots etc.)



Community Buildings (Individual buildings)	Buildings used for community purposes including: – educational – health – community services	Primary schools, Health centers and GPs, Hospitals, Community centers, Places of worship, Police stations
Leisure and recreational Buildings (Individual buildings)	Buildings used for leisure and recreational purposes	Museums, Libraries, Cinemas, Indoor sports facilities
Outdoor Recreation (Individual spaces)	Outdoor amenity and open spaces	Football pitches, sports grounds
Other public green space (Individual spaces)	Spaces of grassland, woodland etc.	Woodland, Heathland
Previously developed land (Individual spaces)	Previously developed land which is or was occupied by a building or other permanent structure	Derelict land
Mixed use (Individual buildings)	Buildings with multiple land uses	Vertical mixed uses (flats above shops/offices above commercial etc.)

Table 4: Land-use indicators. Source: (Cutsinger et al, 2004).

2.4.3 Measuring Accessibility and Transport Infrastructure

Measures of accessibility can refer to different aspects of the concept. Infrastructure for pedestrians and cyclists, as well as private and public transportation, is used to measure accessibility in this case. Table 5 lists the indicators that can be used to assess accessibility, such as public transportation infrastructure characteristics and travel times and distances (Talen, 2003) & (Poerta et al, 2009).



Measurement	Description	Examples of aspects/features measured
Public transport infrastructure (Street)	Location of public transport features	Location of bus/tram stops – Bus/tram routes, Frequency of services
Private transport infrastructure (Street)	Location of private transport features (i.e., parking)	Location of off-street parking and types, Location of on-street parking and types
Pedestrian/cycling infrastructure (Street)	Location of (cycle) paths/alleyways/ underpasses etc.	Location of routes inaccessible to motorized transport
Road management (Street)	Route management	One-way systems, Traffic management, Speed restrictions
Journey time/distance (Individual buildings)	Journey to work/other services etc. in terms of time and distance	Trip origin, Trip destination

Table 5: Accessibility indicators. Source: (Talen, 2003) & (Poerta et al, 2009).

2.4.4 Measuring Housing/Building Characteristics

It is neither feasible nor desirable to evaluate the features of every structure in a neighborhood. The identification of prevalent housing units per street, as well as the highlighting of exceptions, is an effective way to measure the characteristics. In order to measure these characteristics, the household questionnaire can be used. While the questionnaire's primary purpose is to assess part of sustainability, it has also proven to be a valuable instrument for gathering urban form indicators like housing type, lowest rate of living area, and access to a garden or residential outdoor space by a household. This category of indicators includes indicators of maintenance, such as building



condition (when regarded as poor in comparison to other buildings on the road), trash levels, and street and destruction of property incidents (See Table 6) (Talen, 2003) & (Poerta et al, 2009).

Measurement	Description	Examples of aspects/features measured
Housing type (Individual buildings)	Predominant housing type per street with exceptions marked	Detached housing, Semi-detached housing, Terraced housing, Tenements, Flats/apartments
Housing characteristics (Individual buildings)	Characteristics of individual dwellings	Lowest level of living accommodation, Access to garden, Number of bedrooms, Condition of building
Building type (Individual buildings)	Building type according to land use categories	Commercial buildings, Offices, Community buildings
Street characteristics (Street)	Level of maintenance	Extent of litter, Instances of graffiti, Instances of vandalism, Instances of no street lighting

Table 6: Building characteristic indicators. **Source:** (Talen, 2003) & (Poerta et al, 2009).

2.4.5 Measuring Layout

Urban layouts are difficult to quantify. One method for objectively describing and quantifying spatial layouts in order to find similarities and differences is spatial network analysis. In spatial network analysis, relations between spaces in a city, buildings, and settlements are typically signified as relational charts comparable to social network charts. These charts could then be analyzed in order to find patterns and count spatial relations (Porta et al., 2006).

The standard s chart representation is based on road network systems, which analyze spatial relationships using metric distances. The final output must include a set of simple and multiple centrality measures that statistically express a space's relative importance in relation to other spaces

in the city. The output must also include a network map displaying the area and cluster analysis patterns of spatial centrality (Porta et al., 2006).

2.5 Analysis of Urban Form Elements of Neighborhoods Austin, Texas

The Charter of the New Urbanism contains twenty-seven principles (Leccece et al, 2000), eight of which are related to neighborhood form. They are as follows: Measures of urban form were allocated to seven neighborhoods in Texas, Austin, using these principles as a guide (Arnold et al, 2002).

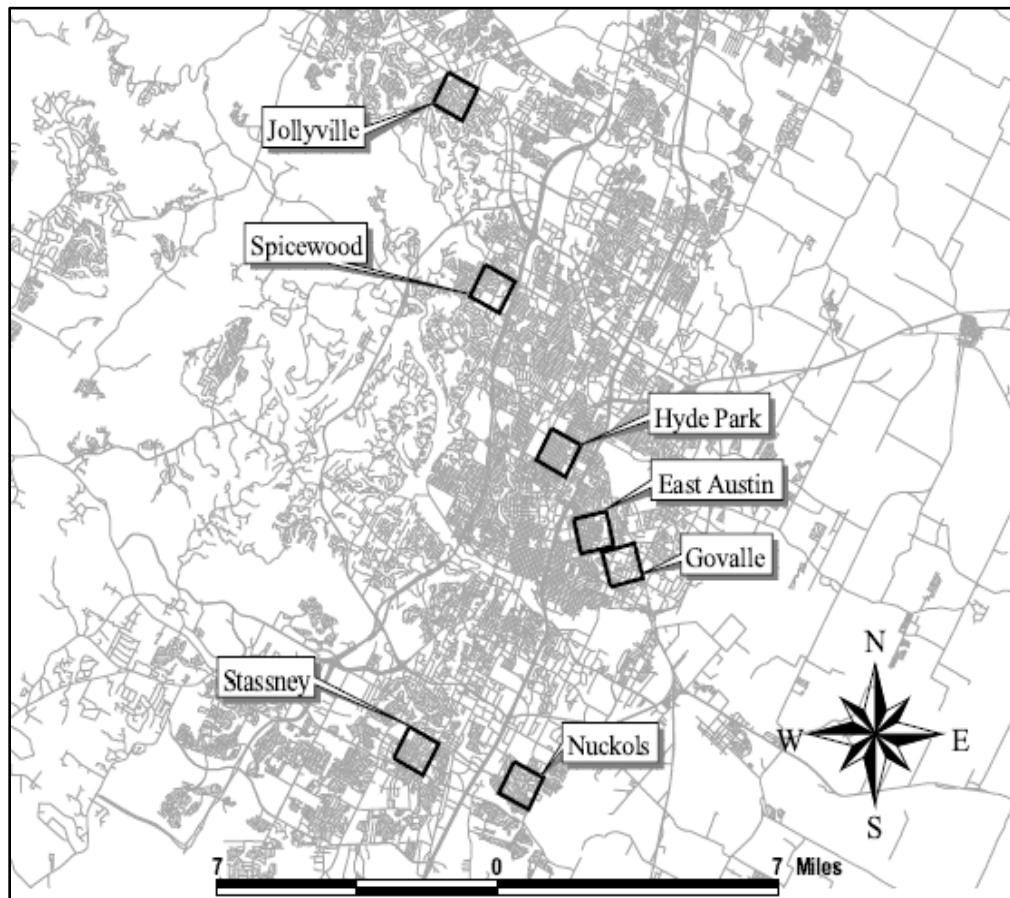


Figure 13: Location of Seven Neighborhoods in Austin. **Source:** (Arnold et al, 2002).



- **Principles for Measuring Urban Form of the Neighborhoods**

1. Neighborhoods should be "small, walkable, and mixture of land-uses."
2. Daily life tasks "should take place within short walk [and] linked roadway networks should be planned to promote walking."
3. Neighborhoods ought to have a "diverse range of housing kinds and pricing points."
4. Well-placed transportation routes can help with metropolitan structure organization.
5. Suitable land uses and density "should be within walking distance of public transit terminals."
6. "Civilian, institutional, and commercial activities should be entrenched in communities, and schools should be designed and positioned such that children may bike or walk to them."
7. Urban visual arts codes act as change guides that are predictable.
8. "A variety of parks... should be scattered throughout communities."

Source: (Lecce and colleagues, 2000).

- **Measuring Indicators**

1. **Land-use:** This index approximates how widely distributed land uses are in a given area. The index is a number between one and zero. A valuation of one indicates that a single type of land use is focused in a single clump, whereas a value of zero indicates that land-use parcels are distributed equally. This analysis would be only applicable to raster data.
2. **Access:** The number of lineal feet of roads (and alleys) in a neighborhood mention how much of the space is open to the public. It can also be an indicator for block sizes (measure used in this type of analysis), because a smaller-block neighborhood would have even more roads than a larger-



block neighborhood. Alleys are treated differently because they only carry specialized traffic for the blocks, like vehicles or pedestrians, and are usually one-way and slow.

The second metric, the link-to-node ratio, estimates the local transportation system's interconnectedness. A higher ratio means that there are more options for getting around in a given area. A situation like this allows for more chances for citizens to interact as well as more chances for commerce (Jacobs 1961). The number of cul-de-sacs is a third metric. This is yet another way to describe an area's interconnectedness. The presence of a high number of cul-de-sacs indicates that circuitous routes are necessary to prevent dead ends. Finally, the number of access points suggests how well a space is interconnected into the fabric of the city.

3. Building/ housing: A metric for assessing the variety of housing types was presented. Which of the following percentages of residential land is committed to multi-family housing? The land-use maps of the City of Austin show four different residential codes, but only two of them show in the case study areas: multi-family (MF) and single family (SF).

4. Open Space: The last metric introduced here characterizes the number of available open space in the study areas. Because undeveloped areas are frequently used for park-like purposes, this measure includes both undeveloped areas and open space. Despite the fact that suburban areas are typically made up of large lots, the percentage of land devoted to undeveloped land and open area measures how many open spaces for public use would be available in each space.

Source: (Arnold et al, 2002).

Results

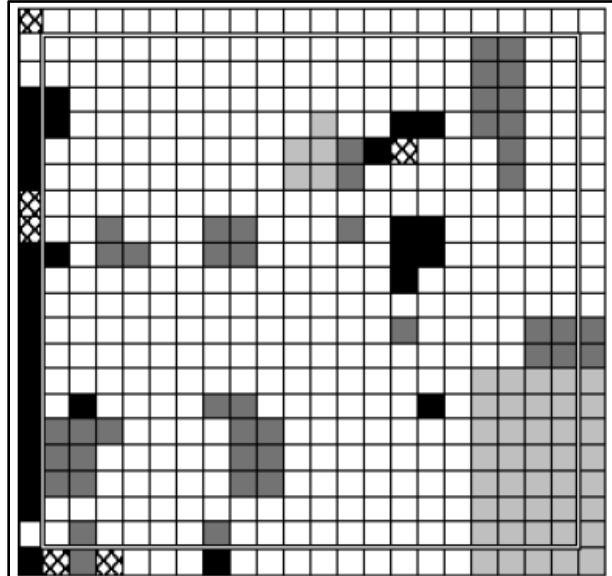


Figure14: Hyde Park - real land usage and grid-based land use. Source: (Arnold et al, 2002).

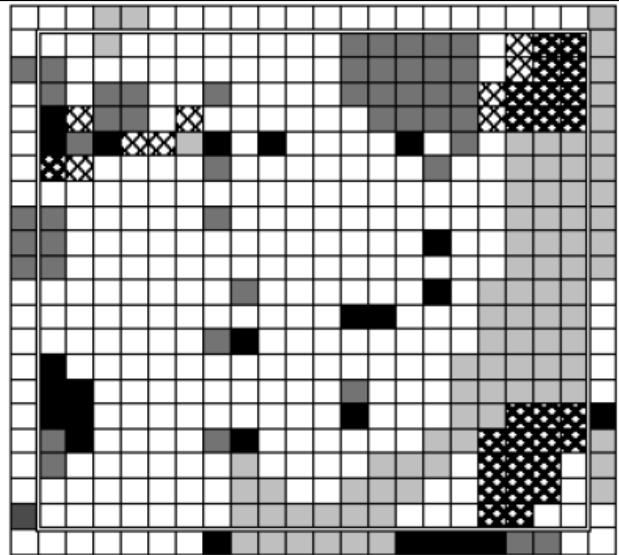
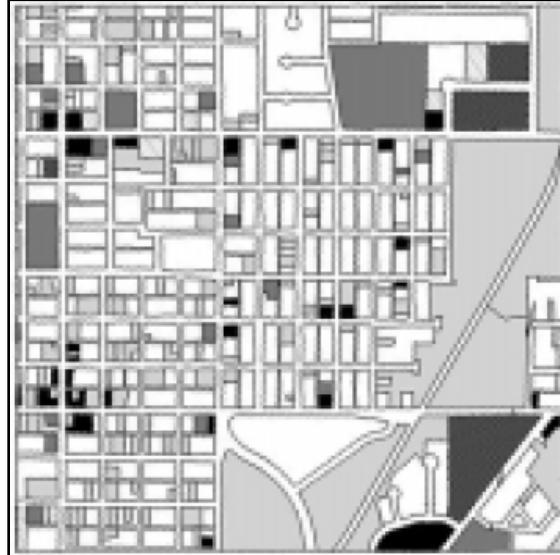




Figure 15: East Austin - real land usage and grid-based land use. **Source:** (Arnold et al, 2002).

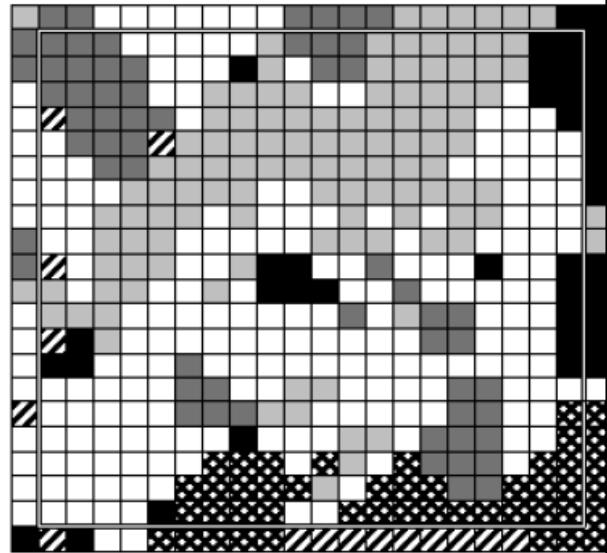


Figure 16: Govalle - real land usage and grid-based land use. **Source:** (Arnold et al, 2002).

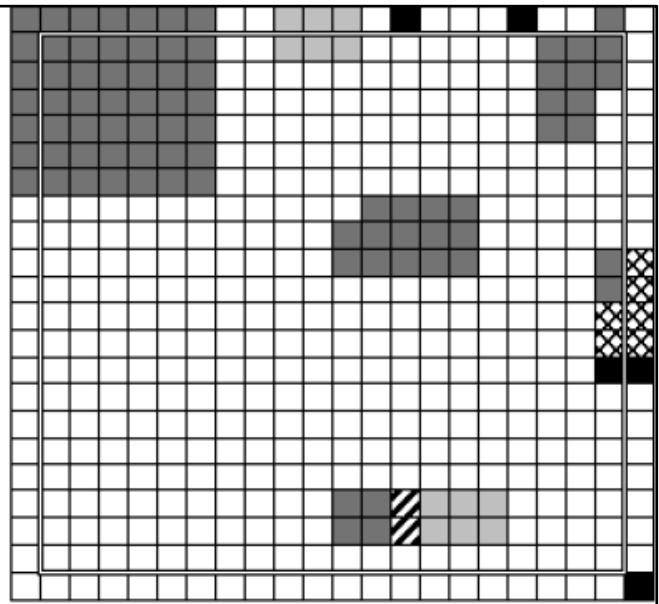


Figure17: Stassney - real land usage and grid-based land use. **Source:** (Arnold et al, 2002).

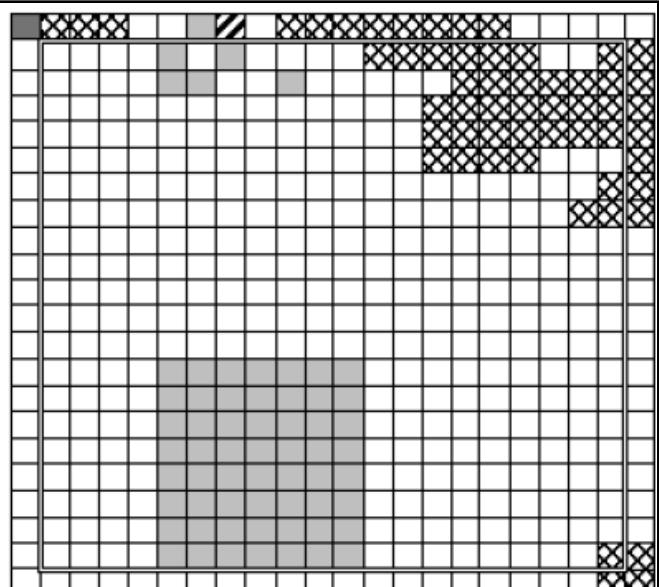
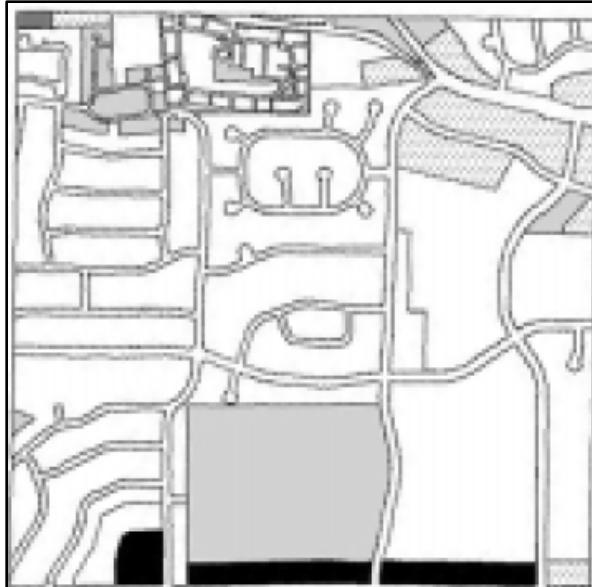


Figure18: Spicewood - real land usage and grid-based land use. **Source:** (Arnold et al, 2002).

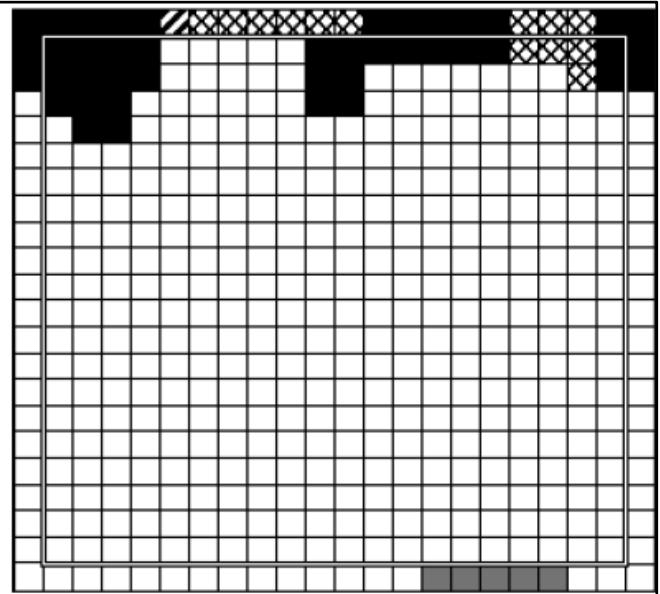


Figure19: Jollyville - real land usage and grid-based land use. Source: (Arnold et al, 2002).

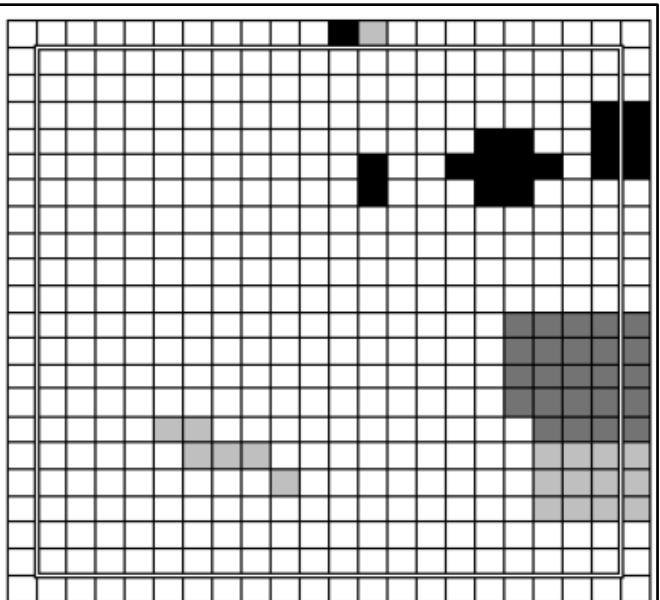


Figure20: Nuckols - real land usage and grid-based land use. Source: (Arnold et al, 2002).

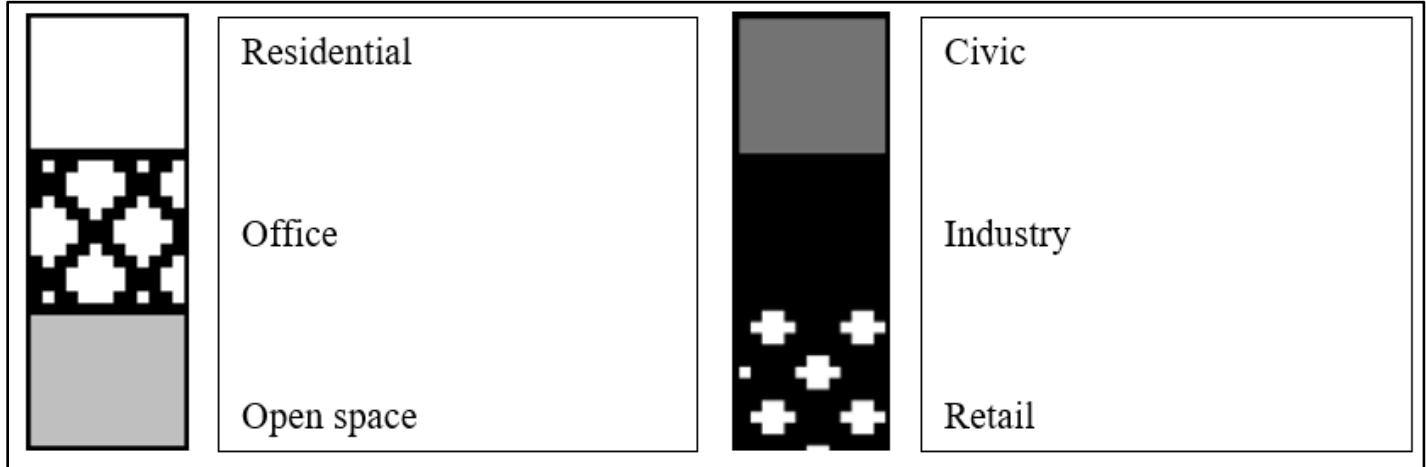


Figure 21: Key to Grid version of land-uses. Source: (Via researchers).

The results of the above-mentioned measures are depicted in the figures above. The seven neighborhoods are listed in approximate direction of development age. The measure describing mixed land use indicates how well the neighborhood's various land uses are mixed. The two results rank the neighborhoods in the similar order, starting with the most aggregated and working down to the least aggregated. The present data between both the three ancient neighborhoods and the four latest new, on the other hand, demonstrates the study area's dramatic differences in land use dispersion. Non-residential land uses are limited to the outskirts of the four newer neighborhoods, with only a small amount of penetration. Numerous parcels of non-residential use are located well into the older neighborhoods (Arnold et al, 2002).

The Stassney neighborhood, with big blocks of residential use and small mixed-use areas, has a score comparable to the traditional local ideal of mixed-use development. The Jollyville neighborhood is distinguished by diverse land uses that are typically clustered together, as evidenced by the neighborhood's high aggregation index score. One possible explanation for the lower aggregation index scores in the Govalle and East Austin neighborhoods is that they own the most various classes (Arnold et al, 2002).

The following four measures are intended to assess the neighborhood's road network. Street systems are extensive in both new and old neighborhoods. When alleys are added, the two oldest



neighborhoods see a significant increase; however, there is a relatively new neighborhood with roads that are roughly the same length. Consider the following metric, the ratio of links to nodes, which can provide an assessment of interconnection inside the neighborhood. When these values are particularly in comparison, the connectivity from older to newer neighborhoods shows a clear downward trend (Arnold et al, 2002).

The increasing number of cul-de-sacs demonstrates that, while two neighborhoods could have the similar number of roads, one may have more roads that lead nowhere. The grid-like layout of older neighborhoods provides more alternate routes, whereas neighborhoods with curvilinear roads and numerous cul-de-sacs funnel traffic onto a few larger roads. The final street network metric, access points, measures how well the neighborhood is linked to the city's nearby fabric. (Blakely & Snyder 1999).

The accessibility of public transportation different from older to newer neighborhoods. Because the transport system is transitioning from a hub-and-spoke to a more grid-like system, the neighborhoods closer to central business district (CBD) are served by numerous local routes that run every ten to forty minutes to entry downtown. With just a few runs in the morning and early evening, the express and limited routes generally serve commuters. Every 30 to 40 minutes, crosstown and feeder routes run. They offer multi-stop facility but do not serve central business district (CBD). The most extensive and diverse transportation service is available in the four oldest neighborhoods. They are all conveniently located near downtown Austin as well as other parts of the Austin area. Public transportation is not well-served in the three newer neighborhoods. The Jollyville neighborhood's bedroom suburb nature is evidenced by its single crosstown route and four express routes. Spicewood has one route that runs into downtown and one limited access route that runs to the University. The Nuckols neighborhood is provided by a single downtown route and an only one crosstown route. (Arnold et al, 2002)

The newer neighborhoods, with the exception of Spicewood, have significantly fewer land dedicated to multi-family housing than the older neighborhoods. A Spicewood neighborhood is densely populated with students and is served by a university bus line. The aggregation index, when introduced only for the two types of housing, shows a clear distinction between both the

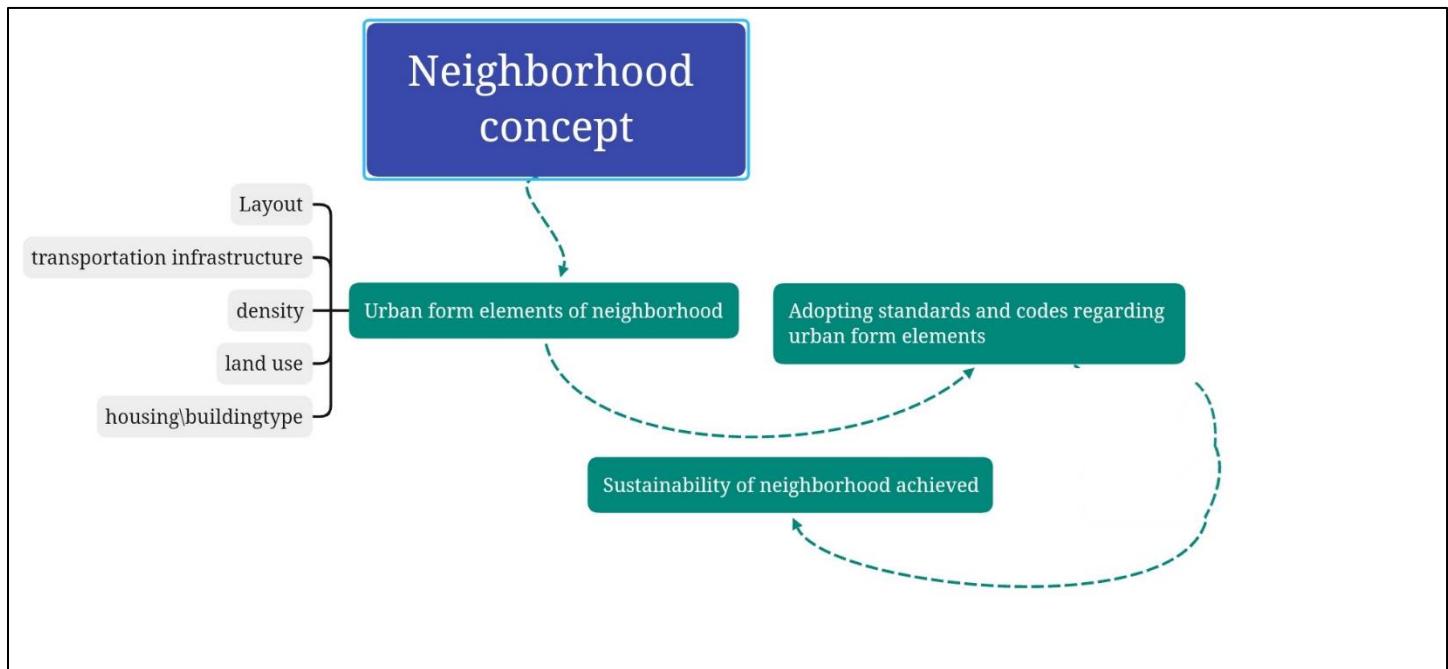


three older neighborhoods, where multi-family units are more distributed all through the area, and the four newer neighborhoods, where multi-family units are largely collected together (Arnold et al, 2002).

The newer neighborhoods have less open space and undeveloped land than older neighborhoods. Because newer neighborhoods have had less time to develop, it is possible that they have more undeveloped land. However, this is not the case in this instance. East Austin, a neighborhood with several industrial sites, has the highest percentage of undeveloped land. Furthermore. The newer areas are almost certainly part of a much larger planned unit development which is being constructed out in stages. There are several large, undeveloped lots in one of the newer areas, Spicewood; However, one is presently being developed into a religious center, complete with worship and entertainment facilities, recreational facilities, and school (Arnold et al, 2002).

2.6 Conceptual Framework

A conceptual framework is a visual or written representation of how variables should interact. The characteristics or possessions that have been addressed in the theoretical background of the research are mentioned to as variables. To develop the conceptual framework, a review of existing studies and theories on the topic is conducted. The literature review of this research focuses on explaining urban form elements of the small unit of the city which is neighborhood, and how adopting certain standards & codes for urban form elements can create different models of



neighborhoods which achieves sustainability.

Figure 22: Conceptual framework of the literature review. **Source:** (Via researchers, 2022).



Chapter Three: Methodology

3.1 Participant and Context

This research under the title of (Assessment of the applied regulations on the urban form in the neighborhood, Duhok city) has been conducted by five students of the third stage in advance project course in the college of spatial planning, University of Duhok. The study's goal is to determine the guidelines for urban form elements that will result in a sustainable neighborhood with quality of living for future housing projects. Such as identifying the rules, codes, and guidelines that influence the development and modification of urban form, establishing obstacles that mandated regulations are not being properly implemented on the ground, as well as giving recommendations to stakeholders and decision-makers about future city projects based on the urban design defects in Duhok.

3.2 Structure of Data Collection Methods

3.2.1 Type of Data

Research members will discuss this section to obtain more information and knowledge about the topic. There are different data collection methods: qualitative, quantitative, and mixed-method. Selecting those methods is dependent on the type of research utilizing numerical or textual data. Qualitative and quantitative data will be used to get the information needed for this research.

Researchers will utilize numerical and textual data to explore the issue;

- **Qualitative:** for qualitative, group members will apply the text to describe rules and regulations relevant to our topic (Assessment of the Applied Regulations on the Urban Form in Neighborhood Duhok city). As well as which standards are available in the case study, and missing standards will be explained. Furthermore, describe how the case study has developed. In addition, we will discuss the urban form features in our research area.
- **Quantitative:** researchers will measure the standards/codes to improve the case study because the topic includes standards and regulations, necessitating quantitative data inclusion. Also, urban form elements will be developed according to codes and standards.



3.2.2 Methods of Data Collection

Since not all data are predicted to be available in quantitative or qualitative formats, therefore, a mixed approach could be more suitable to produce the required data about the neighborhood.

Interviews are dialogues between the interviewer and the participant, in which the interviewer asks the participant a series of questions to which the participant can answer. Therefore, to answer the research questions, interviews were used as a tool to collect data intensively in this research, this collection tool will be used to gather detailed information about the case study.

Structured, semi-structured, and unstructured are three types of interviews. semi-structured methods will be used to be flexible in changing or adding questions to get specific answers, since semi-structured interviews are most relevant style of interview utilized in qualitative research.

Observation data collection will be used to use the senses to gather conscious and purposeful facts needed to answer research questions. In the observation method, the researcher observes an area of interest (which is the case study of this research) to record any actions or sightings that can be useful to answer research questions. There are two types of observation data collecting methods which are (non-participant observation and participant observation). In a non-participant observation, the researchers observe the area without interacting with it. In contrast, in participant observation, the researchers imagine themselves in the subject's shoes and can see the area through the eyes of the participant. As for this study non-participant observation will be used to gather the data such as to see whether the regulations are applied in the case study and to know the difference between the neighborhood from the past and know from the case study.

Measurement is the method of allocating numerical values to variables; it includes measuring, ranking, and comparing people and objects. The interval measurement will be used in this study because variations represent differences in the attribute. As a result, this type will be used to answer the third research question which indicates the number of applied regulations. Therefore, to compare the study area's land-use types and transportation infrastructure to the municipality's base map. It will also be used to compare the allowed density in the neighborhood with the actual density in the chosen study area.



The questionnaire is a moderate, quick, and efficient method of gathering large amounts of data. A questionnaire will be used to collect information from several residents from three selected neighborhoods. The questions in this questionnaire will focus on how many people follow the rules or have a specific opinion about their neighborhood satisfaction. And to know the difference between the application of rules in new and old neighborhoods of Duhok city.



3.3 Case Study & Selected Sample

3.3.1 Case Study

Duhok city contains 49 neighborhoods, each with its own population and area, as shown in table (9) the data on the area and population of 2015 were obtained from a secondary source authored in 2019. The research team then calculated the population in 2021, assuming a 3.4 percent growth rate.

N	Neighborhoods	Population in 2015	Population in 2021
1	Aşty	6530	7862
2	Azadî	4843	5830
3	Avrocity	8507	10242
4	Behdînan	3282	3951
5	Beruşka Bakur	3456	4160
6	Beruşkê	33135	39895
7	Besire	4066	4895
8	Bazar	570	686
9	Bintuka	4685	5640
10	Botan	4694	5649
11	Birayetî	987	1188
12	Dasinya	704	848
13	Diyarî	9994	12032
14	Êtutê	6549	7885
15	Gelî	9084	10937
16	Geverkê	2918	3513
17	Grêbasê	4569	5501
18	Kanîxişmana	4885	5882
19	Kanîmehmedkê	15341	18470
20	Kevelan	2954	3557
21	Malta Jori	16962	20422
22	Malta Jeri	11729	14121
23	Masîka Rojava	6472	7792



24	Masîka	8568	10315
25	Mazî	4324	5206
26	Mîdiya	5462	6576
27	Mihabad	5427	6534
28	Nawroz	3476	4185
29	Nohadra	2504	3015
30	Nizarkê	10569	12723
31	Pêşangeha	466	561
32	Pîşzasi	465	559
33	Qesara	6512	7840
34	Reza	10980	13220
35	Ronahî	9733	11719
36	Serhildan	39519	47581
37	Sêgirka	5664	6819
38	Serbestî	2589	3117
39	Şehîdan	2696	3246
40	Şaxkê	10363	12477
41	Şindoxa	10797	13000
42	Şêlê	9363	11273
43	Şoreş	6355	7651
44	Tanahî	10981	13221
45	Xabat	10657	12831
46	Zanko	1609	1937
47	Zirkâ	9035	10878
48	Zozancy city	163	196
49	Others	0	0

Table 7: The number of neighborhoods and their population in the city of Duhok. Source: (Edited by researchers).

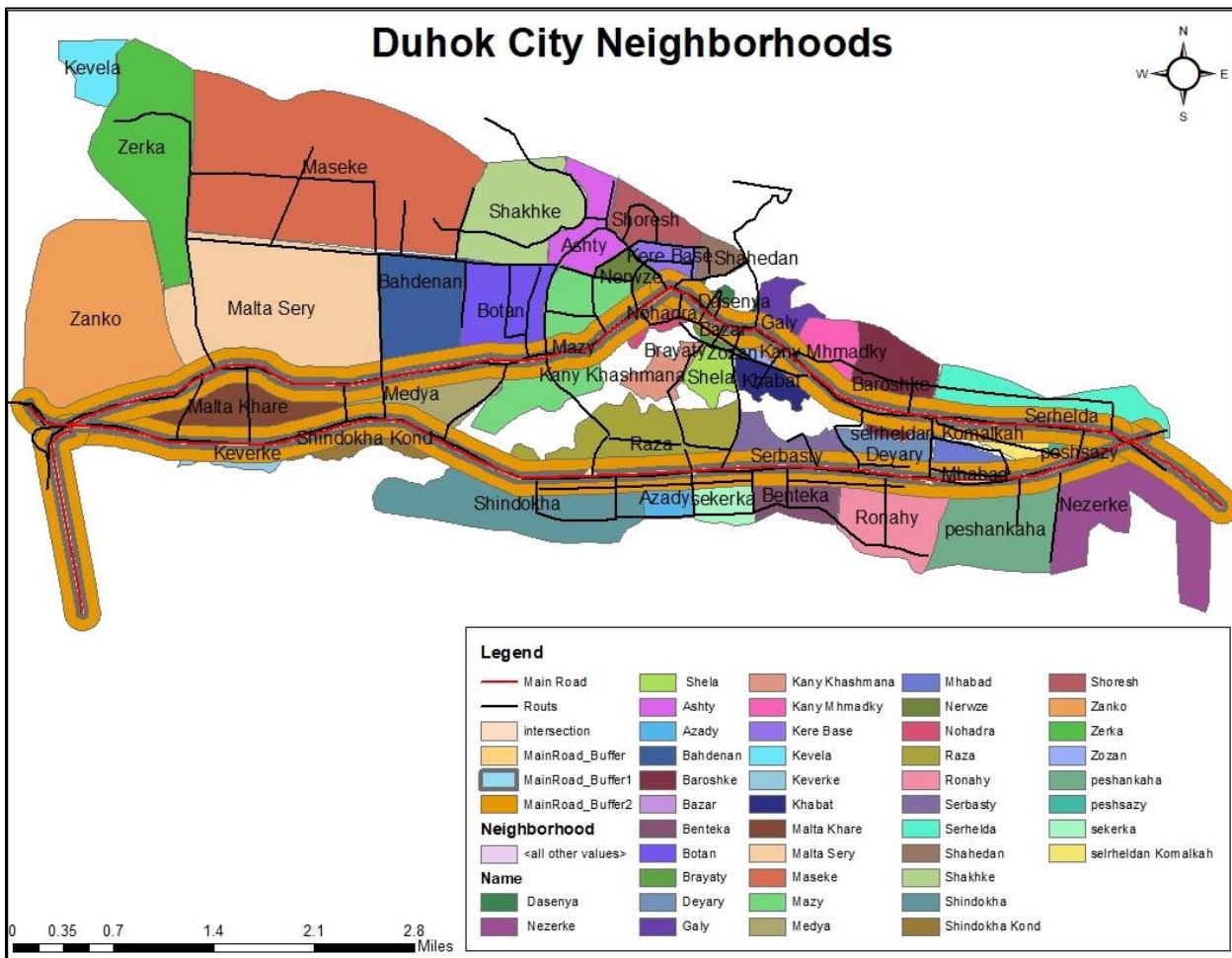


Figure 23: Duhok city neighborhoods. Source: (Edited by researchers Via ArcMap).

From the neighborhood above for this research, two particular neighborhoods have been chosen, the first one is the old neighborhood of Shele, which is located in the center of the city, which estimated about 11273 population in 2021. And the second neighborhood selected is Ashty neighborhood in the north of the city, with a population of 7862 in 2021. And the chosen last neighborhood is Masike rojava, located in the north-west of the city with a population of 7792 in 2021.

The area chosen from each neighborhood is 0.5 square kilometers, out of a total area of Shele of 0.5 square kilometers. Only 0.5 square kilometers of the Ashty neighborhood, which has a total area of 0.9 square kilometers, were chosen. Finally, only 0.5 square kilometers have been chosen for Masike rojava, which has a total size of 5.8 square kilometers.

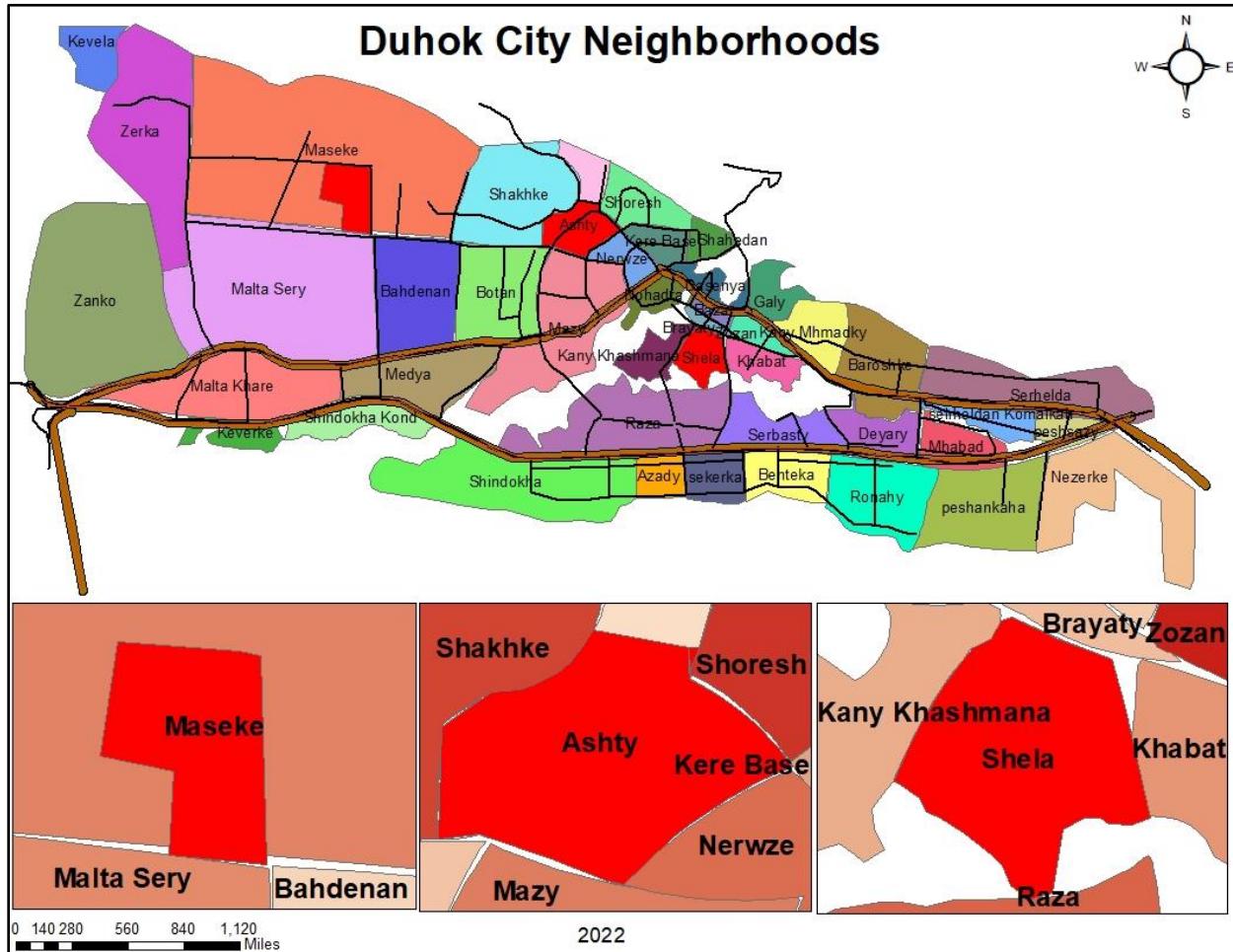


Figure 24: Selected case Studies. Source: (Created by researchers Via ArcMap).

3.3.2 Justification of Sample Selection

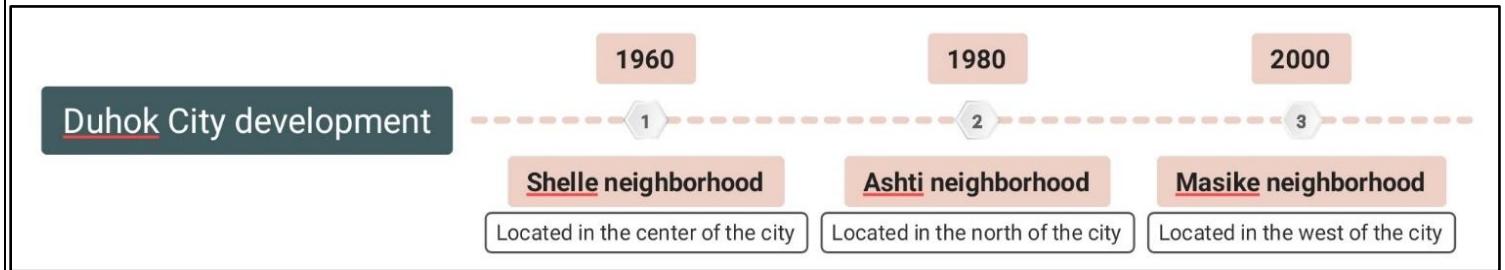


Figure 25: The development of Duhok city through three-time phases. Source: (Via by researchers).

The selected case studies (Shelle, Ashty, and Masike) neighborhoods were chosen based on their age, as the development of Duhok city began in the 1960s, followed by the 1980s, and then the 2000s. As a result, Shelle neighborhood was chosen from the 1960s, while Ashty neighborhood began development in the 1980s, and Masike neighborhood began development in the early 2000s. Each case study has developed in a different age phase of the city's development process.

3.3.3 Sampling Process

Sampling is a statistical analysis technique in which a predefined number of observations are drawn from a larger population. The method used to sample from a larger population is determined by the type of analysis being conducted (TUOVILA, 2020). Since Duhok city has a large population, we imposed sampling to get an idea from some people about lack of application of standards in neighborhoods and complexes in Duhok city, rather than asking everyone in the city.

According to our research, we will use probability sampling; in addition, we will employ cluster sampling to select three neighborhoods' clusters; within those three neighborhoods clusters, we will use basic random sampling to select people at random to ensure that everyone has an equal opportunity to contribute their views.

The non-probability which is a sampling technique, this sample is gathered in a process that doesn't have all the individuals in the population equal chances of being selected; therefore, this

type is used in this research because some people have been chosen to be the sample of this research on purpose. And three types of non-probability which are convenience snowball and purposive types are used in this research.

Convenience sampling is a sampling method taking the sample from a group of people easy to contact or reach. In this research, this type is used, for example, to ask about the satisfaction of their neighborhoods and to choose some stakeholders in the selected neighborhood to interview.

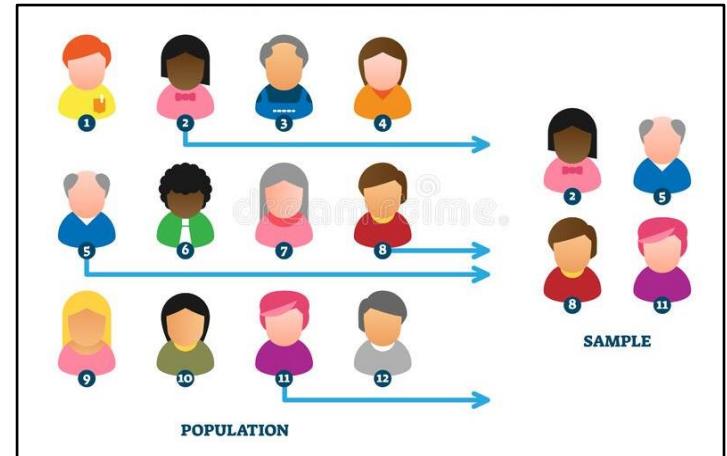


Figure 26: Random Sampling. Source: (Dreamstime, 2021).

A purposive sample in which researchers rely on their own judgment when choosing members of the population to participate in their study will be used to select the government employees to be interviewed to gather data about the existing standards and codes for urban form elements.

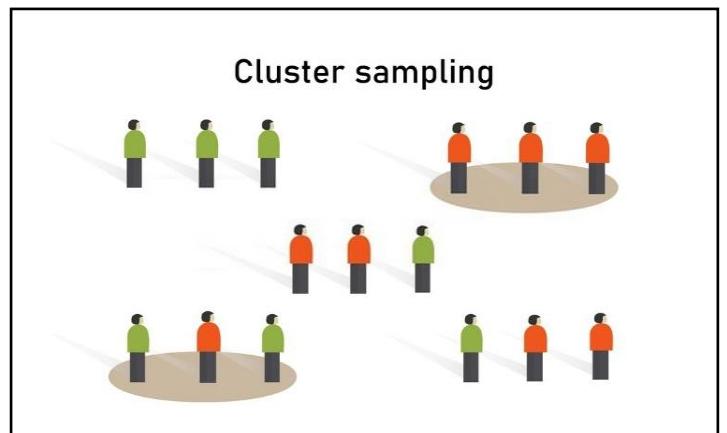


Figure 27: Cluster Sampling. Source: (Dreamstime, 2021).



3.3.4 Participants

As mentioned in the previous section, the sample is the group of people who participate in the investigation. People who participate are referred to as "participants." As a result, the appropriate sample size will be determined using the formula below.

Where:

N = Population size,

$$\text{Sample Size } n = N * [Z^2 * p * (1-p)/e^2] / [N - 1 + (Z^2 * p * (1-p)/e^2)]$$

Z = Critical value of the normal distribution at the required confidence level,

p = Sample proportion,

e = Margin of error

To begin, calculating the population size, which is the total range of unique units in the population and is denoted by **N**. in our research the population of three neighborhoods is equal to 29,450. The significance level of the normal distribution at the required confidence level is then determined. For this research at a 95% confidence level, which the critical value is 1.96. Next, determining the sample proportion, which we have used 0.5 as conservative approach. Next, computing the margin of error, which is the variation within which the true population is allowed to decline, The smaller the margin of error, the greater the accuracy, and thus the accurate answer. Therefore 0.05 is used in this research.



For each neighborhood the population size will be taken based on the selected area of the neighborhood, therefore the selected area of Masike which is 0.5 sq km which is an 8.6% of the total area the population will be 760. Total Shelle population will be taken and 55.5% of Ashty neighborhood will be taken based on the selected area from the total neighborhood.

Particular	Value
<i>Population Size (N)</i>	16,397
<i>Critical Value (95% confidence level) (Z)</i>	1.96
<i>Margin of Error (e)</i>	0.05
a) <i>Sample Proportion (uncertain) (p)</i>	0.5
b) <i>Sample Proportion (p)</i>	0.05
<i>Sample Size(n)</i>	379
<i>Sample Size(n)</i>	73

Table 8: Sampling equation. Source: (Via researchers).

The sample size of each neighborhood must be available in order to distribute the questionnaires among the participants equally for the Three neighborhoods. However, due to the limited time available for the group to complete the project on a given date, the total sample size 379 divided by 2. only 190 participants are going to make the sample size for the questionnaires. The population percentage of each neighborhood is helpful to mention the specific number of questionnaires that have to be used in that neighborhood, in order to receive the best outcome and make an effective and efficient method of questionnaires. Table 9 shows the number of sample size for each neighborhood.

Neighborhoods	Population	Sample Size
<i>Shelle</i>	11273	130
<i>Ashty</i>	4364	51



Masike	670	9
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Table 9: Sampling Size for Each Neighborhoods. Source: (Via researchers).

3.4 Strategy of Data Collection

The table below will describe the data types and highlight the most important information and the report's main idea. The table will also act as a guide to assist us in understanding the reason for lacking the standards regarding urban form elements in Duhok is. It is typically displayed as a table containing the data required for the research as well as the data sources. It also explains the methods used to collect the required data and the frequency, date, and time of the methods. All of these categories are presented in a logical and understandable order.

Table 10: Strategy of Data Collection. Source: (Created by researchers, 2022).

Research Questions	Measures	Data Needed/ Indicators	Data Source	Data Collection Methods	Type of Data	Purpose of Collected Data	Frequency	Collection Dates
1. To what extent are the Iraqi national housing standards contributed to shaping urban form?	Legalizing the rules regarding land-use (mixed-use, green spaces, open spaces, community building such as services and institutions).	(mixed-use, green spaces, open spaces, community building such as services and institutions).	-Urban planning department -Duhok municipality -Urban housing standards manual book (Ministry of construction and housing)	Interviews (with semi-structured questions)	Primary data Qualitative	To find out about the national standards of urban form elements that take into account for neighborhood design.	3 Times	3th/March/2022
	Rules regarding Transportation infrastructure (Public & private transportation infrastructure, and street scape).							
	Rules regarding layout of neighborhood.							
	Rules regarding housing/building type (housing type, building type such as size, shape, type, & No. of floors).							
	Rules regarding neighborhood density (indicators such as household units per km2, & population size per km2).							
2. What strategies and mechanisms are used to legalize and follow up regulations by planning institutions?	Legalizing the rules regarding land-use (mixed-use, green spaces, open spaces, community building such as services and institutions).	(mixed-use, green spaces, open spaces, community building such as services and institutions).	-Urban planning department -Duhok municipality	Interviews (with semi-structured questions)	Primary data Qualitative	To get knowledge about the procedure of legalization of national standards	2 Times	3th/March/2022
3. To what extent are the rules & standards of urban form elements enforced in the case-study?	Enforcement of the rules regarding land-use (mixed-use, green spaces, open spaces, community building such as services and institutions).	(mixed-use, green spaces, open spaces, community building such as services and institutions).	-Data collected by researchers	Interviews Observations Questionaries & Measurement	Primary data Qualitative and Quantitative	To get knowledge about how much the government was able to enforce the existing laws.	3 Times	22th/March/2022
	Enforcement of the rules regarding Transportation infrastructure (Public & private transportation infrastructure, and street scape).							
	Enforcement of the rules regarding layout of neighborhood.							
	Enforcement of the rules regarding housing/building type (housing type, building type such as size, shape, type, & No. of floors).							
	Enforcement of the rules regarding neighborhood density (indicators such as household units per km2, & population size per km2).							



3.5 Difficulties and Limitation

Researchers encountered various obstacles and limits when gathering data and conducting observations, including:

- Communication was difficult, especially when it came to language. Particular experts were uninterested in some terms of English, while others had no concept what English was. As a result, researchers were required to translate all of the questions into the relevant language.
- Additional difficulty was with residents during questioning; not everyone accepted to respond to the research questions, therefore researchers were obliged to explore elsewhere.
- Due to the obvious sensitivity, researchers cannot seek clarification about the government during expert interviews, making data collection more complex.
- The specialist has not always been approachable. As a result, researchers were forced to conduct interviews more than once.
- Much of the information and standards were formulated before 2010, having not been updated in a long period, making it more difficult for researchers to acquire additional data in order to be more certain about the data obtained.
- Data not available, certain information was not provided from any administration, resulting in incomplete information for researchers.
- Five elements were exceedingly comprehensive, and handling them with all three case studies with the researchers' restricted time was quite tough.



Chapter Four: Result & Discussion

- **Urban Planning Department Standards for Neighborhood Development**

Based on Iraqi housing standards up until recently, the dominant urban design orientations followed a community idea with a service center at its center. Then, based on the strip of service distribution, additional tendencies emerged, interfering with the grouping system of housing and preventing the neighborhood's economic, social, and cultural activities from being continuous and lively. The term "residential district" refers to a neighborhood that is defined by three factors: the number of family members, the population, and the number of homes. A housing district is produced by joining four (neighborhoods) together, while a housing sector is formed by grouping four districts together. In terms of the city, it is made up of four or more housing sectors.

The goal of the planning standards is to organize the neighborhood determinants. In order to determine the general house development requirements in Duhok city the all standards explained next must be followed.

- **Characteristics of Neighborhood**

The table below displays the population limit, neighborhood area, plot area, garden area, and all the facilities that are expected to be located in the residential neighborhood based on the directorate of urban planning when the neighborhood is created from the ground up.

The Foundation of Projects in Neighborhoods must Start as a Residential Neighborhood and must Include the Following Characteristics

1	The number of neighborhood population must be (2400-5000)
2	The area dedicated for the neighborhood must be (77) hectares with density of (370person/hectare)
3	The students consist of 10% of total neighborhood population
4	Kinder garden for children of 3-5 years old are about 3% of total neighborhood population
5	The area for garden in the houses 2sq meters per capita
6	The area for playgrounds 5sq meters per capita



7	The public garden 1sq meter per capita
8	Primary school 0.7-1 square meter/capita
9	Nursery 2400 square meter
10	Kinder garden 2400sq meter
11	Market 1.1-2.6 square meters per capita
12	Cultural center 0.1-0.2 sq meters per capita
13	Health center 1500sq meters
14	Fire station 800sq meters

Table 11: Neighborhood foundation. Source: (Directorate of urban planning).



4.1 Density & Distribution of Housing Type of Urban Form Elements

Urban areas	Plot area	Population density by mahala person/hectare	Population density by neighborhood person/hectare	Population density by sector (person/hectare)
First	100-199	225-380	240-320	219-299
Second	200-299	150-220	140-200	130-180
Third	300-599	100-140	95-35	99-130
Fourth	600-800	65-90	60-85	99-80
Apartment				
Buildings				
3 Stories		250-340	200-290	185-260
4-5 Stories		270-350	220-300	190-270
6 or more		320-440	250-345	220-310

Table 12: Distribution of Housing types. Source: (Directorate of urban planning).

Type of houses	Accommodation density/dwelling /hectare/	Population net density Inhabitants /hectare
One family house:		
- detached	13-21	80-130
-semidetached	18-27	110-160
-row houses	24-42	140-250
courtyard	28-48	170-290
Multifamily:		
low-rise	40-80	200-400
high-rise	60-120	250-500

Table 13: Neighborhood density. Source: (Iraqi Planning Indicators for Community Facilities).



4.2 Planning Standards Regarding Land-Uses and Community Buildings

Mahala		
Type of Facility	Average Area (m ²)	Maximum Access Distance from Dwelling to Facility (in m)
Nursery	2000	300
Kinder garden	3500	300
Primary school	5000	500
Children playground	1500	800
Market	200	500
Public garden	5000	800

Table 14: Iraqi planning standards for community services (Mahala). **Source:** (Directorate of urban planning & Iraqi Planning Indicators for Community Facilities).

Neighborhood		
Type of facility	Average area (m ²)	Maximum Access Distance from Dwelling to Facility (in m)
Intermediate school	7500	500
Secondary school	70,000	800
Health center	1500	800
Social center	2500	800
Post office	400	800
Mosque	1000	800
Public garden	10,000	800
playground	25,000	800

Table 15: Iraqi planning standards for community services (Neighborhood). **Source:** (Directorate of urban planning & Iraqi Planning Indicators for Community Facilities).



Sector		
Type of facility	Average area (m ²)	Maximum access distance from dwelling to facility (in m)
Youth center	15,000	800
Public library	1000	500
Swimming pool	3500	500
Market	5000	500
Public transport	3000	-----
Fire station	2000	-----
Police center	2000	800
Fuel station	5000	1600
Mosque	2500	800
Sports ground	55,000	500
Social club	10,000	500
Other facilities	15,000	-----

Table 16: Iraqi planning standards for community services (Sector). **Source:** (Directorate of urban planning & Iraqi Planning Indicators for Community Facilities).

The tables above show the community services and land-uses standards, as determined by Mahala, neighborhood, and sector. As the population expands and demands to develop, the area for each facility changes and grows larger. Nursery, Kindergarten, primary school, children's playground, market, and public garden are all required land uses for Mahala. Intermediate school, secondary school, health center, social center, post office, mosque, public garden, and playground become more important as the area grows. The sector, which is made up of four neighborhoods,



University of Duhok, College of Spatial Planning, Department of Spatial Planning requires a youth center, a public library, a swimming pool, a market, public transportation, a fire station, a police station, a fuel station, a mosque, a sports ground, a social club, and other services.

Planning level	<i>type of facility</i>	<i>Low density areas (Less than 70persons/hectare)</i>	<i>Med density areas (70-220persons/hectare)</i>	<i>High density areas (More than 220 persons/hectare)</i>			
		pop. Served (x1000)	Min. Site area (M2)	pop. Served (x1000)	Min. Site area (m2)	pop. Served (x1000)	Min. Site area (m2)
neighborhood level (2000-3000)	local mosque	(2-3)	2230	(3-5)	1486	(3-5)	1115
	retail facilities	(2-3)	372	(3-5)	465	(3-5)	372
	local plaza	(2-3)	2787	(3-5)	2787	(3-5)	2323
	Tot lot	(2-3)	2787	(3-5)	2787	(3-5)	1858
Community level (5000-10000)	Juma mosque	(7-10)	4645	(10-15)	3716	(10-15)	2787
	Commercial shopping center	(7-10)	8826	(10-15)	7990	(10-15)	6503
	Children nursery	(5-7)	1858	(7-10)	1394	(7-10)	1115
	Kinder garden	(5-7)	7246	(7-10)	5574	(7-10)	4645
	Primary school	(5-7)	11706	(8-12)	8361	(8-12)	7525
	Pvt. General clinic	(5-7)	1115	(5-7)	929	(5-7)	743
	Pvt. Specialty clinic	(7-10)	1115	(7-10)	929	(7-10)	743
	Private polyclinic	(7-10)	1486	(7-10)	1115	(7-10)	743
	Playground	(5-7)	7432	(5-7)	6503	(5-7)	5574
	Community Park	(7-10)	17652	(7-10)	1486	(7-10)	11148

Table 17: community facilities-planning standards. Source: (Directorate of urban planning).

The following information is provided by the department of urban planning, in the law number (50), of qualifications of preparing suitable land for kindergarten and schools based on the number of families that occupy the neighborhood; the law is as follows:

1. Each family has one member in kindergarten
2. Each family has two primary school students.
3. Each family has one high school student.



- **For more Clarification, the New Schools are Built Based on the Following Characteristics**

1. Schools of 9 classes in rural areas, complexes, and centers of towns, the area dedicated for is (4500-5000m²), and 650 students are allowed.
2. High Schools of 12 classes in large complexes, town centers, and districts, the area dedicated to these schools is about (6500-7500m²) and receives around 900 students.
3. High schools of 18 classes in the center of districts and provinces are built in a range of (7500-8500m²) and receive around 1300 students.
4. High schools of 27 classes are only allowed in the center of the province, the area dedicated must be between (7500-8500m²) and receives around 1950 students.
5. The kindergarten buildings must have six classes and are built-in large complexes and districts center, town center, and province center, the area dedicated must be in the range of (3500-4500m²) and receives around 300 students.

- **Obligatory Plot Area**

The obligatory plot area for houses is determined as:

Type of one family houses	Plot area (in sq m)	Land-use balance
Detached houses	400-600	0.63-0.80
Semi-Detached houses	300-400	
Row house	200-350	0.55-0.70
Courtyard house	150-300	

Table 18: Obligatory plot area for one family houses. Source: (Iraqi Planning Indicators for Community Facilities).

Regarding several categories of dwelling, it is recommended to plan plot areas for small one-family houses at lower limits and plot area for large and extra-large houses at upper of the ranges determined previously as obligatory for houses of definite type.

4.3 Transportation Infrastructure Standards for Neighborhoods

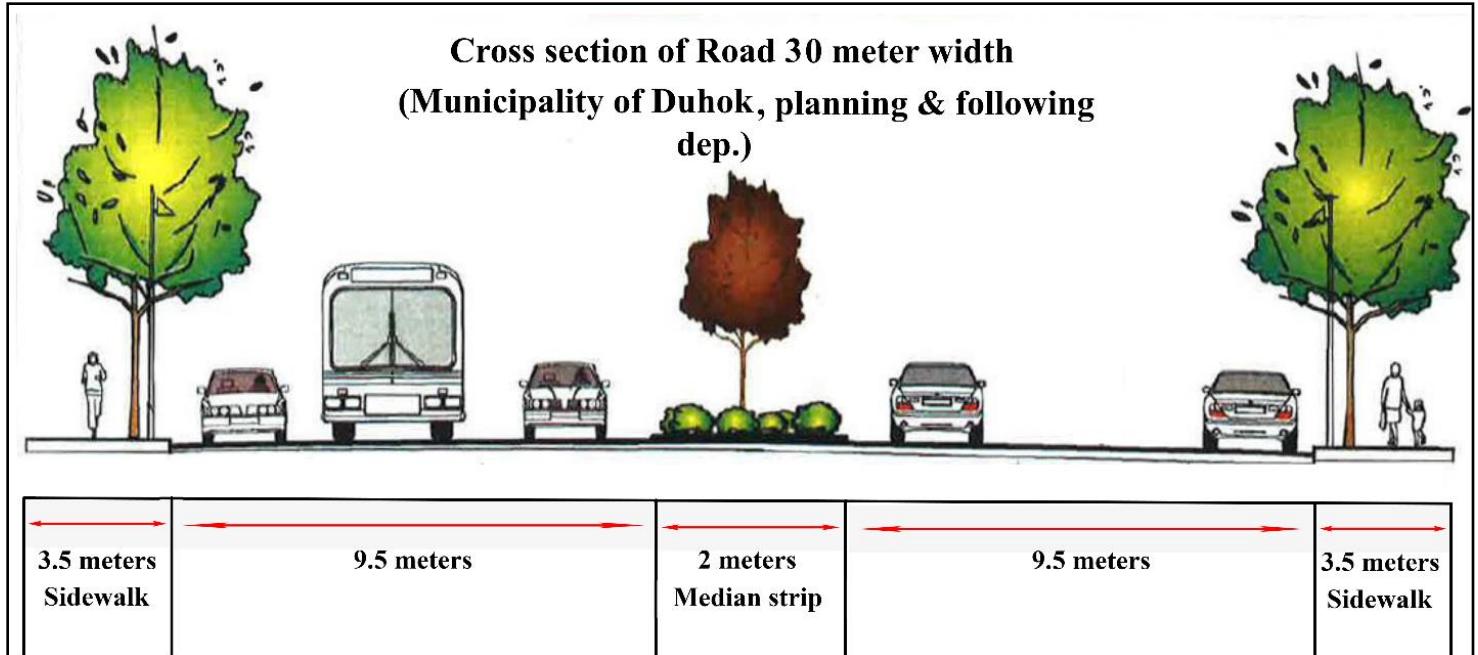


Figure 28: Cross section of road 30m width. Source: (Designed by Duhok municipality, adopted by researchers).

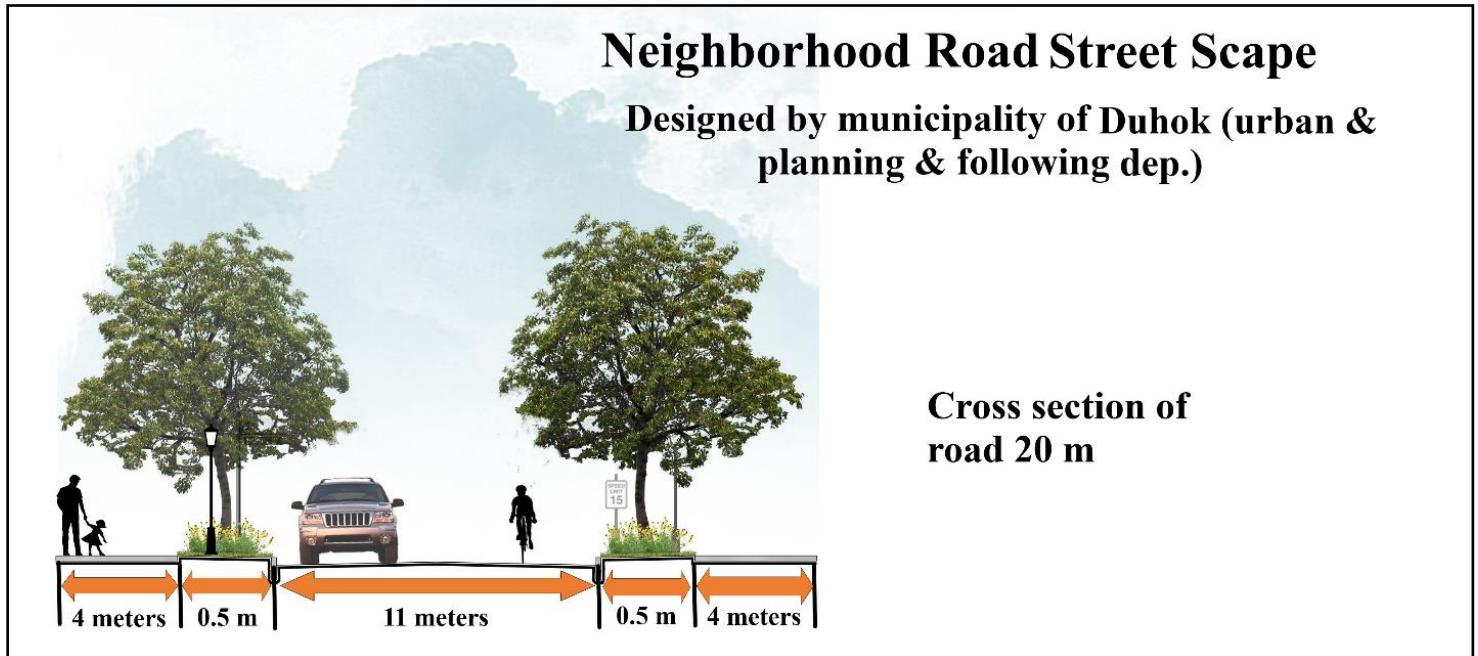


Figure 29: Cross section of road 20m width. Source: (Designed by Duhok municipality, adopted by researchers).

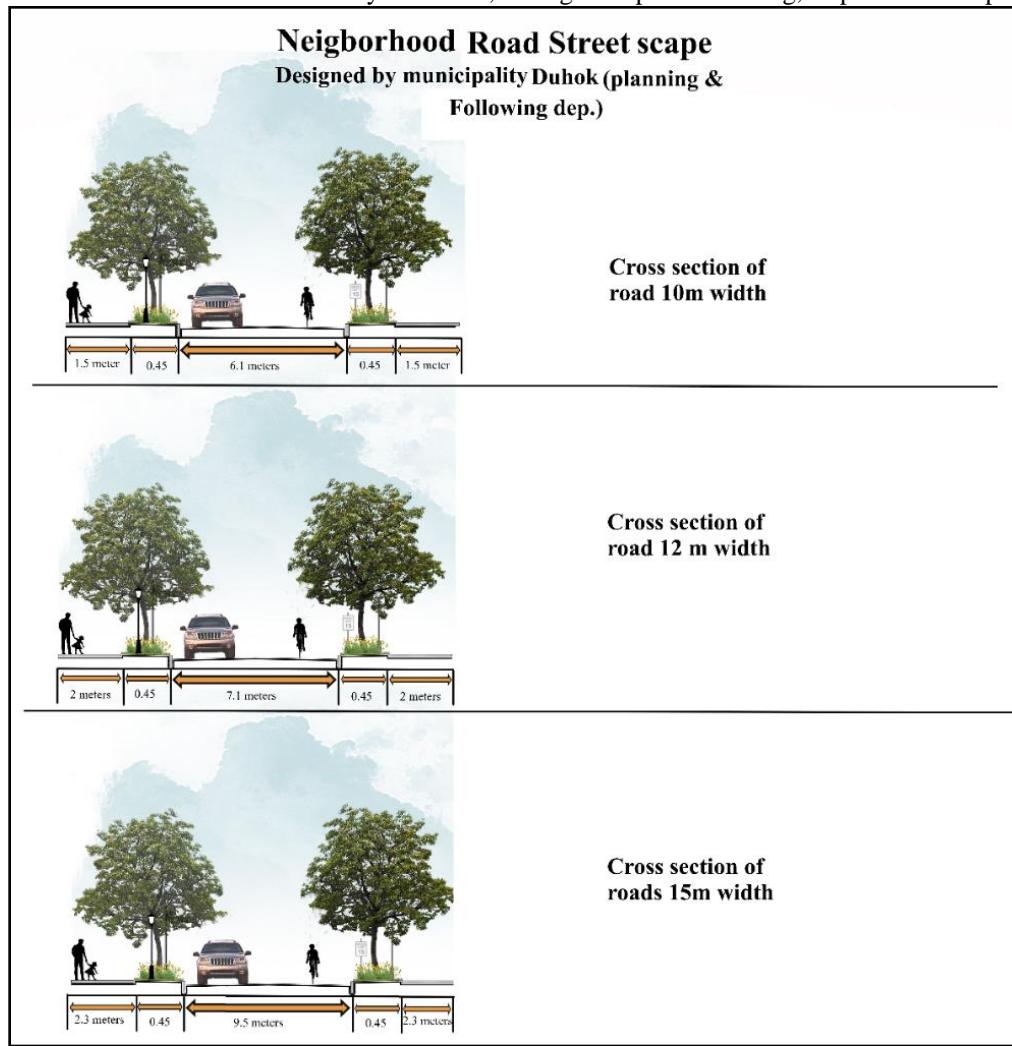


Figure 30: Cross section of road 10-, 12-, And 15-meter width. **Source:** (Designed by Duhok municipality, adopted by researchers).

Road Width	Sidewalk width	Buffer width	Traffic lane Width	Median Width
10m	1.50 m *	0.45 m **	6.01 m	N/A
12m	2.00 m *	0.45 m **	7.10 m	N/A
15m	2.25 m *	0.50 m ***	9.50 m	N/A
20m	4.00 m *	0.50 m ***	11.0 m	N/A
30m	3.50 m *	0.50 m ****	9.50 m	2 m

* For each sidewalk on both sides
** For each buffer on both sides
**** For each buffer out of total

Table 19: Width of roads according to the standards with sidewalk **Source:** (Duhok municipality).



4.4 Characteristics of Building Types

- Playground 2400m² (more than one numeral)
- Parks (9600m²)
- Yong's center (1200m²)

When they design, they should consider the high and low buildings, building forms, building types, the distance between services and residential blocks, and the direction of sunlight to a building; furthermore, a distance between buildings should not be less than (20m). The sun should shine on the building's basement for three hours during the day. The planning law (semi-private, private, semi-public, public) reduces riskiness.

- **Building Orientation**

The sun's position at any point on the earth's surface is defined by the angle of azimuth and the angle of altitude. These angles, determined by the latitude, the date and the hour, play an important role in establishing the orientation of the building. In Iraq, the latitude generally accepted N. for the purposes of the orientation of the building is 35°. The greatest and smallest altitude of the sun within a year, receptivity, the best orientation of the building is 15° east from the south.

4.5 Planning Standards Regarding Urban Layout

Either of municipality and urban planning department of Duhok doesn't follow certain codes or standards regarding layout, the development of layout simply follows the transportation routes.



4.6 Standards Creation Procedure of Urban Elements in Neighborhoods in KRG

4.6.1 Kurdistan Region Laws and Standards Process

When the land uses are distributed in the neighborhood, whether commercial, residential, or service. All laws come from Parliament, and every law carries special instructions. After Parliament, the instructions go to the governorates' municipality, where laws and projects are implemented through the municipality. For example, building permits are distributed by the municipality in accordance with Article 41, which states that only the municipality can give building permits to residents. As for the licenses for towers, services, and industrial stores, they come from the Urban Planning Department, which also offers approvals on agricultural, industrial, and service lands, the municipality cannot provide these licenses if the Department does not approve them of Urban Planning.

This indicates good coordination and communication between the municipality and other departments. As for other services, such as building schools, mosques, and hospitals, they come directly at the request of the Kurdistan Regional Government. These laws are given in general, after which each department operates according to its own rules.

There is permanent communication between the municipality and all other government departments regarding building standards. Density, transportation, green, commercial and residential areas, each department has its own laws, and only the municipality has the right to intervene in these laws. For example, the design department only has powers in matters related to design only. Whether designs are for streets or residential buildings, according to the width of the street, the buildings that need to be provided in this street are determined. As for the standards of service streets, the residents here can build a house that contains a storeroom and two floors. But each region differs from the other according to the topography of the place.

If the residents do not comply with these standards, legal measures will be taken against them. The Violations Committee follows up on violators. In addition, every map, whether it is for a house or shops, must be presented to the municipality and obtain approval for construction, as nothing is built without the municipality. As mentioned previously, the construction achievement contains instructions that must be followed. The design and the map are also provided



University of Duhok, College of Spatial Planning, Department of Spatial Planning with instructions. Failure to comply with the instructions leads to the immediate halt of construction.

4.6.2 Iraqi Laws and Standards

The laws that come to the Kurdistan region of Iraq are the same that are followed in all the Iraqi governorates. Modern Iraqi rules are followed in the Kurdistan region, except for some laws that the Kurdistan Region Parliament itself does not follow. These laws have been followed since 1992 due to the quality of these laws. For example, when creating any government project that infringes a person's ownership, that person will be compensated. The Iraqi building codes and standards are drawn from the French standards but are applied according to the current situation in Iraq. According to Law 55, all the streets and lands of the Green Zone are owned by the municipality only, which means that no one can use them, and if they are used, the violator will be punished.

4.6.3 Follow-Up Department

The municipality has a section that follows up on building permits, where the construction is followed up in the construction stages to see if the construction violates what has been agreed upon in the municipality. In the event of breaches, appropriate legal measures are taken. If any violation of the laws occurred and the municipality was not informed of this, the building permits follow-up department bears the responsibility. Follow-up violations become better year after year. And the reaction of people said that they would be compensated later.



4.7 Standards Enforcement on Case-Studies

4.7.1 Density Element & Building Characteristics Analysis in Case Studies

• Density Element Analysis in Masike Neighborhood

Density is a number of units, dwelling in a given land area, there are two types used of residential density (net residential density, gross residential density). the total area selected from the Masike rojava neighborhood is 50 hectares, so it's included:

- 748 dwellings
- 8 semipublic spaces
- 1 public space (Tahsin taha park)
- 3 school
- 1 kindergarten
- 21 local market
- 113 commercial shops

Net residential density = Number. of dwellings + semipublic space + local market / Total area

Net area: 500,000 m. sq -schools 39,100-1820 mosuq-29417 neighborhood garden- commercial 39945 =389,718 (38.9ha) referring to Residential small shops, small gardens, and home zone streets

Net residential density = $748+8/ 38.9 \text{ ha} = 19.4 \text{ dwelling per hectare}$

Gross residential density = number of dwellings +local market +semipublic space +public space +educational building +commercial shop/ Total area

Gross residential density = $748+8+21+4+103/50 \text{ ha} = 17.68 \text{ dwelling per hectare}$, within the range of standard requirements which are 12-35 dwelling per hectare

Land use balance= Net residential density/ Gross residential density

Land use balance= $19.4/17.68 = 1.09$ which is outside of the required range



NO. of floor	Area range (square meters)	No. unit	Area of unit (hectare)
1	200	100	2.4ha
	400	10	
2	200	536	11.3ha
	400	15	
3	200	120	2.4ha
	400	5	
4	200	90	2.04ha
	400	6	

Table 20: Characteristics buildings in Masike. Source: (Created by researchers).

- **Density Element Analysis in Ashty Neighborhood**
- Number of dwellings: 470
- Number of commercial markets: 44
- Number of schools within the area: 5
- No of green spaces: 8 small (local)+ 1 large (neighborhood)
- Generators (Private) within the area: 1
- Empty area or empty yard: 5

Population density: $4364/50 \text{ ha} = 87 \text{ person per hectare}$, Med density areas (70-220 persons/hectare)

Residential density (dwelling per hectare): $470/50\text{ha}: 9.4 \text{ units/hectare}$

Net area: 500,000 m. sq -schools 21,400-2330mosuq-3100 neighborhood garden- commercial 40,000-16760 minor road=416410 (41.6 ha) referring to Residential small shops, small gardens, and home zone streets.

Net density= $(470 \text{ dwellings} + 2 \text{ small shops} + 5 \text{ small gardens}) / 41.6 \text{ ha} = 11.4 \text{ dwelling per hectare}$

Gross density= $(470 \text{ dwelling} + 44 \text{ Commercial} + 1 \text{ mosque} + 6 \text{ gardens}) / 50 \text{ ha} = 10.42 \text{ dwelling per hectare}$, within the range of standard requirements which are 12-35 dwelling per hectare

Land use balance= Net residential density/ Gross residential density

Land use balance= $11.4/10.42 = 1.09$ which is outside of the required range



No. of floors	Area Range	No. of buildings	Total area per floor
1	150-200	43	0.86
	201-250	6	0.15
	251-300	75	2.25
	301-350	39	1.365
	351-400	22	0.88
	451-500	4	0.2
	551-600	1	0.06
2	150-200	21	0.42
	201-250	19	0.475
	251-300	67	2.01
	301-350	52	1.82
	351-400	42	1.68
	401-450	1	0.045
	451-500	21	1.05
	551-600	3	0.18
	851-900	3	0.27
	1500	1	0.15
3	251-300	16	0.48
	301-350	11	0.385
	351-400	11	0.44
	451-500	5	0.25
4	301-350	1	0.035
	351-400	1	0.04
6	451-500	2	0.1

Table 21: Characteristics of buildings in Ashty. Source: (Created by researchers).



- **Density Element Analysis in Shelle Neighborhood**

Density is a number of units, dwelling in a given land area, there are two types used of residential density (net residential density, gross residential density). The total area selected from the Shele neighborhood is 50 hectares, so it's included:

- Number of dwellings: 670
- Number of commercial markets: 67
- Number of local markets: 38
- Number of schools within the area: 3
- Number of Mosque: 2
- No of green spaces: 2 small (local)+ 1 large (neighborhood)
- Empty area or empty yard: 7

Population density: $11273 / 50 = 225$ person per hectare

Residential density (dwelling per hectare): $670 / 50 \text{ ha} = 13.4$ units/hectare

Net density= $(670 \text{ dwellings} + \text{local market } 38 + \text{small gardens } 2) / 45 \text{ ha} = 15.7$ dwelling per hectare

Gross density= number of dwellings +local market +semipublic space + public space +educational building +commercial shop/ 50 ha = 17 dwelling per hectare

Land use balance= Net residential density/ Gross residential density

Land use balance= $15.7 / 17 = 0.92$ which is outside of the required range

No. of floors	Area Range	No. of buildings	Total area per floor
1	150-200	40	0.84
	200-250	56	1.4
	250-300	75	2.25
	300-350	29	1.015
2	150-200	29	0.58

	200-250	93	2.32
	250-300	81	24
	300-350	22	0.77
	350-400	10	0.4
3	200-250	69	1.72
	250-300	57	1.71
	300-350	39	1.36
4	300-350	30	1.05
	350-400	21	0.84
	400-450	19	0.85

Table 22: Characteristics of buildings in Shelle. Source: (Created by researchers).

- Building Orientations in Case Studies

Building Orientation In Case-studies



Figure 31: Building orientation in case-studies. Source: (Created by researchers).

In Ashty neighborhood 251 buildings, In Masike rojava 553, and in Shele neighborhood 503 buildings which are oriented at south, south, -east, south-west, and east. While in Ashty 216 buildings, in Masike 344, and in Shele neighborhood 269 buildings are oriented at north, north-west, and west. Based on standards the most preferred orientation is 15° at south. It can be seen



University of Duhok, College of Spatial Planning, Department of Spatial Planning in all three neighborhoods most of the buildings are directed to receive enough sun during day time.

- **Comparison of Density and Building Characteristics Element Between the Selected Case-Studies**

According to the data gathered by researchers, Masike neighborhood has a low density since it is a recent neighborhood, Ashty neighborhood has a medium density, while Shele neighborhood has a larger density than both Ashty and Masike neighborhoods.

A neighborhood vibrancy and long-term economic stability are enhanced by establishing a balance of land uses. A well-balanced neighborhood may provide citizens a varied range of housing, recreational possibilities, to job prospects. As explained previously in the three case-studies the land-use balance is outside of the suggested range of the standards, which means the land-uses aren't balanced and unable to provide a sustainable housing and economic activity.



4.7.2 Measuring of Land Uses & Determining Building Types of Selected Neighborhoods/Case Studies

Land-uses	Area in meter square	Area in hectares
Residential	196,478	19.6478
Mixed-use	39,945	3.9945
Green spaces (Public gardens)	50,156	5.0156
Institutions	25,985	2.5985
Services	2,925	0.2925
Parking	2,731	0.2731
Empty land	23,024	2.3024
Transport infrastructure	273,100	15.25
Total	500,000	50

Table 23: Measuring land uses of Masike neighborhood. Source: (Created by researchers).

The total area selected from Masike rojava neighborhood is 0.5sq.km; as researchers measured Ashty neighborhood by AutoCAD and ArcGIS to create the map. From this total area. biggest portion, which is 0.196478, is dedicated to residential purposes, followed by Transport infrastructure which is 273,100. Then green spaces which has area of 50,156. Followed by Mixed-use with the area of 39,945. After that Institutions with area of 25,985. Empty land has covered 23,024 area. and services has covered small area of 2,925. A lesser portion is dedicated to parking, which is 0.002731. Following map indicates the land uses of a chosen case study.

Land-uses	Area in meter square	Area in hectares
Residential	222,040	22.204
Mixed-use	40,000	4
Green spaces (Public gardens)	49,630	4.963
Empty land	2,580	0.258
Parking	500	0.05
Services	1,820	0.182
Institutions	39,100	3.910
Transportation infrastructure	125,490	12.549
Total	500,000	50

Table 24: Measuring land uses of Ashty neighborhood. Source: (Created by researchers).



University of Duhok, College of Spatial Planning, Department of Spatial Planning

The area selected from the Ashty neighborhood is 0.5 square kilometers, as researchers measured Ashty neighborhood by AutoCAD and ArcGIS to create the map. the biggest area is dedicated to residential areas which is 222,040. Followed transportation infrastructure which is 125,490. After that 49,630 is dedicated green spaces. Then mixed-uses covers 40,000 and institutions cover the area 39,100. Also, there are empty lands that cover 2,580. And services that cover 1,820. And finally, the smallest area is dedicated to parking, which is located in front of the mosque with area of 500. The bellow map shows the land use of Ashty neighborhood.

Land-uses	Area in meter aquae	Area in hectares
Residential	267,099	26.7099
Mixed-use	32,262	3.2262
Green spaces (Public gardens)	40,120	4.0120
Institutions	32,262	3.2262
Services	12,600	1.26
Parking	4,174	0.4174
Empty land	24,393	2.4393
Transport infrastructure	77,090	7.7090
Total	500,000	50

Table 25: Measuring land uses of Ashty neighborhood. Source: (Created by researchers).

The total area selected from the neighborhood Shelle is 0.5sq.km, from this total area the biggest portion which is 267,099 dedicated from residential purposes, followed by Transport infrastructure with area of 77,090. And green spaces which are mostly agricultural land with 40,120. And Institutions that cover 32,262 and Mixed-use also that cover 32,262. Empty land exists in the south of the neighborhoods selected area that cover 24,393. and lesser portion is dedicated for Parking which is 4,174. the following map indicates the land uses of chosen case study.

Landuses in Masika roj avaneighborhood

Legend

- [Yellow] Residential
- [Light Brown] Commercial
- [Brown] Mixeduse
- [Dark Blue] Institution
- [Blue] Services
- [Diagonal Lines] Parking
- [Green] Greenspaces
- [Dotted Green] emptyspaces

0 0.05 0.1 0.2 0.3 0.4 Miles

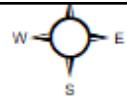
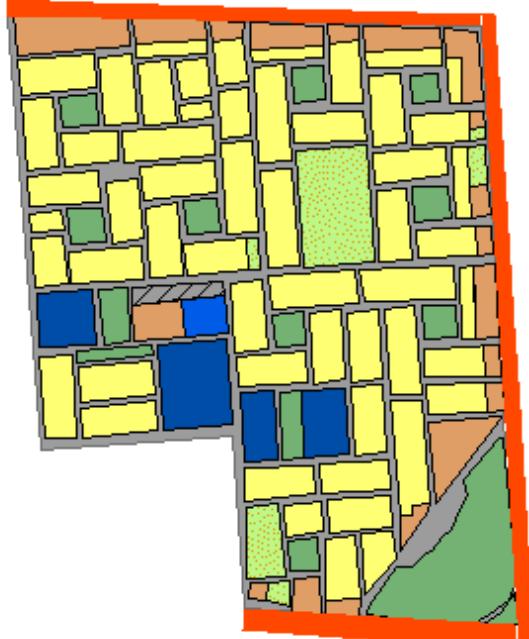


Figure 32: Land uses of Masike neighborhood. Source: (Created by researchers via ArcMap, 2022).

Landuses in Ashti neighborhood

Legend

- [Yellow] Residential
- [Light Brown] Commercial
- [Brown] Mixeduse
- [Dark Blue] Institution
- [Blue] Services
- [Diagonal Lines] Parking
- [Green] Greenspaces
- [Dotted Green] emptyspaces

0 0.04 0.08 0.16 0.24 0.32 Miles

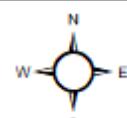


Figure 33: Land uses of Ashty neighborhood. Source: (Created by researchers via ArcMap, 2022).

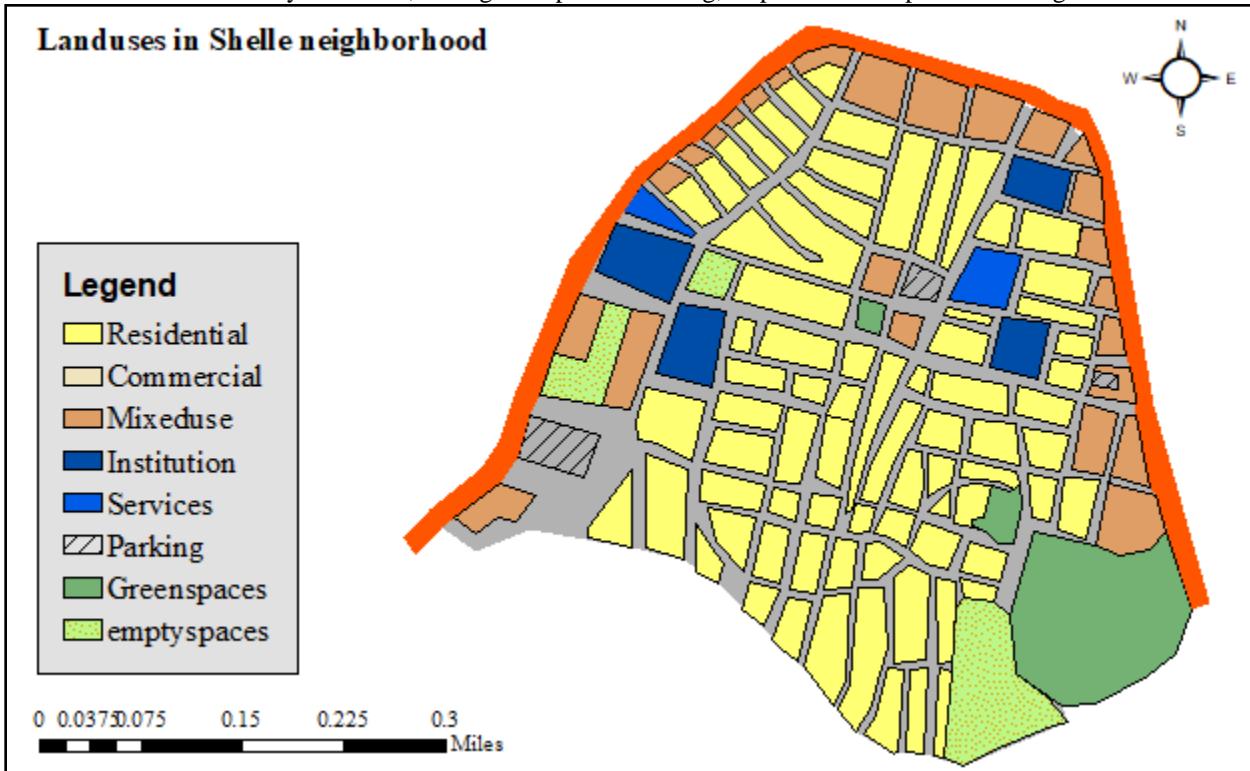


Figure 34: Land uses of Shelle neighborhood. Source: (Created by researchers via ArcMap, 2022).

- Comparing Land Uses of Neighborhoods with Required Standards

Services	Ashty neighborhood	Masike neighborhood	Shelle neighborhood
Nursery	Exist	Do not exist	Do not exist
Kindergarten	Do not exist	Do not exist	Do not exist
Primary school	Exist	Exist	Exist
Playground	Exist	Exist	Exist
Market	Exist	Exist	Exist
Public garden	Exist	Exist	Do not exist
Mosque	Exist	Exist	Exist

Table 26: services availability within the case studies. Source: (Created by researchers, 2022).

As can be seen in the table above, the Ashty and Masike neighborhoods mainly conform to the recommended standards, and the services that should be offered within 0.5 square kilometers are indeed available in the area. While it is clear that the old Shelle neighborhood lacks many amenities



University of Duhok, College of Spatial Planning, Department of Spatial Planning such as public gardens, play fields, a kindergarten, and a nursery, it is also clear that the old Shelle area lacks numerous important services.

Services	Low density area	Available area dedicated for services	Medium density area	Available area dedicated for services	High density area	Available area dedicated for services
	Masike neighborhood		Ashty neighborhood		Shelle neighborhood	
Nursery	1858	0	1394	325 with two floors	1115	0
Kindergarten	7246	0	5574	0	4645	0
primary school	11706	9272 with two floors	8361	11733	7525	2841 with two floors
Playground	7432	20739	6503	2902	5574	1100
Market	2787	39,945	2787	40,000	2323	1,150
Public garden	17652	29417	1486	40728	11148	0
Mosque	4645	2925 with two floors	3716	1820 with two floors	2787	12,600

Table 27: Required land for each service based on density of the case study. Source: (Created by researchers, 2022).

As it will be explained in coming parts the case studies are classified on density as following (Masike is a low dense area, Ashty is a medium dense area, and Shelle is a high dense area). The Masike neighborhood is deemed a low-density area, as detailed in the following sections, and the services accessible inside this neighborhood are pretty similar to the requirements of a low dense area, according to the researchers' measurements.

For primary school the land required is 11706 square meter while the available area is 9272 with two floors which is more than enough. For services such as playground the required area is 7432 square meters while the available one is 20,739 which is also more than enough. For the available market area, it is 29,417 square meter while the standards require less than that is 2787. For public gardens the land that must be dedicated for this service must be 17652 square meters while the available area is 29417. And finally for services such as mosque the available area is 2925 with two floors and the required area must be 4645.



For Ashty the available nursery covers 325 square meters with two floors which is 650 meters while the required standards it must be 1394. For primary school the land required is 8361 square meter while the available area is 11733 with two floors which is more than enough. For services such as playground the required area is 6503 square meters while the available one is 2902. For the available market area, it is 40,000 square meter while the standards require less that is 2787. For public gardens the land that must be dedicated for this service must be 1486 square meters while the available area is 40,728. And finally for services such as mosque the available area is 1820 with two floors and the required area must be 3716.

For old neighborhood of Shele, the available primary school the land required is 7525 square meter while the available area is 2841 with two floors which is more than enough. For services such as playground the required area is 5574 square meters while the available one is 1100. For the available market area, it is 1,150 square meter while the standards require less that is 2323. And finally for services such as mosque the available area is 12,600 with two floors and the required area must be 2787.

While there is no such thing as a nursery or kindergarten. Not quite similarly, the services are to the required area that must be devoted for the services in medium density areas such as the Ashty neighborhood. While in a densely populated location like Shelle, services fall short of expectations. For example, most of the available green space is used for agricultural purposes rather than playgrounds and parks.



- **Comparison of Land-Use Element Between the Selected Case-Studies**

Over all the standards regarding land-use exist in department of urban planning and municipality of Duhok in details, as well as the enforcement of such laws are confirmed in the three case studies but its more focused on the new neighborhoods. It can be seen not all of the services are available specially in the old neighborhood of Shele it lacks several important services, while most of the needed services are available in the neighborhood of Ashty and Masike rojava.

Compared to the standards the available services in the case study Masike rojava are equal, while in Ashty neighborhood it can be seen some of the services cover less area than needed while some of the services surpass the needed area that must be dedicated for the services. Finally, the old neighborhood of Shele has shortage in area for most of the available services in large amount of area.

4.7.3 Transportation Infrastructure of Case Studies

The quantity and quality of connections in the street network can be defined as street connectivity. The goal of the street network is to connect two locations and provides access to services and facilities. The number of various paths that connect two places is governed by the design of the street network, which affects how direct or indirect the connections are. A typical rectilinear street grid has high connectivity because it provides relatively direct links and diverse routes as can be seen in Masike and Ashty neighborhoods. Curvilinear networks and dead-end routs are characterized by cul-de-sacs, which are more common in Shelle neighborhood, on the other hand, frequently give relatively indirect links and few paths, resulting in low connectedness.

- **Road Infrastructure of Masike Neighborhood**

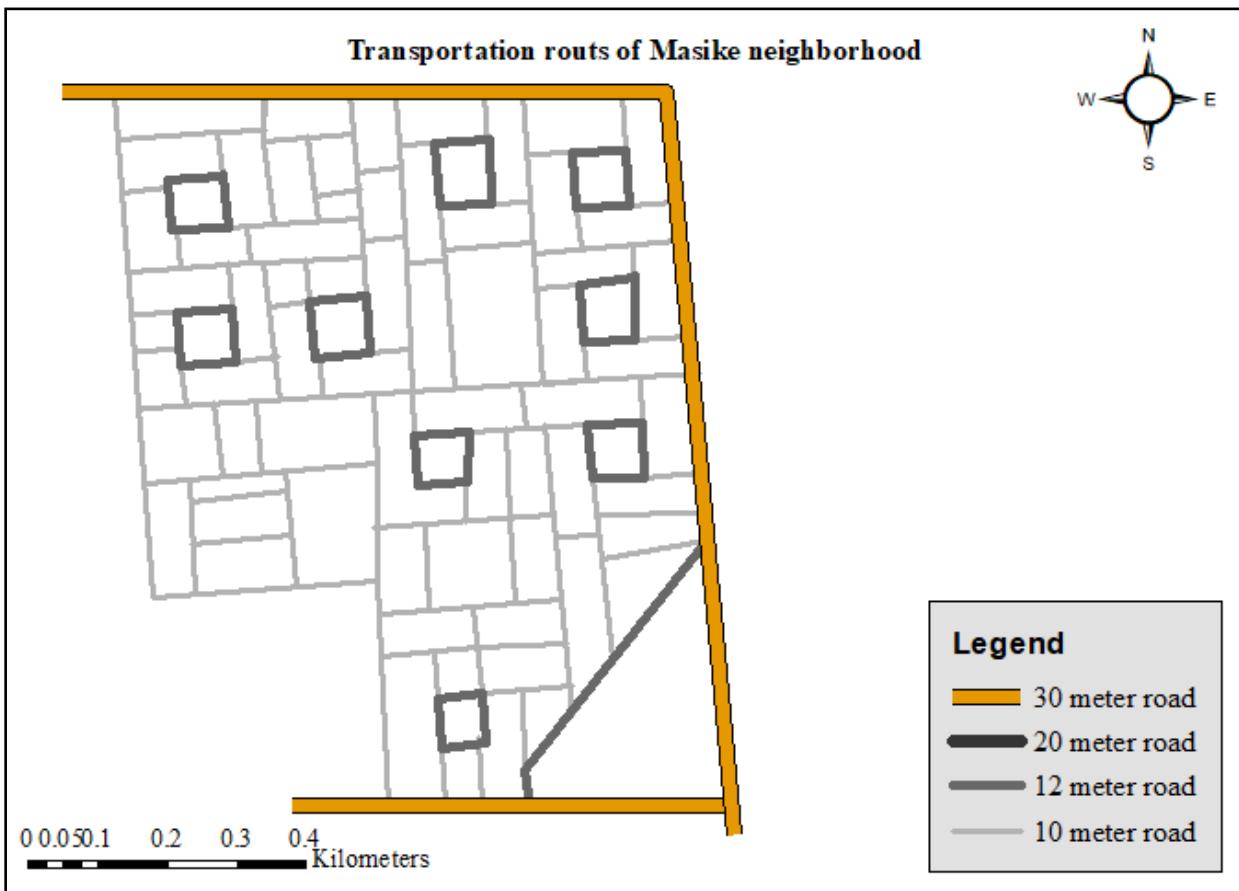


Figure35: Transportation infrastructure of Masike neighborhood. Source: (Created by researchers using ArcMap, 2022).

University of Duhok, College of Spatial Planning, Department of Spatial Planning

As can be seen in map above the connections between the transportation routes is ideal, and provides a perfect connection between residential area and surrounding services. It can be seen from the map that the roads surrounding the local green spaces are in the width of 12m, which provides citizens more space to park their car or more walking are available. while all of the rest are in 10m parameter.

- **Road Infrastructure of Ashty Neighborhood**

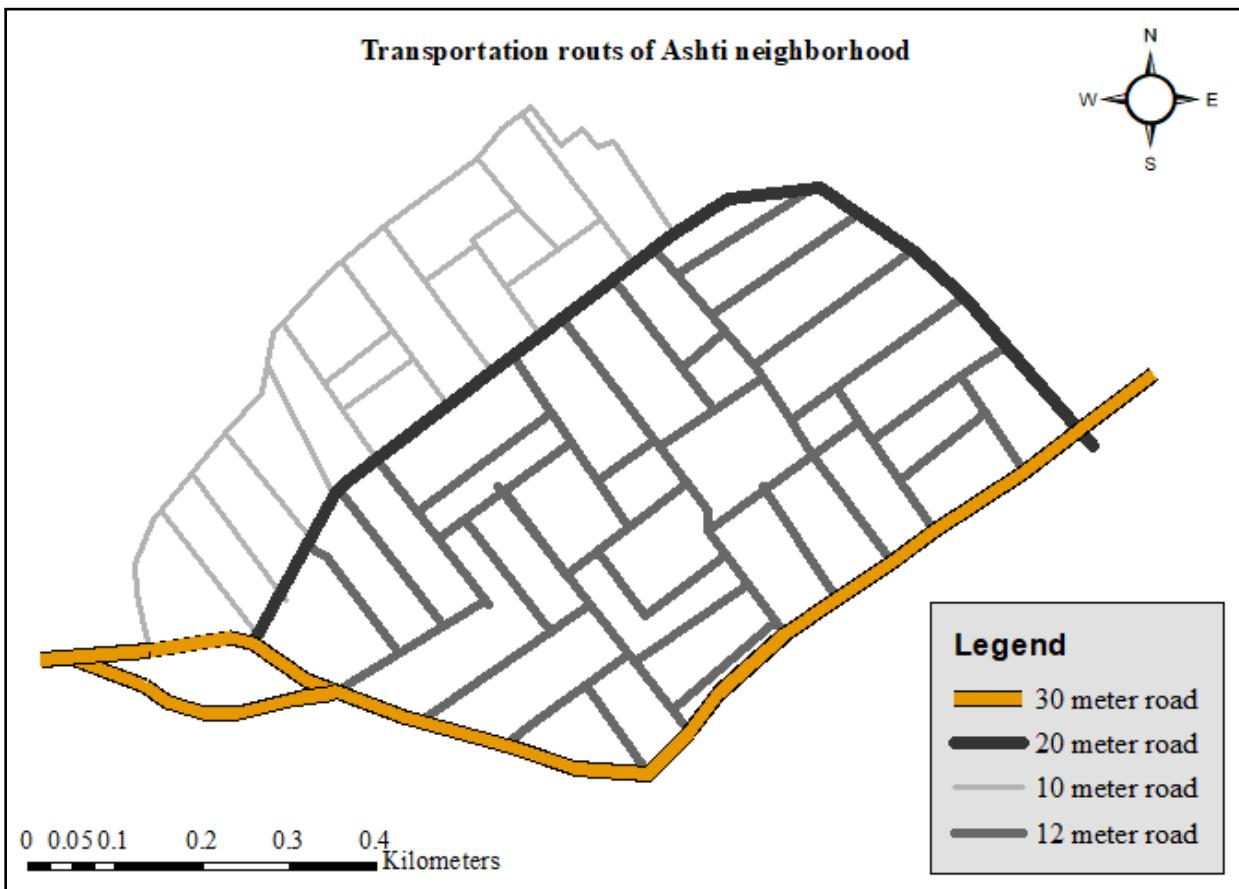


Figure 36: Transportation infrastructure of Ashty neighborhood. Source: (Created by researchers using ArcMap, 2022).

As figure above indicates the neighborhood has very wide roads and most of them are in 12meter width, which provides the citizens with very comfortable accessibility to the main road or travelling through the neighborhood.

- **Road Infrastructure of Shelle Neighborhood**

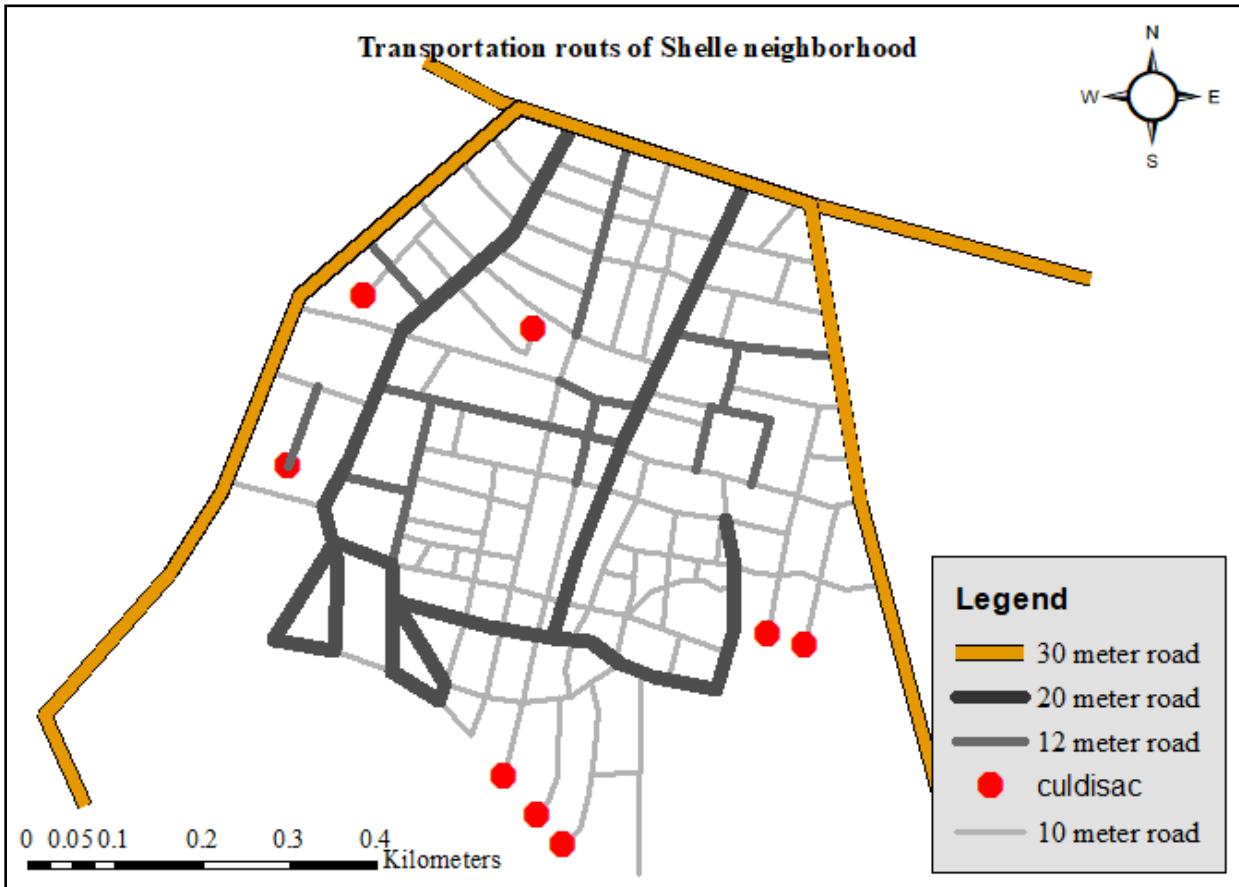


Figure 37: Transportation infrastructure of Shelle neighborhood. Source: (Created by researchers using ArcMap, 2022).

As can be seen in the map above there is a very poor connection and inorganizing between the routs as well as existing of many dead-end routs (cul-de-sacs) specially in the south of the neighborhood which is close to agricultural area. All mentioned makes reaching the services a bit difficult to the residents of the neighborhood.

- **Sidewalks of Ashty Neighborhood**

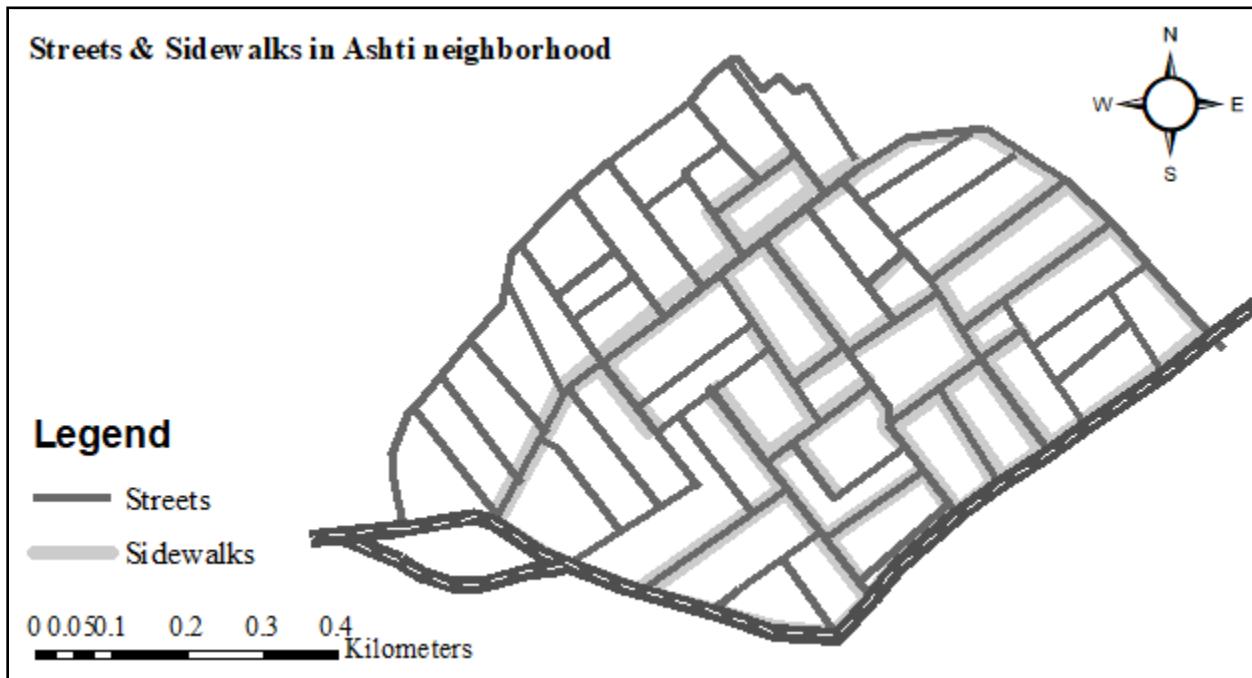


Figure 38: Sidewalks of Ashty neighborhood. Source: (Created by researchers using ArcMap, 2022).

- **Sidewalks of Shelle Neighborhood**

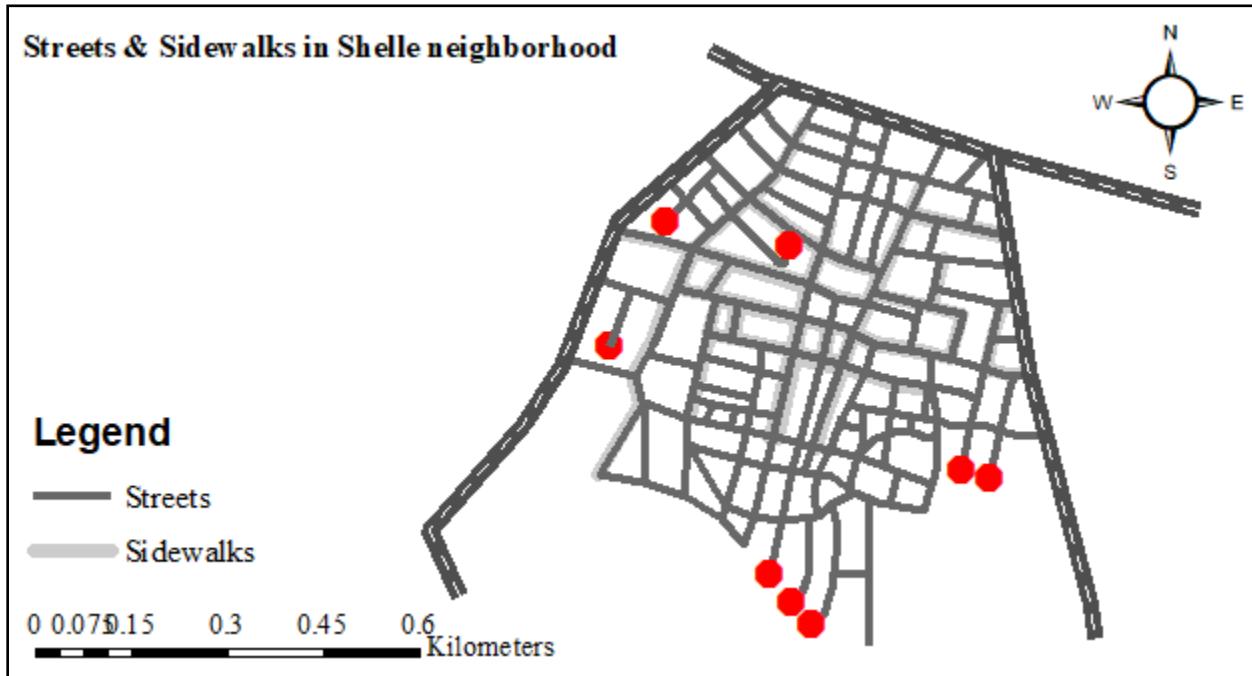


Figure 39: Sidewalks of Shelle neighborhood. Source: (Created by researchers using ArcMap, 2022).

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There are numerous concerns with transportation infrastructure in the case studies, as seen in the figure above. Sidewalks allow people who are in a hurry to get somewhere without having to cross heavy traffic, however if people misuse the sidewalks, it becomes difficult for pedestrians to move. People in the Masike neighborhood can be observed freely using the public space on the sidewalks and roads for personal gain, which is completely against the law. As well as unavailability of sidewalks on some roads.

This issue can also be seen in the Ashty area; based on observations, multiple private electrical generators have been seen on the public space of neighborhood roads; as can be seen in the figure below, the generator covers half of the road, making going through difficult. Many of the roads and sidewalks in the Ashty area have deteriorated over time, as have the sidewalks, which have a life expectancy of about 80 years because they are made of concrete but are severely degraded and uncomfortable to walk on after only 40 years.

As for Shelle neighborhood there are many issues regarding transportation infrastructure that has been observed, as can be seen in the below figure there are 8 Cul-di-sacs (dead-ends) in the neighborhood which makes accessibility uneasy. As for road pavement many roads haven't been paved inside and on the borders of the neighborhood, such roads generate a lot of dust during dry periods, and are rough and which can increase road noise. Also, most of roads has been very deteriorated due to the poor construction.

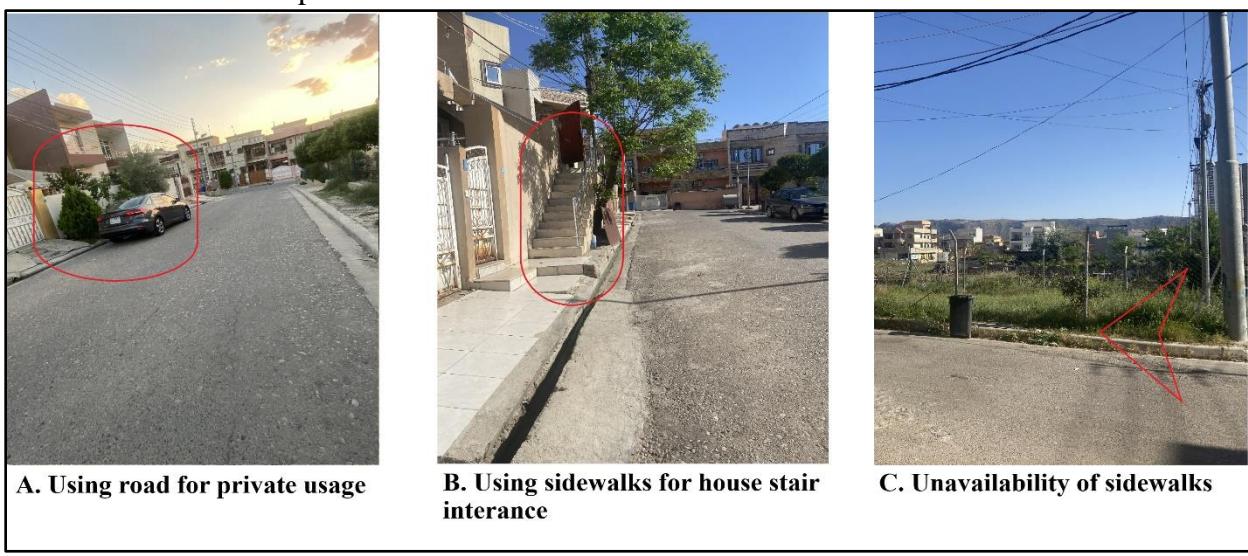


Figure 40: Case study (Masike) transportation infrastructure conditions. **Source:** (Created by researchers, 2022).

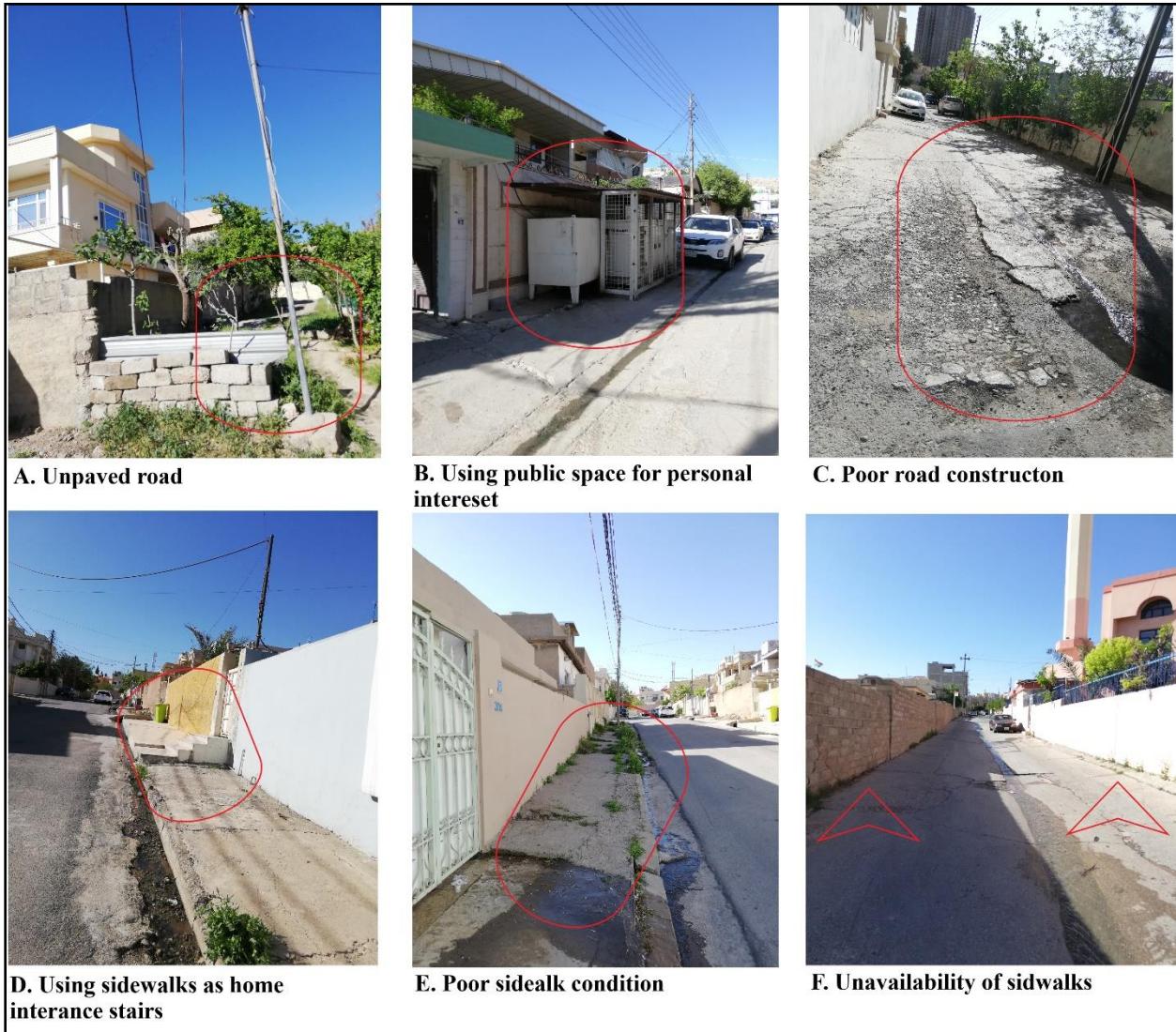


Figure 41: Case study (Ashty) transportation infrastructure conditions. **Source:** (Created by researchers, 2022).

**A. Poor road construction****B. Unpaved road covered with vegetation****C. Cul-di-sac (Dead end roads)****D. Unpaved narrow road****E. Unavailability of sidewalks****F. Using sidewalks for non-public usage (Building stairs entrance)**

Figure 42: Case study (Shelle) transportation infrastructure conditions. **Source:** (Created by researchers, 2022).



- **Access to Services in Ashty Neighborhood**

The inhabitants must have access to nursery within maximum distance of 300 meters, As can be seen in the figure the location of the existing nursery doesn't serve the neighborhood very well specially for citizens that live in the north of the neighborhood.

Based on the standards the inhabitants must have access to Local market within maximum distance of 500 meters, as can be seen in the figure the existing market area serve the neighborhood very well. Based on the standards the inhabitants must have access to Gardens within maximum distance of 800 meters. As can be seen in the figure the seven existing public gardens are located in very well locations and serve the neighborhood very well.

With a population of 4364 people and 727 families. According to the Urban Planning Directorate's requirements, each household has two members who are of primary school age. As a result, 1454 students attend school, according to estimations.

And according to regulations, residents must be able to walk to a primary school within 500 meters. The primary school, as shown in the figure, is located in the middle of the neighborhood, with practically all residents having access to it within 500 meters.

According to the standards, residents must have access to amenities such as a mosque within an 800-meter radius. As can be seen in the figure, the nearest mosque is located in the heart of the community, within 800 meters of practically every resident.

The services that must exist within this are Nursery, Kindergarten, Primary school, Playground, Public Garden and mosque. All of the services mentioned are available in the neighborhood except for the kindergarten. For selected area from Ashty neighborhood, the population is 4364, with family numbers of 727 families. Based on the standards of Urban planning directorate, each family has a member with proper age for kindergarten. Therefore, based on calculations there are 727 inhabitants that could require kindergarten. As for the available services all of them are located in the proper locations and serve the neighborhood well except for the nursery.

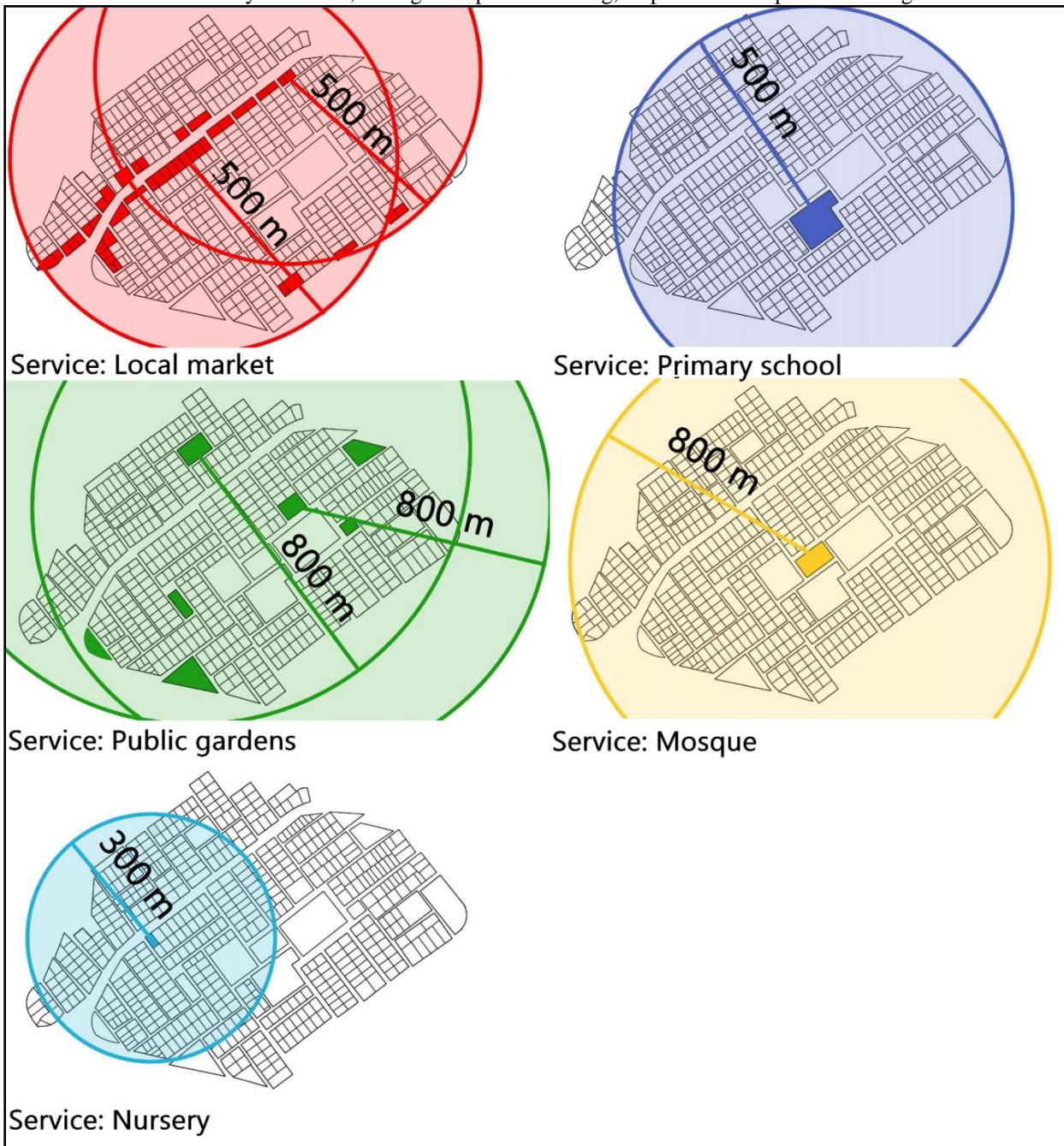


Figure 43: Service access within Ashty neighborhood. **Source:** (Created by researchers, 2022).



- **Access to Services in Masike Rojava Neighborhood:**

Based on the standards the inhabitants must have access to Local market within maximum distance of 500 meters, as can be seen in the figure the existing market area serve the neighborhood very well. Based on the standards the inhabitants must have access to Gardens within maximum distance of 800 meters. As can be seen in the figure the ten existing public gardens are located in very well locations and serve the neighborhood very well.

With population of 670 people and 111 families. According to the Urban Planning Directorate's requirements, each household has two members who are of primary school age. As a result, 222 students attend school, according to estimations. Residents must also be able to walk 500 meters to a primary school, according to laws. The primary school, as shown in the picture, is in the south of the community, which does not adequately serve the residents in the north.

Residents must have access to amenities such as a mosque within an 800-meter radius, according to the regulations. The nearest mosque, as shown in the figure, is in the heart of the community, within 800 meters of almost every resident.

The services that must exist within this are Nursery, Kindergarten, Primary school, Playground, Public Garden and mosque. All of the services mentioned are available in the neighborhood except for the kindergarten and nursery. For selected area from Masike neighborhood, the population is 670, with family numbers of 111 families. Based on the standards of Urban planning directorate, each family has a member with proper age for kindergarten. Therefore, based on calculations there are 111 inhabitants that could require kindergarten. Also, the existing services all serve the citizens very well in term of access except for the primary school which is located in the south of the neighborhood.

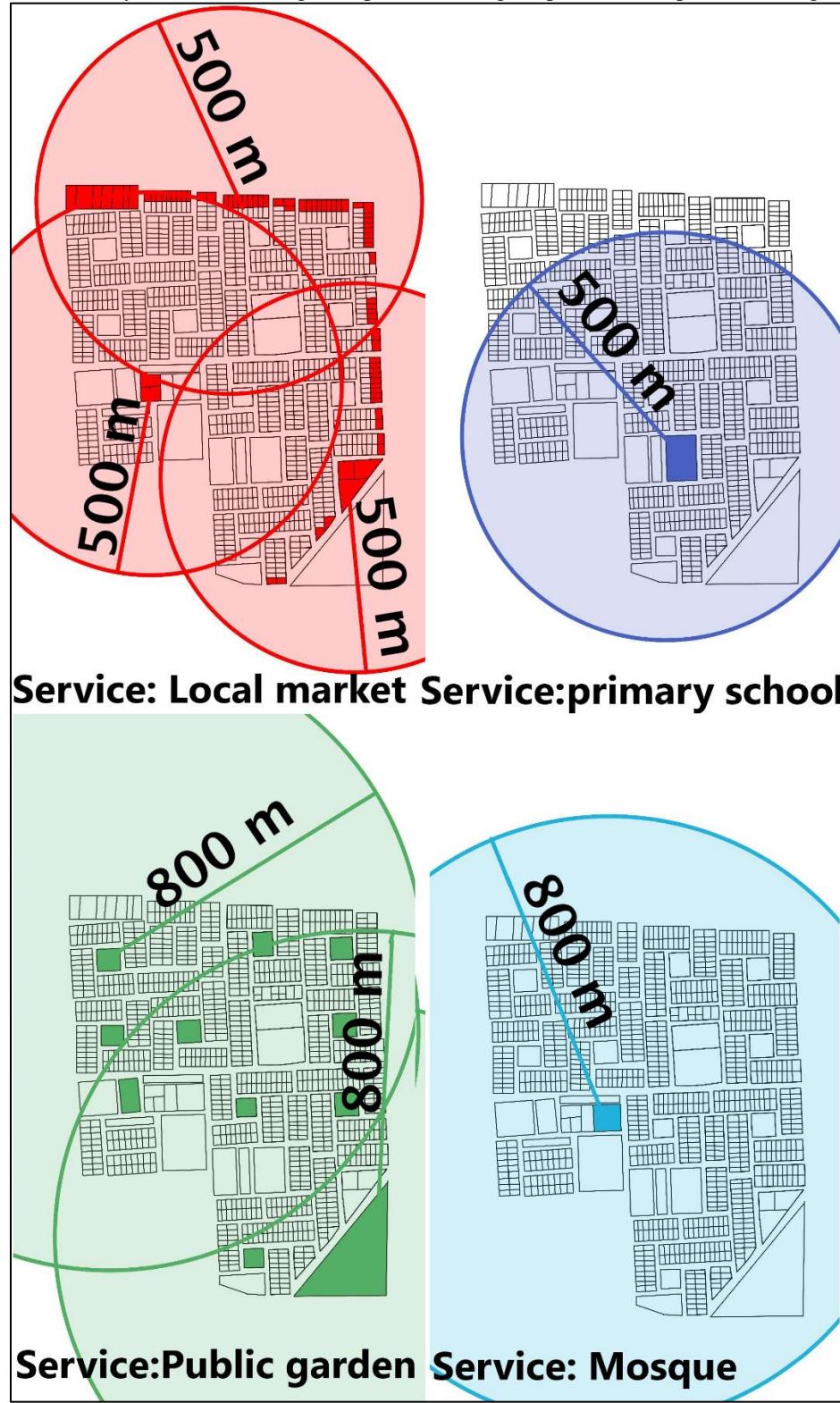


Figure 44: Service access within Masike neighborhood. Source: (Created by researchers, 2022).



- **Access to Services in Shelle Neighborhood**

Based on the standards the inhabitants must have access to Local market within maximum distance of 500 meters, as can be seen in the figure the existing market area serve Shelle neighborhood very well. Based on the standards the inhabitants must have access to Gardens within maximum distance of 800 meters. As can be seen in the figure despite the lack of public gardens the only existing public gardens are located in very well locations and serve the neighborhood very well.

With a population of 11273 people and 1878 families. According to the Urban Planning Directorate's requirements, each household has two members who are of primary school age. As a result, 3757 students attend school, according to estimations.

And according to regulations, residents must be able to walk to a primary school within 500 meters. The primary school, as shown in the figure, is located in the middle of the neighborhood, with practically all residents having access to it within 500 meters.

According to the standards, residents must have access to amenities such as a mosque within an 800-meter radius. As can be seen in the figure, the nearest mosque is located in the heart of the community, within 800 meters of practically every resident.

Nursery, Kindergarten, Primary school, Playground, Public Garden, and mosque are all required services. Some of the services mentioned have excellent coverage, while public gardens, nurseries, and kindergartens are in insufficient supply. The population of a selected area from the Shelle neighborhood is 11273, with 1817 families. Each family has a member who is of kindergarten age, according to the standards of the Urban Planning Directorate. As a result, according to estimations, there are 1817 people who may require kindergarten.

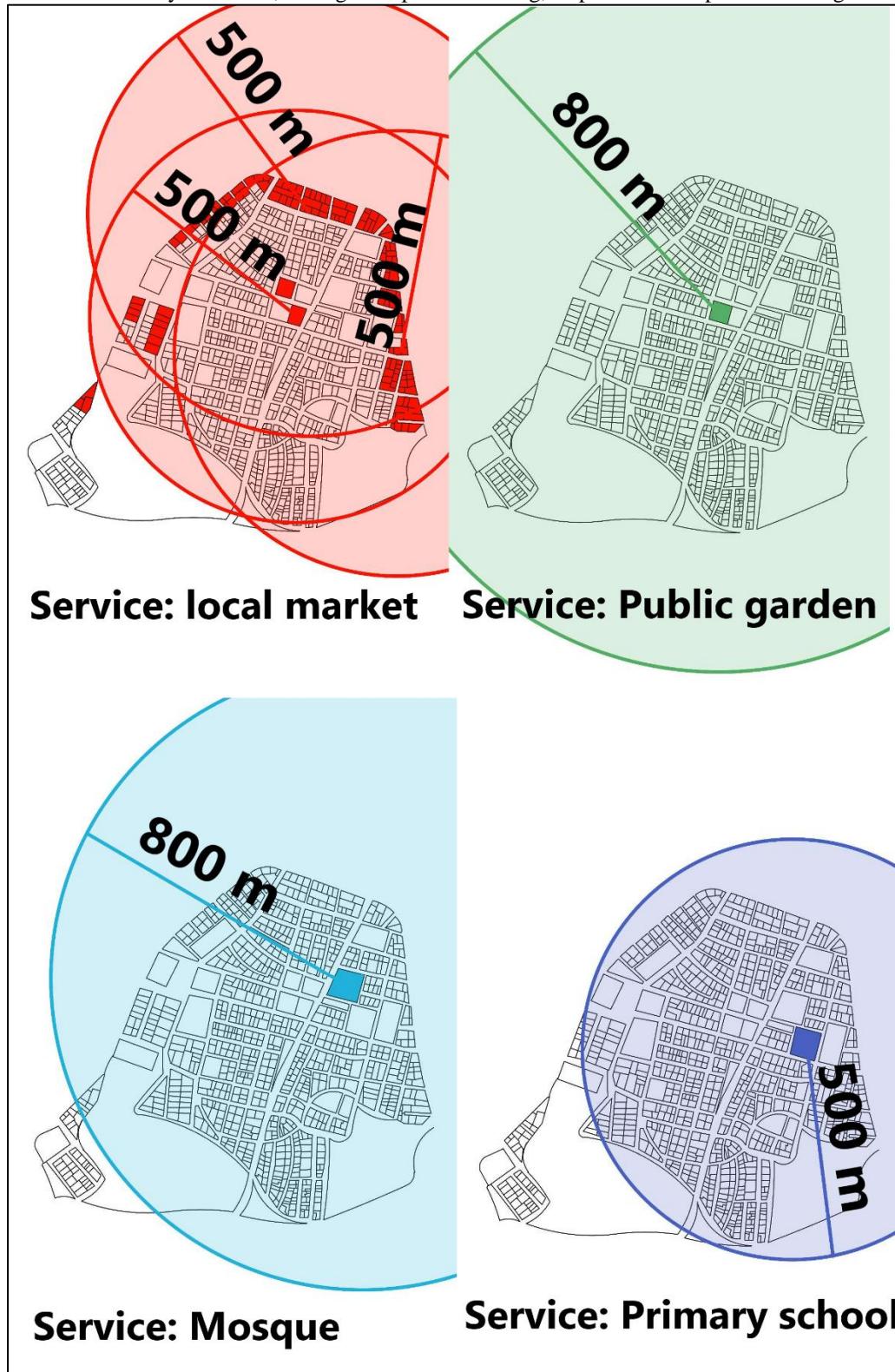


Figure 45: Service access within Shelle neighborhood. Source: (Created by researchers, 2022).



Neighborhoods	Street	Sidewalk
Masike	All of the streets were (6m) wide Except for those that have local markets the range of streets is (8m) wide.	For the sidewalks, they had different scales, for houses the scales were (1.20, 1.30, 1.50, and 2m). and for those streets that have local markets, the scales of sidewalks were (2, 2.20, and 2.60)
Shele	The shele neighborhood streets had many different scales starting from (2.70, 2.80, 3.30, 3.50, 4, 4.10, 6, 7.30, and 7.40m), and for those streets that have local markets, the scales start from (9, 9.40, 10, and 15m).	And also, the shele neighborhood sidewalk had many different scales starting from (50, and 90 cm) and (1.90, 2, 2.20 m), and for those sidewalks that have local markets, the scales start from (2.70, 2.80, and 23.50m).
Ashti	The Ashti neighborhood streets did not have many different scales starting from (4.50, 5, 5.80 m), and for those streets that have local markets, the scales start from (7, 8.10, 15 m).	And also, as same for the sidewalks did not have many different scales, and the different thing for the Ashti neighborhood is sidewalks for the houses and sidewalks that have local markets had the same scales, starting from (1.10, 1.70, 1.80, and 2 m).

Table 28: scales of the streets and sidewalks of the three neighborhood (Masike, Shele, and Ashti) Source: (Created by researchers, 2022).



- **Comparison of Transportation Infrastructure Element Between the Selected Case-Studies**

According to the data gathered by researchers, transportation elements are used in the Masike, Ashty, and Shele neighborhoods, although in various ways. Furthermore, the sidewalks in above figures demonstrate that there has been safety in the Masike area since there are contemporary sidewalks and the quality of the sidewalks is not poor and it is recent, while the quality of the sidewalks in Shele is very poor due to having numerous dead-ends. Furthermore, the status of the sidewalks in Ashty is not awful, and there is safety out from Ashty sidewalks, however the width of streets in Ashty is wider than in Masike and Shele neighborhoods. Although Ashty and Masike have greater street connectivity than Shele, residents in Ashty and Masike have broader access to public services than Shele, however Ashty has much more connectivity than both Masike and Shele.

4.7.4 Urban Layout of Case Studies

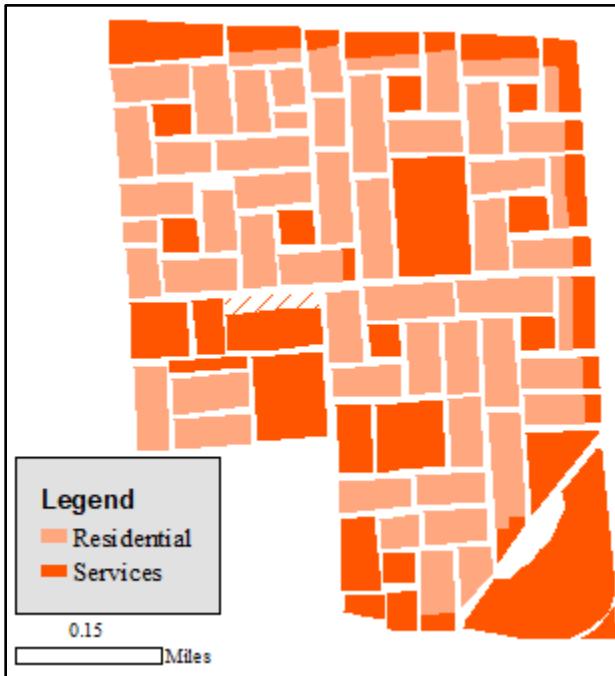


Figure 46: Layout of Masike neighborhood. **Source:** (Researchers, 2022).

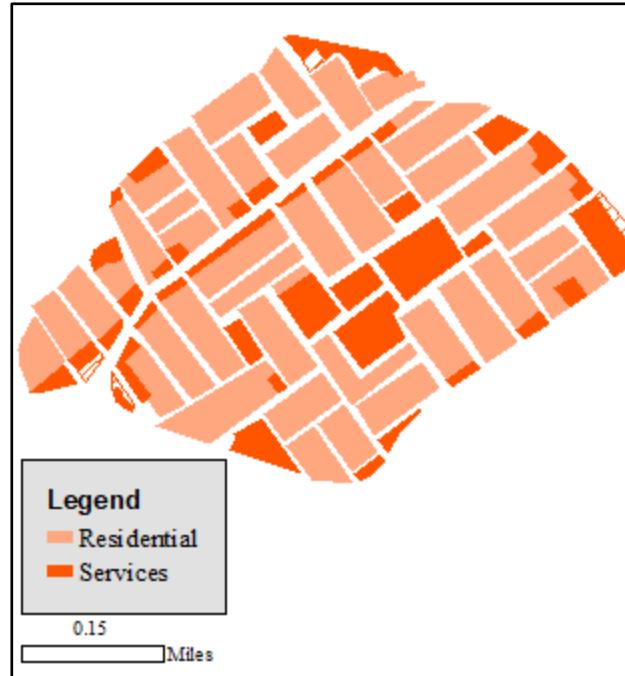


Figure 47: Layout of Ashty neighborhood. **Source:** (Researchers, 2022).

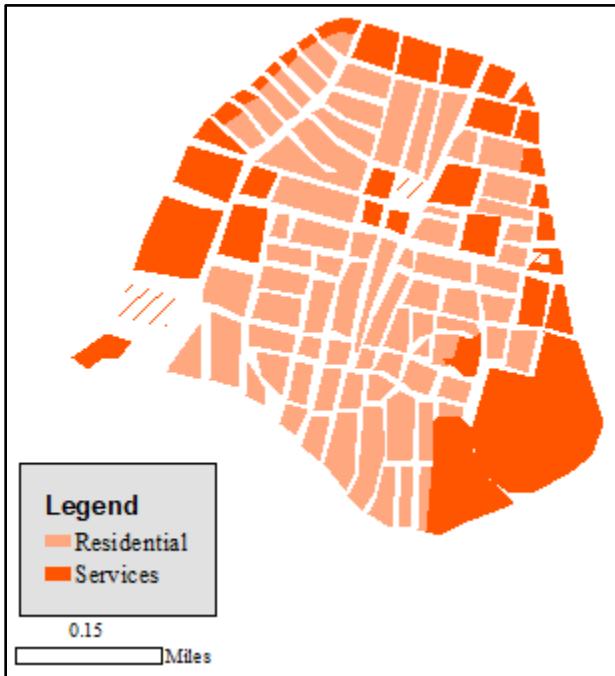


Figure 48: Layout of Shelle neighborhood.

Source: (Researchers, 2022).

- **Observation Analysis- Layout for Case Studies**

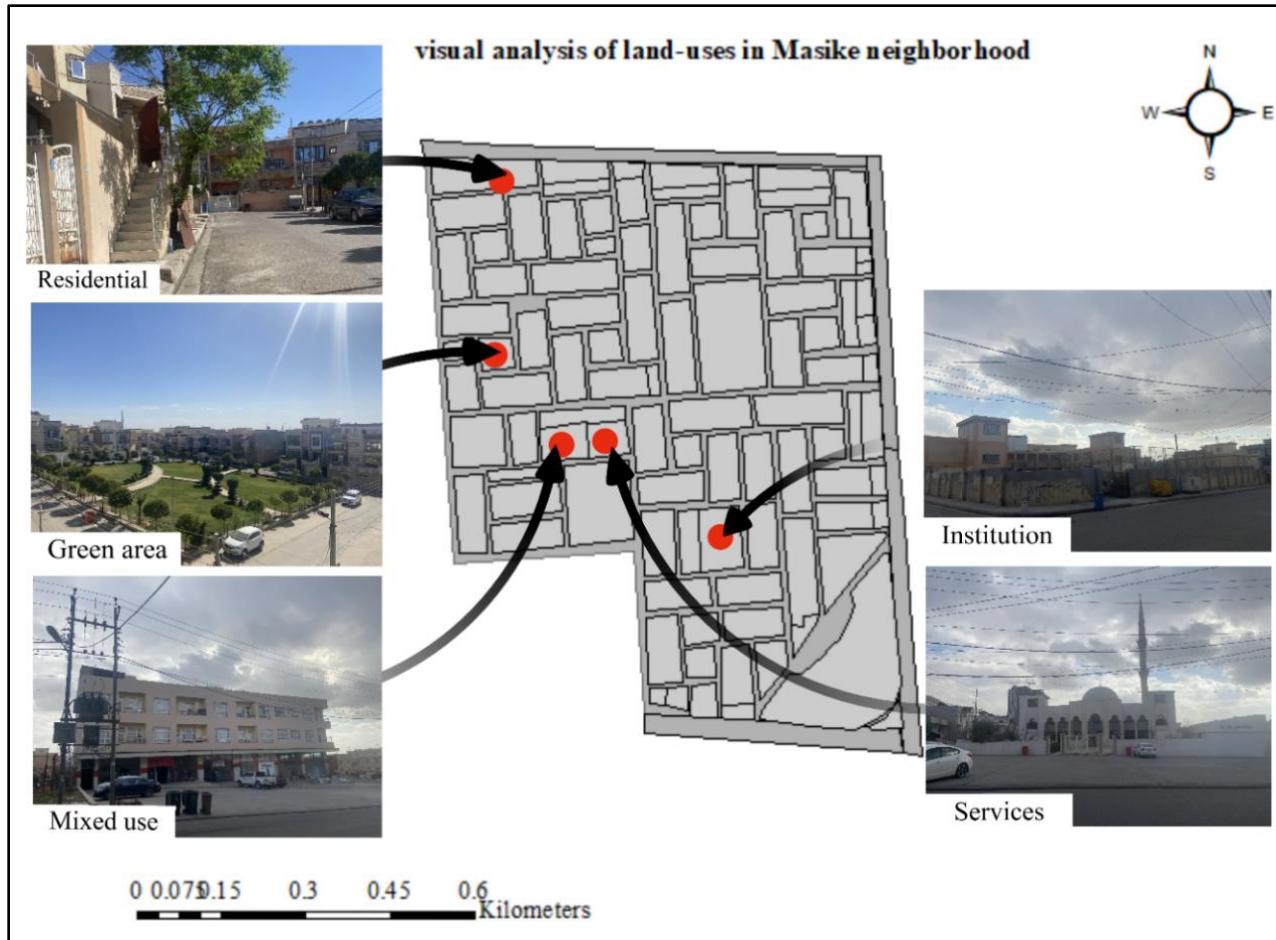


Figure 49: Visual analysis of Masike neighborhood. Source: (Created by researchers, 2022).

visual analysis of land-uses in Ashti neighborhood

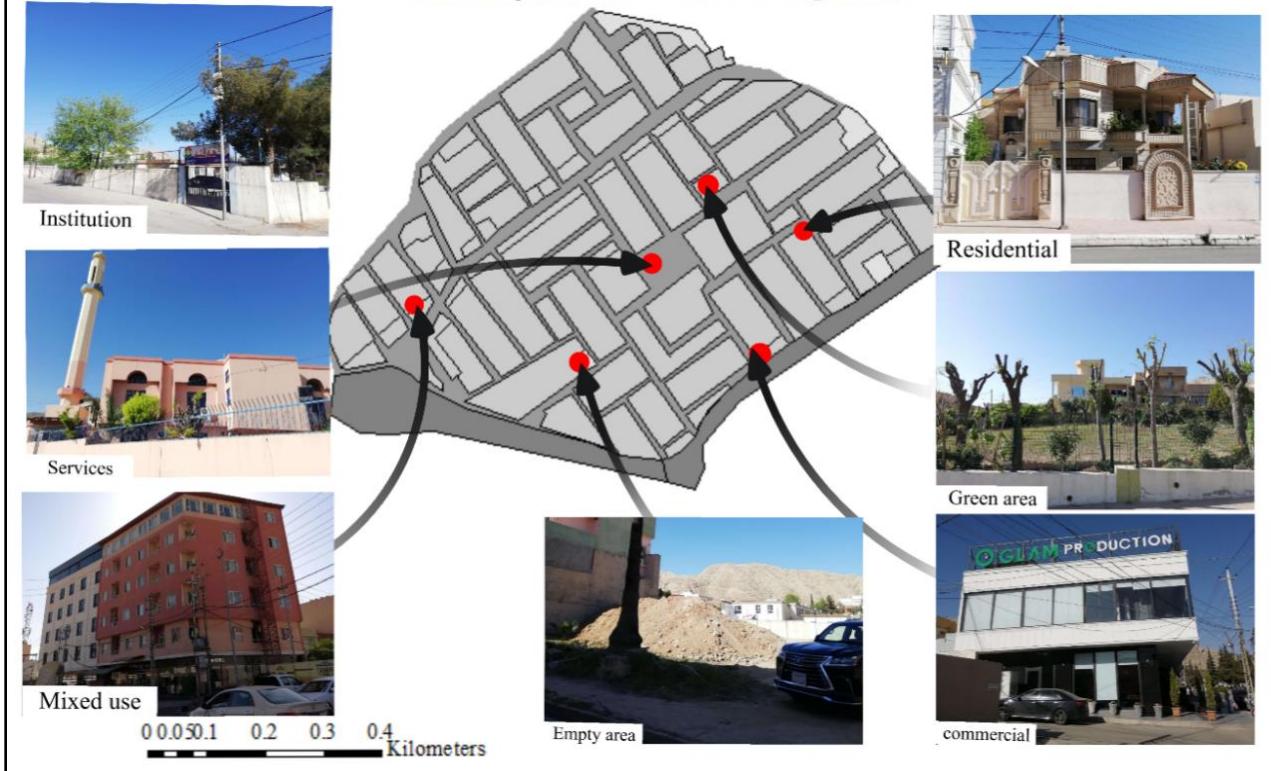


Figure 50: Visual analysis of Ashty neighborhood. **Source:** (Created by researchers, 2022).

Visual analysis of landuses in Shelle neighborhood

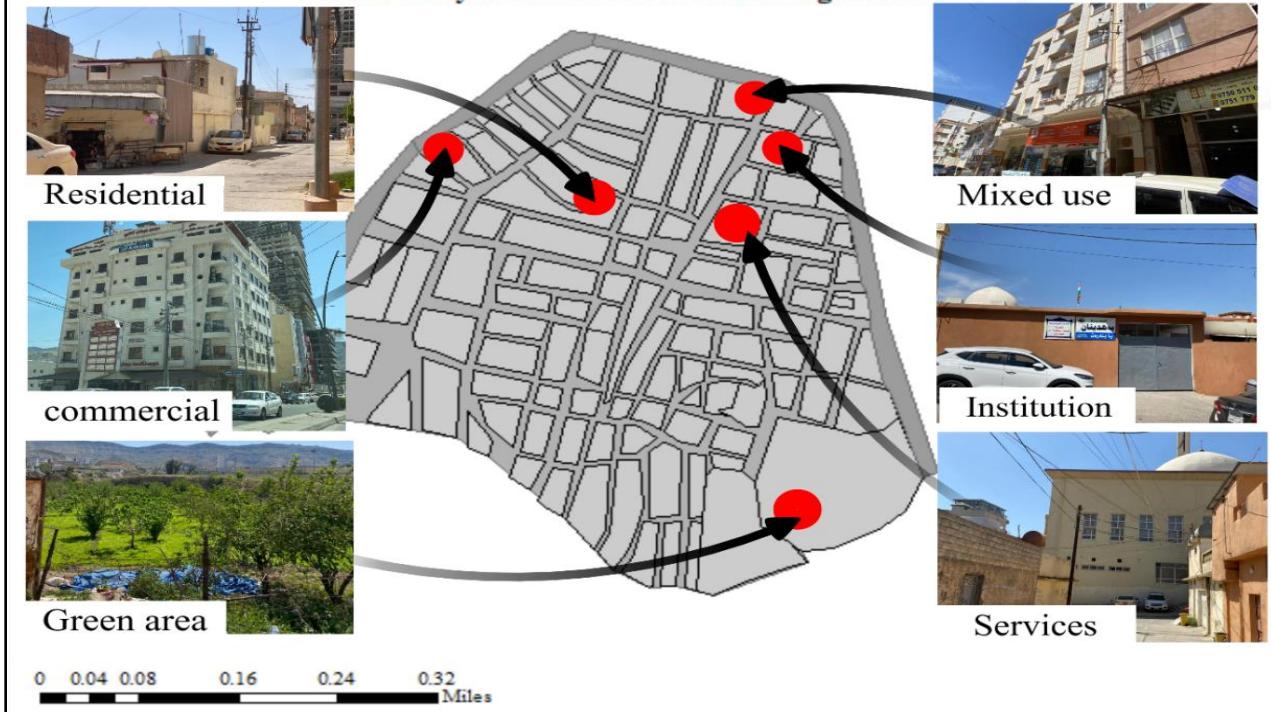


Figure 51: Visual analysis of Shelle neighborhood. **Source:** (Created by researchers, 2022).



University of Duhok, College of Spatial Planning, Department of Spatial Planning

The figures above show the current situation of the three-study area, first figure presents the Residential area, green area which is only public parks, services such as the mosque, institutions such as primary school and vertical mixed uses with a combination of commercial and residential together.

The second figure presents the current situation of Ashty neighborhood. With showing residential area, primary school which is considered institution, services such as mosque, commercial buildings, with green areas which are the public gardens and finally vertical mixed use with also a combination of commercial and residential together, and also empty lands.

And finally, the last figure presents the current situation of the Shelle neighborhood, with showing institutions which is a primary school, services such as mosque, commercial buildings, vertical mixed use with a combination of commercial and residential together, and finally the only green area that exist is used for agricultural purposes without any leisure green area.

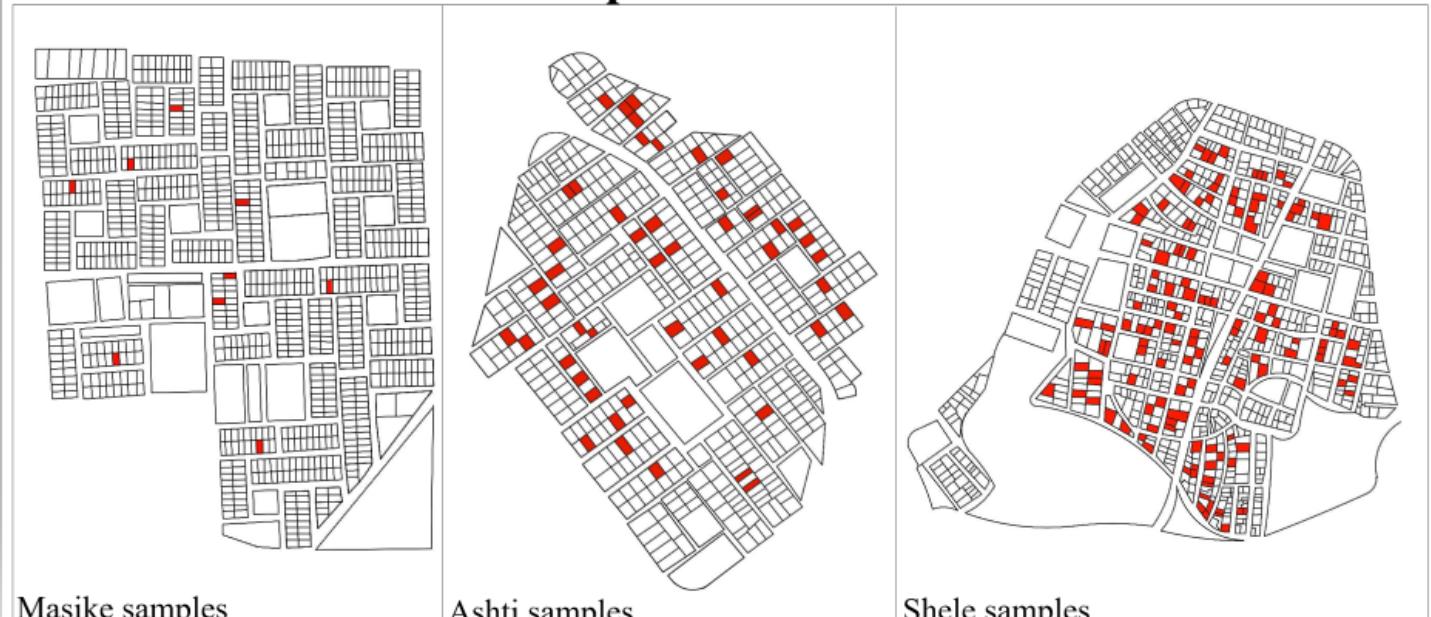
As can be seen above the Masike and Ashty neighborhoods both have conventional grid pattern of streets in term of layout, the extremely ordered arrangement creates a feeling of direction and way-finding, with numbered streets making origin-destination situations in everyday scenarios simple and well-facilitated. While Shelle neighborhood has curvilinear pattern, in term of access it has lack of connectivity between residential and services due to availability of Cul-di-sacs.

4.8 Questionnaire Analysis

A. Demographical Analysis

The presence of missing data reduces the representativeness of the chosen sample, causes bias, and reduces the calculated statistical power, as well as the efficiency and validity of the conducted analyses, causing conclusions about the referent population to be distorted. Therefore, to avoid such issues, the demographic data has been collected first through questionnaires. All for the variation, equality, and quality to be collected. The demographic data which were collected from the three neighborhoods of Masike rojava, Ashty, and Shelle were the gender, Age, Number of people in the house, number of floors of your dwelling, and finally the Education level of the surveyed population.

Samples location



Sample location in all three case-studies

Figure 52: Sampling Location map. Source:(Researcher, 2022).

- Ashty

1.1 Gender

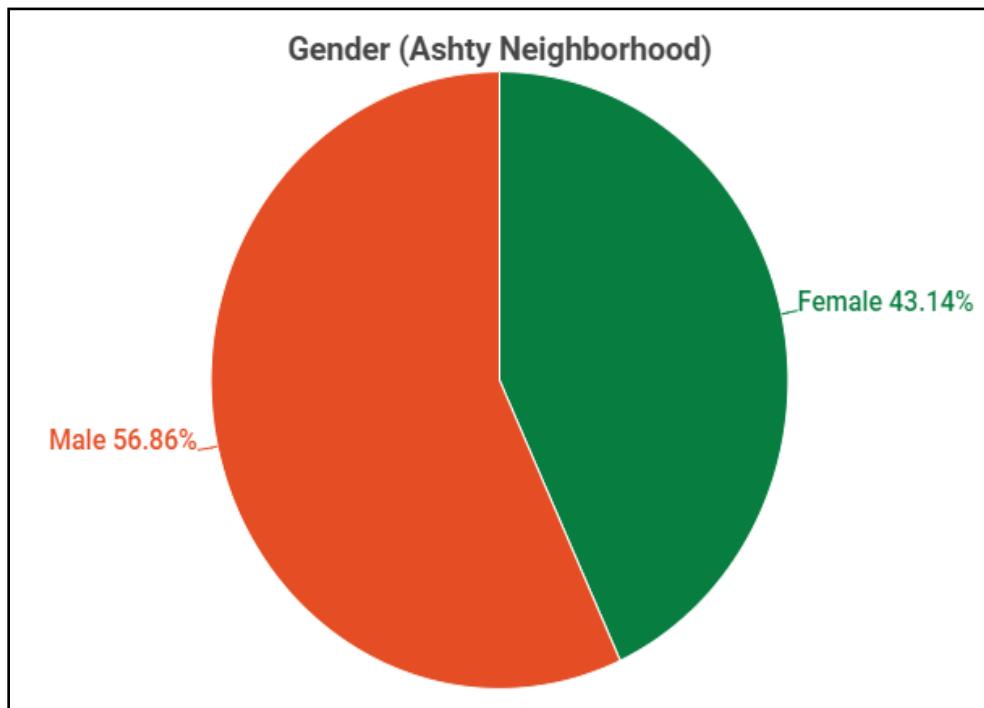


Figure 53: Gender Percentage in Ashty Neighborhood. Source: (Via Researchers ,2022).

When questionnaires are disseminated purposefully throughout society, a survey can produce more meaningful data, and both males and females must have been given approximately equal weight. The questionnaires were handed to males and females in the Ashty area, which is located on the city's northern part. A total of 29 males and 22 females took part in the 51-question survey. Men have a higher proportion of the population than females, with 56.9% of males and 43.1 percent of females.

1.2 Age

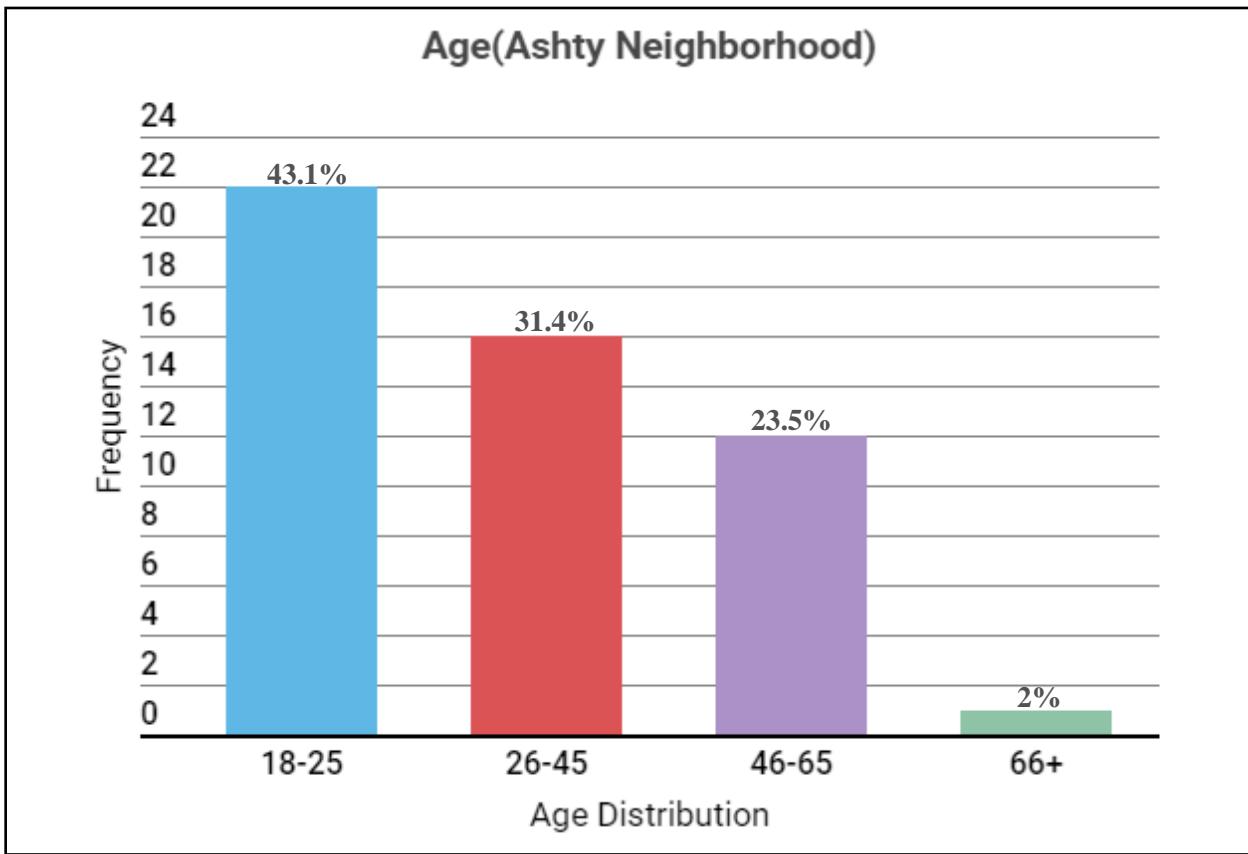


Figure 54: Age Percentage in Ashty Neighborhood. Source: (Via Researchers ,2022).

The age of the participant is classified as follows: young society (18-25 years old), 26-45 years old, 46-65 years old, and elderly (above 66 years old). 22 of the 51 people who completed the survey in Ashty neighborhood were between the ages of 18 and 25, accounting for 42.1 percent of the total. The participants between the ages of 26 and 45 were 16, accounting for 31.4 percent of the total. While 12 individuals were between the ages of 46 and 65, accounting for 23.5 percent of the total. Finally, one elderly individual took part in the survey, accounting for 2% of the total number of questionnaires issued. The highest proportion goes for the age range of 18-25 while the lowest one is for elderly people.

1.3 No. of People in the House

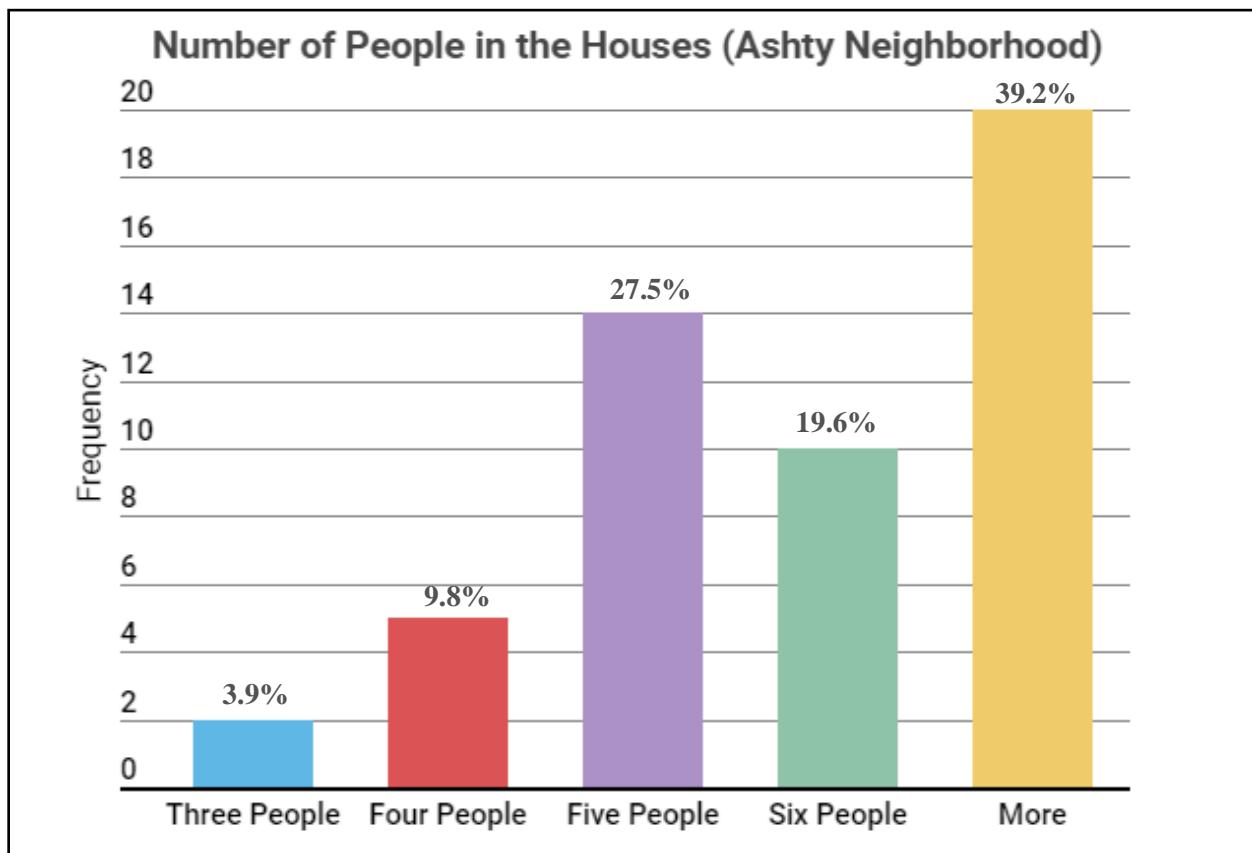


Figure 55: Percentage of People Number in the Houses in Ashty Neighborhood. Source: (Via Researchers ,2022).

The number of family members must be collected in order to determine the density of the chosen region; according to the regulations, an urban family member should consist of six persons. In the surveys, the number of people living in the residence was divided into five categories: (3 individuals, 4 individuals, 5 individuals, 6 individuals, or more individuals than 6). As can be seen in the table, the number of family members varies, with some falling below the norms and others exceeding them for families with more than six members. Two of the participants came from a household of three people, accounting for 3.9 percent of the total. With 9.8% of the total, five participants came from four individuals in one household. While 14 participants came from a family of five people, accounting for 27.5 percent of the total, and 10 people came from a household of six people, accounting for 19.6 percent of the total. Twenty people from households with more than six members took part, accounting for 39.2 percent of the total.

1.4 Number of Floors of the Dwelling

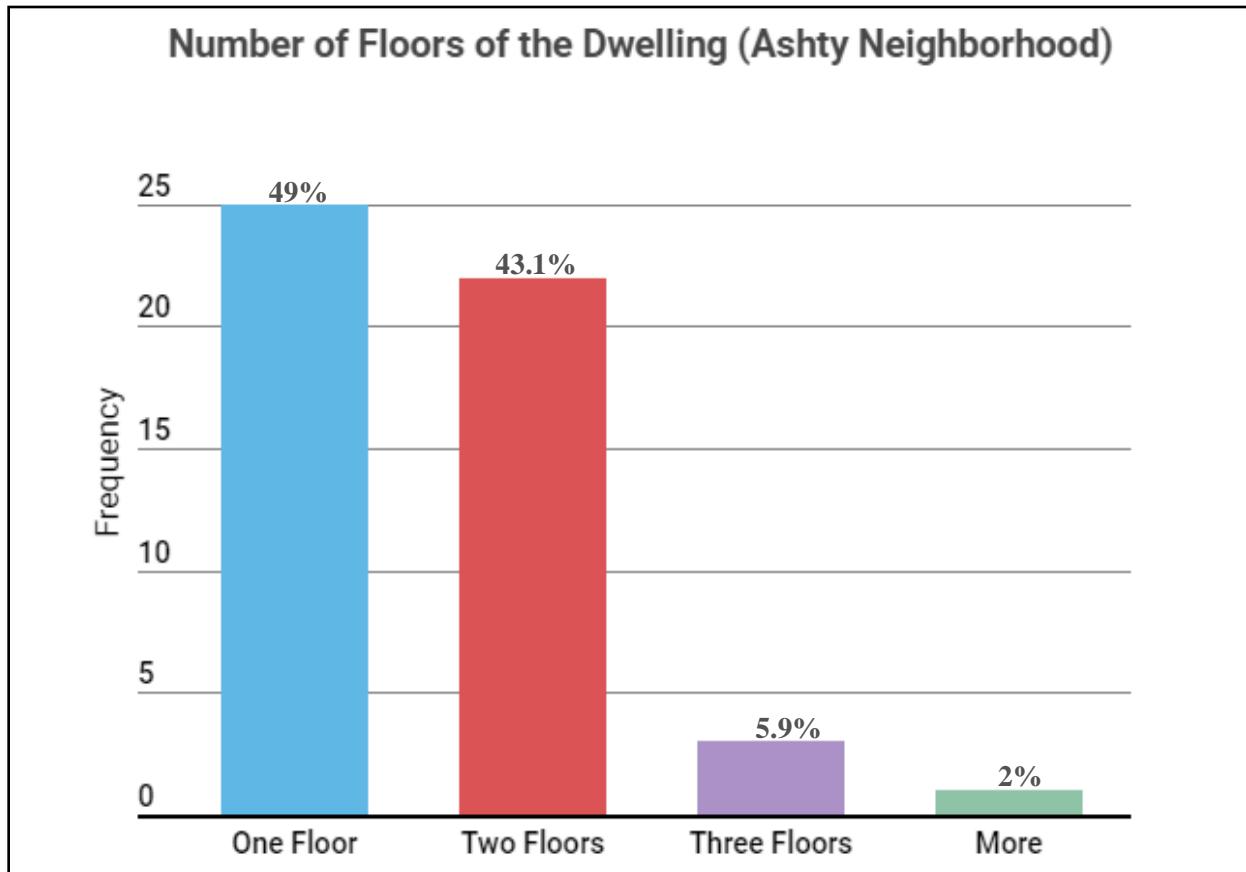


Figure 56: Number of Floors of the dwelling in Ashty Neighborhood. Source: (Via Researchers ,2022).

This demographic question was introduced to learn about the differences in home flooring in the selected Ashty area. The number of floors was divided into four categories: one floor, two, three floors, and four floors or more. The majority of the participants, 25 people, reside in a single-story house, accounting for 49 percent of the total. Then came 22 individuals who lived in two-story residences, accounting for 43.1 percent of the total. And there were three individuals who lived in three-story residences, accounting for 5.9% of the total. Finally, one participant, with 2% of the total, lives in a house with four or more.

1.5 Education Level

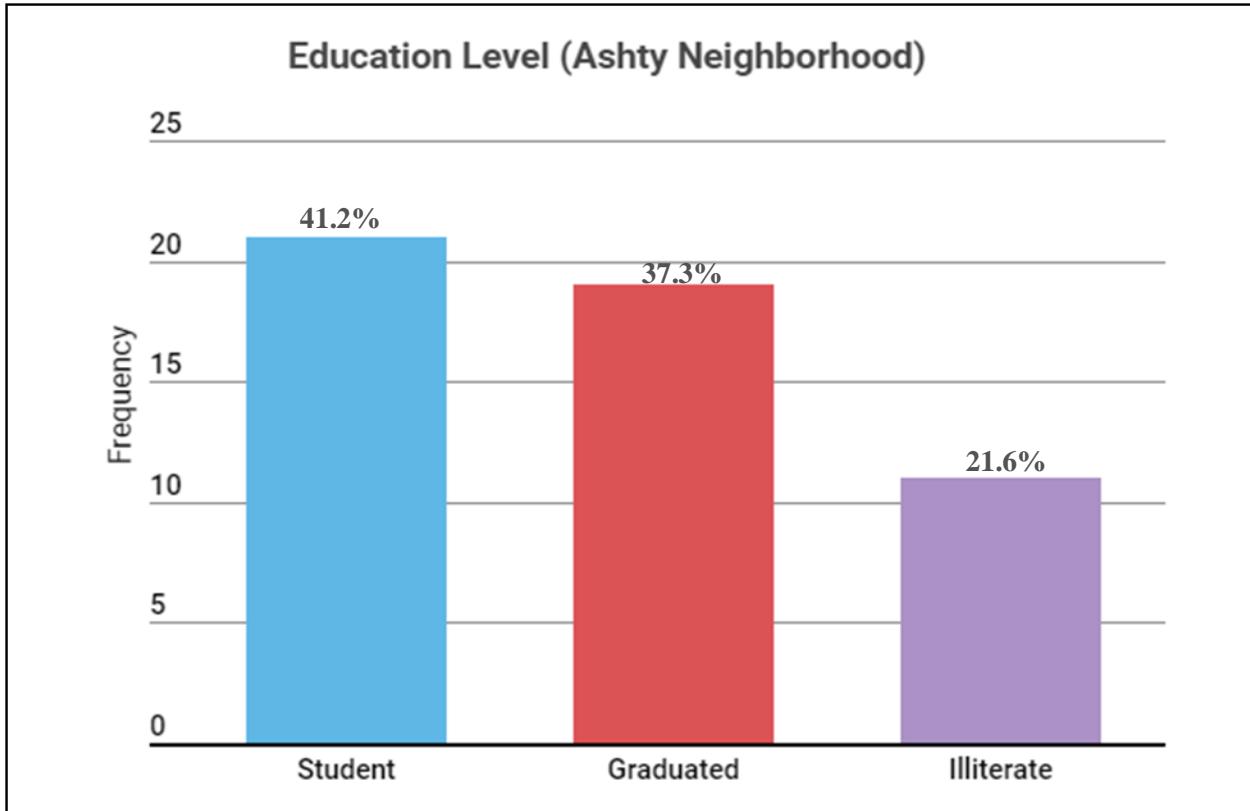


Figure 57: Education Level in Ashty Neighborhood. Source: (Via Researchers ,2022).

This question was introduced with the classification of education level into three categories in order to know the average education level of the society in the case study region of Ashty neighborhood (students, school graduated, and illiterate). Twenty-one of the fifty-one participants were students, accounting for 41.2 percent of the total. 19 people have completed high school, accounting for 37.3 percent of the total. Illiterate participants, who did not even complete basic school, came in second, accounting for 21.6 percent of the total.

- **Masike**

1.1 Gender

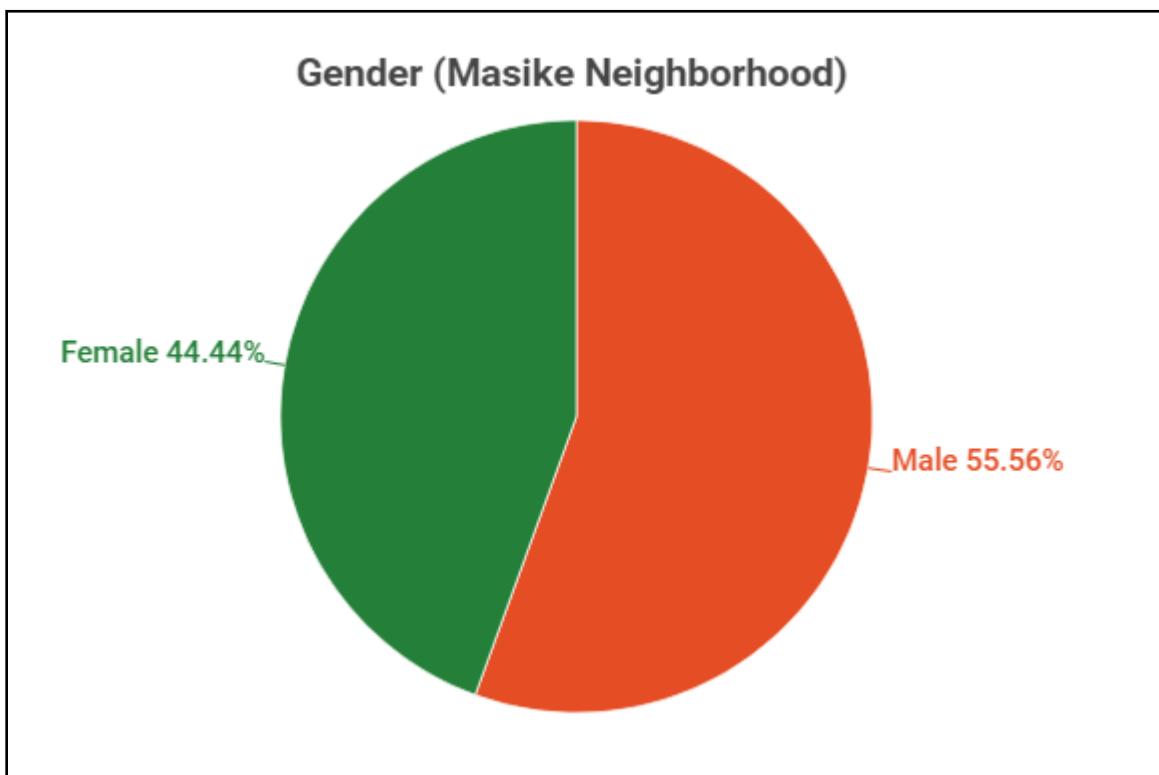


Figure 58: Gender Percentage in Masike Neighborhood. Source: (Via Researchers ,2022).

In Masike rojava neighborhood which is located in northern-west of the city, both genders have participated in provision of data, A total of 5 males and 4 females took part in the 9-question survey. Men have a higher proportion of the population than females, with 55.6% of males and 44.4% of females.

1.2Age

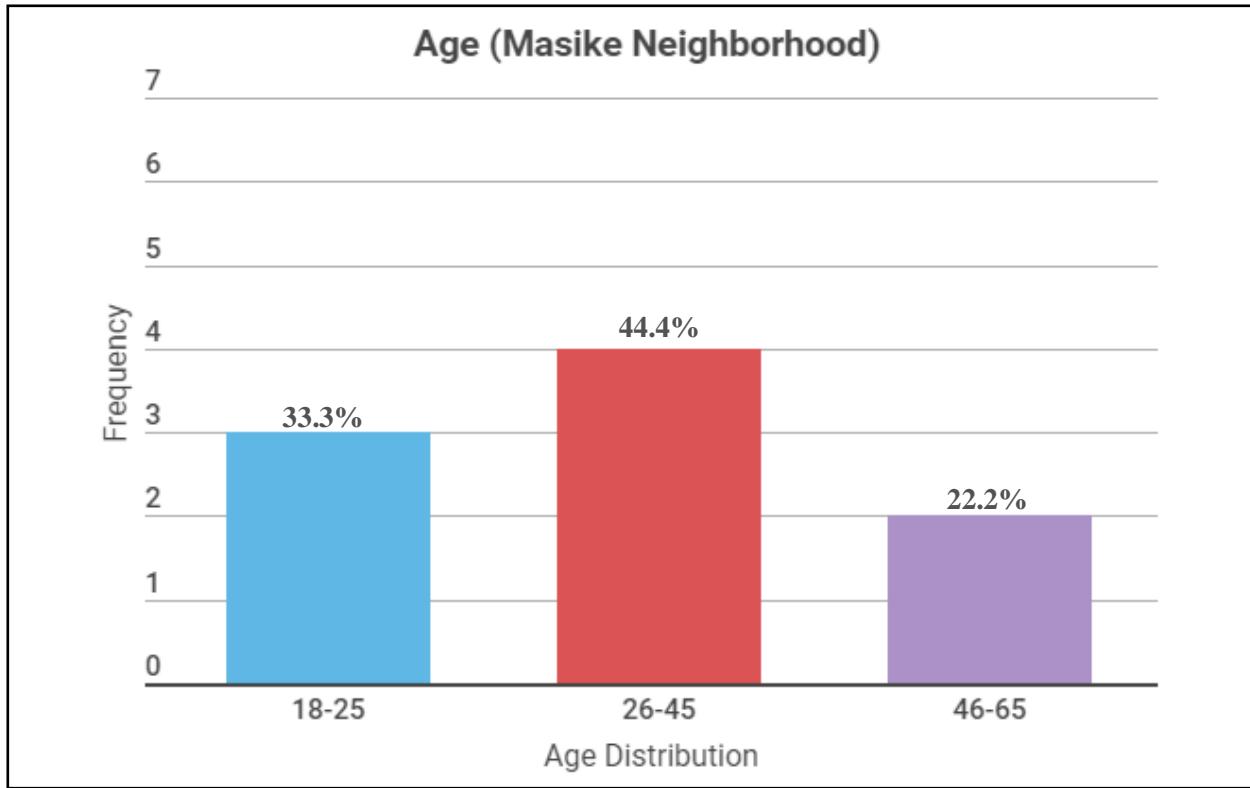


Figure 59: Age Percentage in Masike Neighborhood. Source: (Via Researchers ,2022).

3 of the 9 people who completed the survey in Masike neighborhood were between the ages of 18 and 25, accounting for 33.3 percent of the total. The participants between the ages of 26 and 45 were 4, accounting for 44.4 percent of the total. While 1 individual were between the ages of 46 and 65, accounting for 22.2 percent of the total. Finally, no one of elderly individual took part in the survey. The highest proportion goes for the age range of 26-45 while the lowest one is for 46-65 aged people.

1.3 Number of People in the House

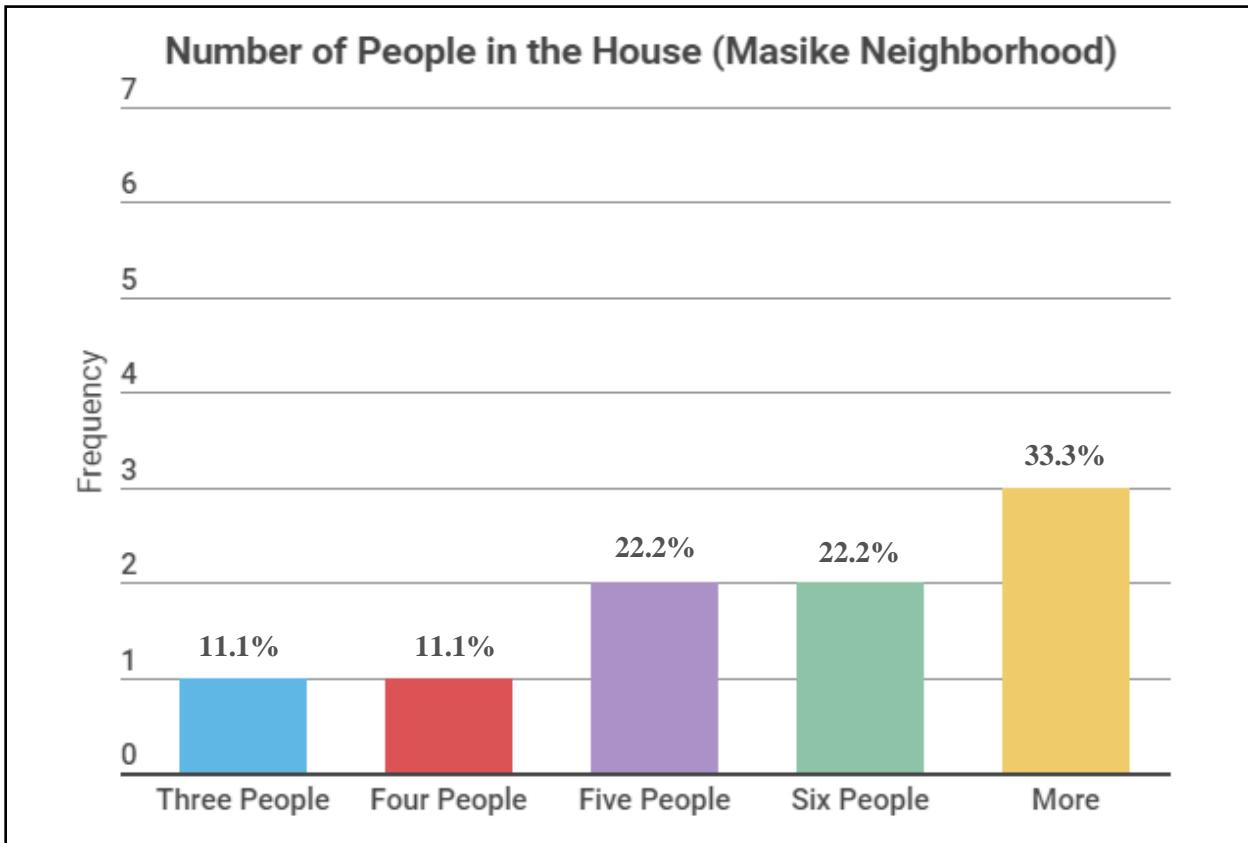


Figure 60: Percentage of People Number in the Houses in Masike Neighborhood. Source: (Via Researchers ,2022).

As can be seen in the table, the number of family members varies, with some falling below the standards and others exceeding them for families with more than six members. one of the participants came from a household of three people, accounting for 11.1 percent of the total. With 11.1% of the total, one participant came from four individuals in one household. While 2 participants came from a family of five people, accounting for 22.2 percent of the total, and two people came from a household of six people, accounting for 22.2 percent of the total. Three people from households with more than six members took part, accounting for 33.3 percent of the total.

1.4 Number of Floors of the Dwelling

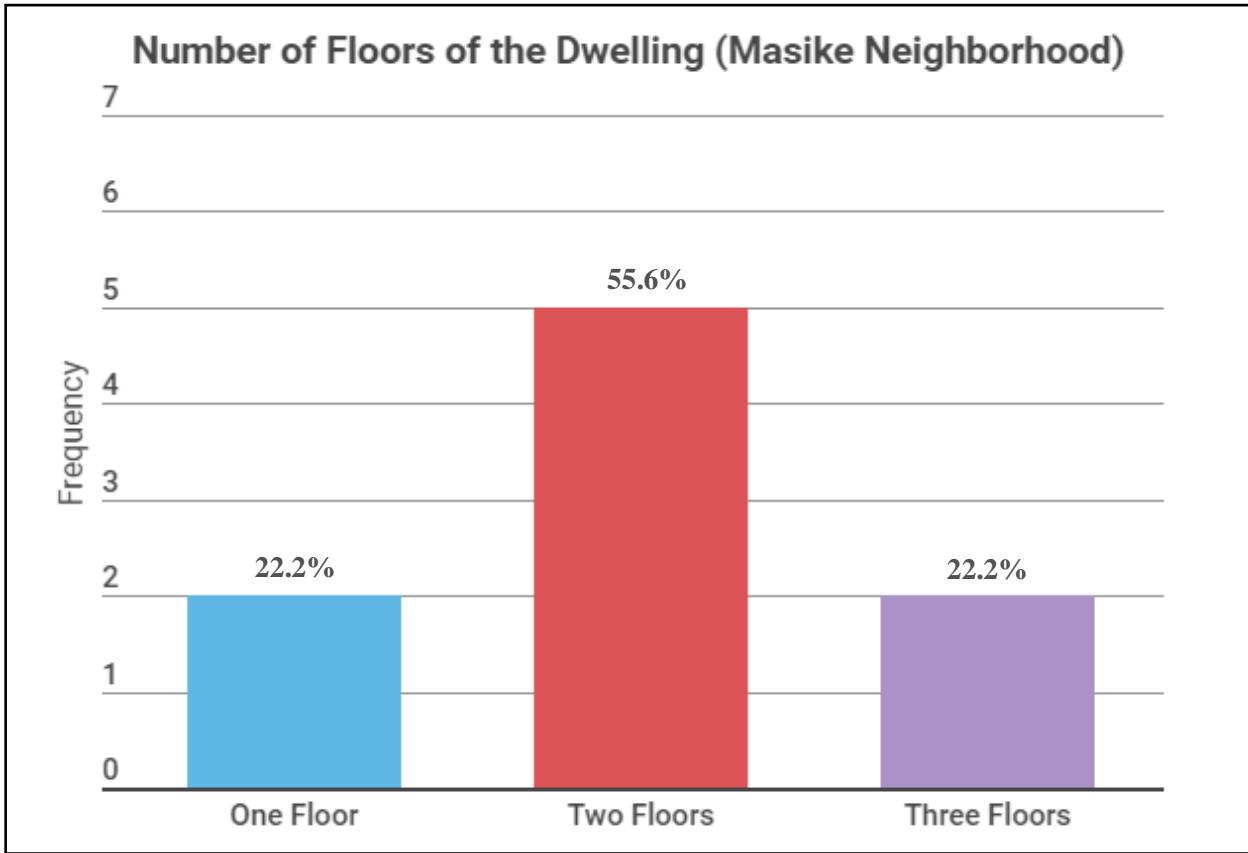


Figure 61: Number of Floors of the dwelling in Masike Neighborhood. Source: (Via Researchers ,2022).

The majority of the participants, 5 people, reside in a two-story house, accounting for 55.6 percent of the total. Then came 2 individuals who lived in Single-story residences, accounting for 22.2 percent of the total. Finally, two individuals who lived in three-story residences, accounting for 22.2% of the total.

1.5 Education Level

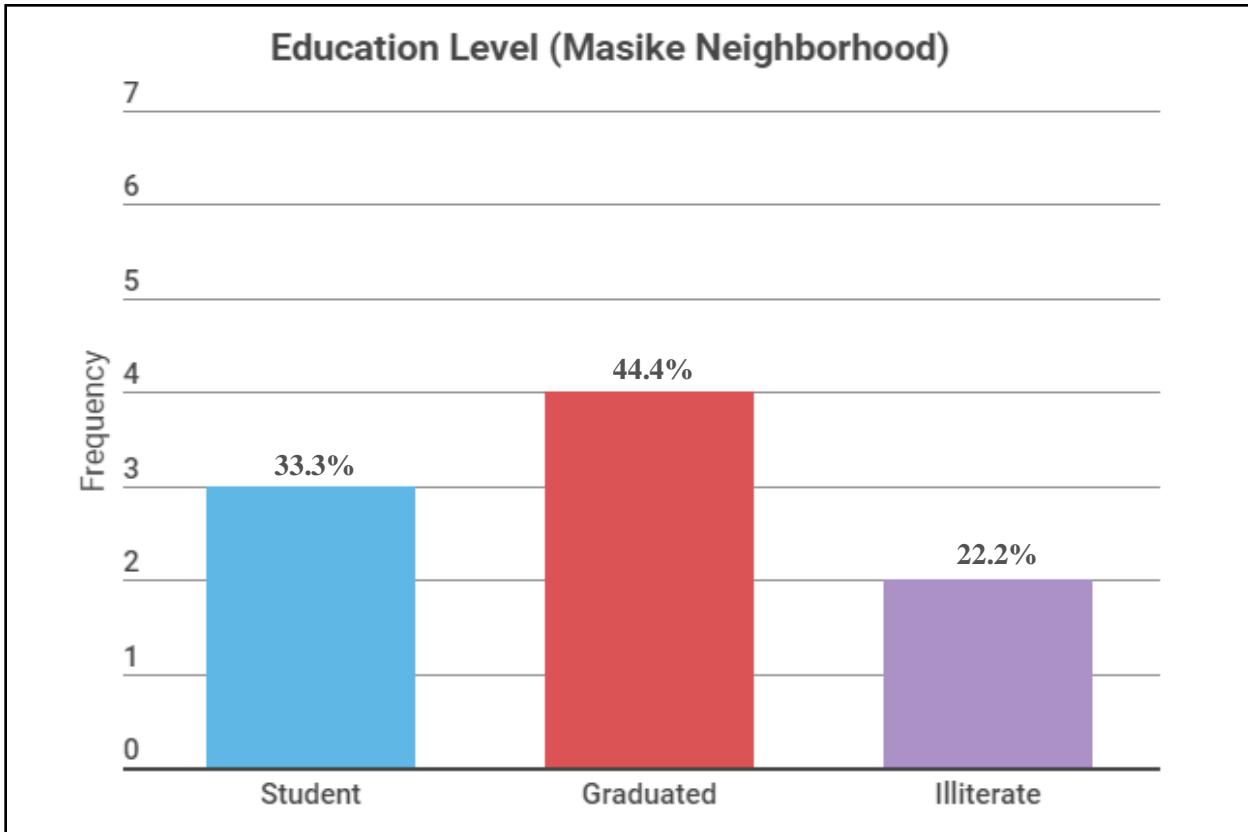


Figure 62: Education Level in Masike Neighborhood. Source: (Via Researchers ,2022).

Three of the nine participants were students, accounting for 33.3 percent of the total. four people have completed high school, accounting for 44.4 percent of the total. Illiterate participants, who did not even complete basic school, came in two participants, accounting for 22.2 percent of the total.

- Shele

1.1Gender

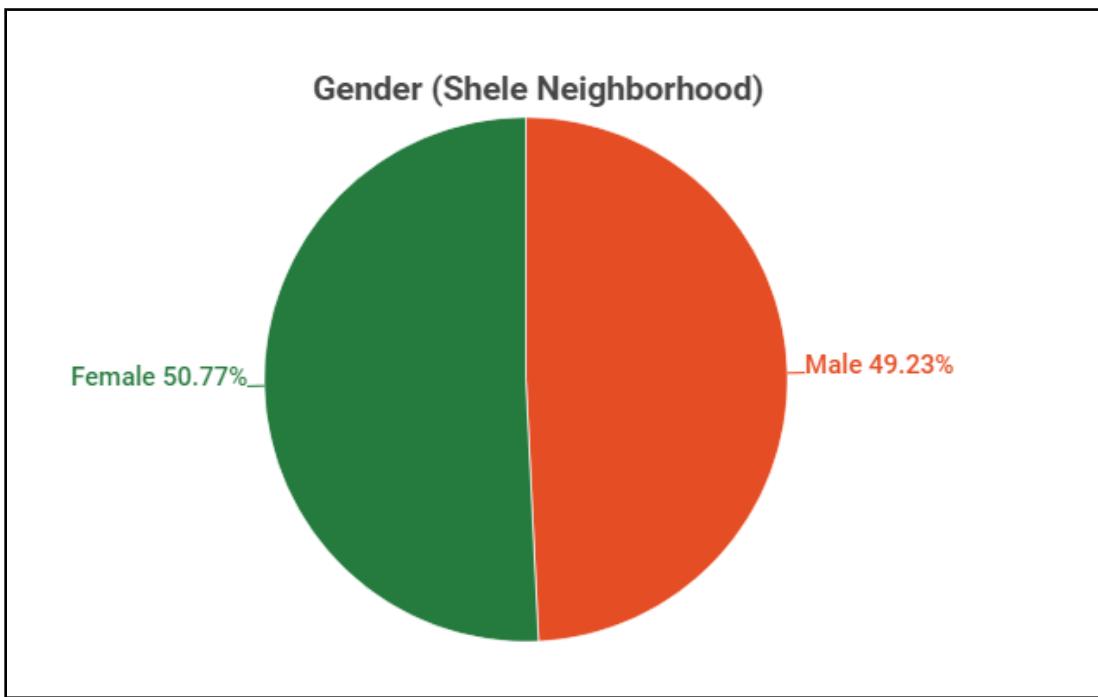


Figure 63: Gender Percentage in Shele Neighborhood. Source: (Via Researchers ,2022).

For the third case study also, the questionnaires were handed to males and females in the Shelle area, which is located on the city's central part. A total of 64 males and 66 females took part in the 130-question survey. Men and females have almost taken similar opportunity to participate, with 49.2% of males and 50.8% of females.

1.2Age

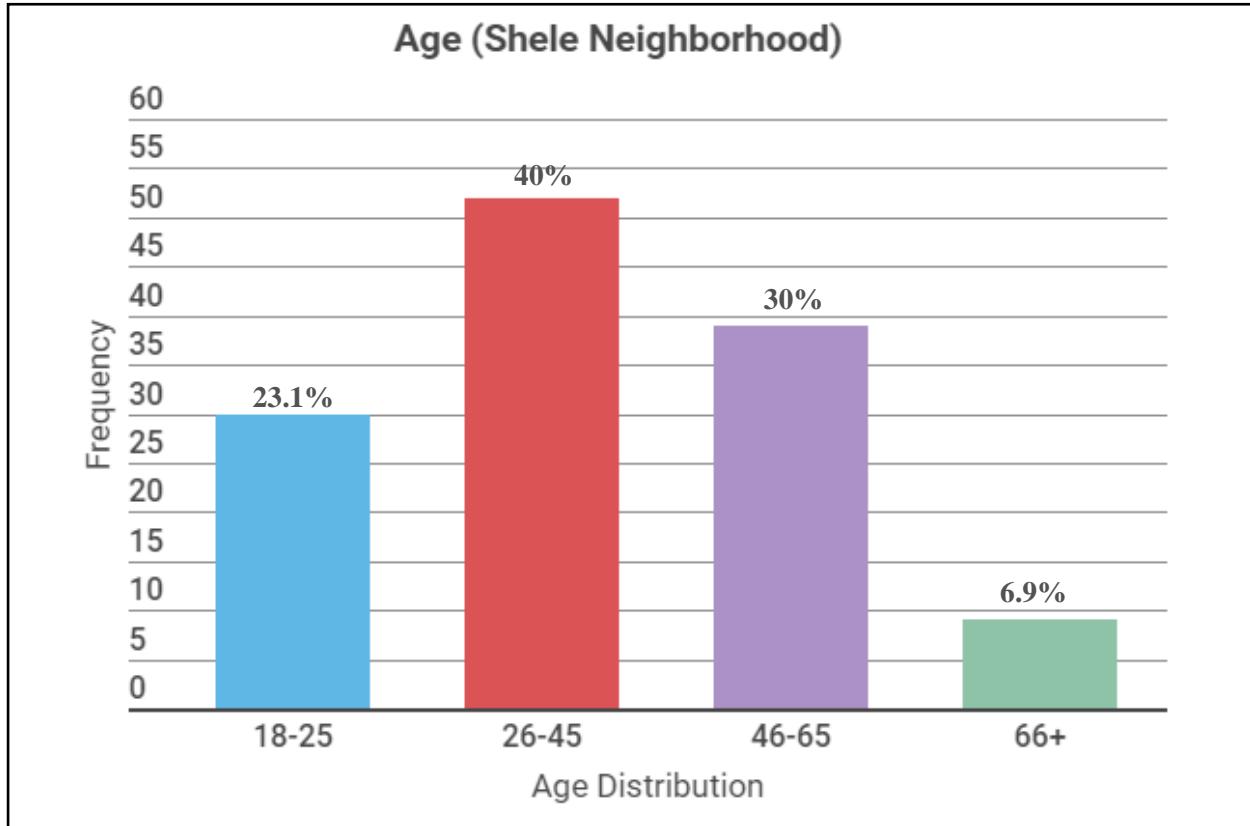


Figure 64: Age Percentage in Shele Neighborhood. Source: (Via Researchers ,2022).

30 of the 130 people who completed the survey in Shelle neighborhood were between the ages of 18 and 25, accounting for 23.1 percent of the total. The participants between the ages of 26 and 45 were 52, accounting for 40 percent of the total. While 39 individuals were between the ages of 46 and 65, accounting for 30.0 percent of the total. Finally, 9 elderly individuals took part in the survey, accounting for 6.9% of the total number of questionnaires issued. The highest proportion goes for the age range of 26-45 while the lowest one is for elderly people.

1.3 Number of People in the House

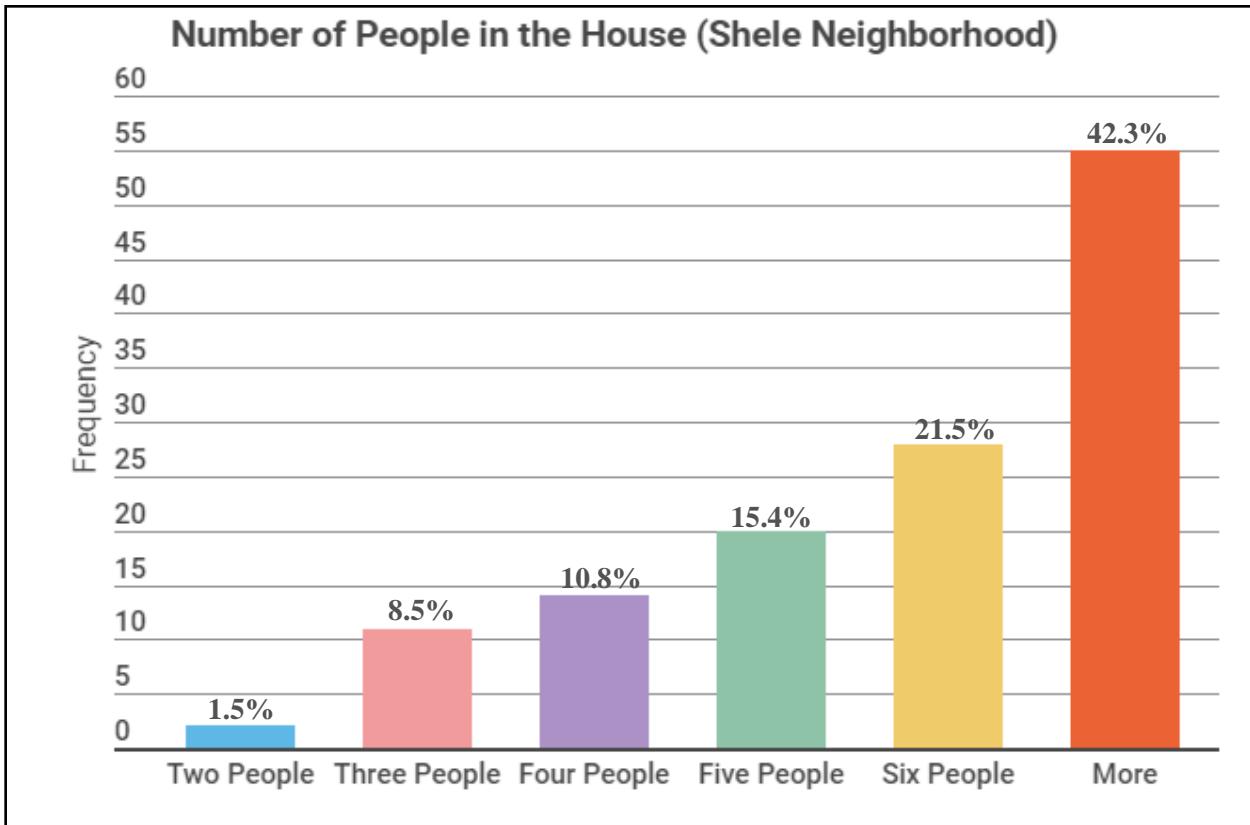


Figure 65: Percentage of People Number in the Houses in Shele Neighborhood. **Source:** (Via Researchers ,2022).

As can be seen in the table, the number of family members varies, with some falling below the standards and others exceeding them for families with more than six members. two of the participants came from a household of three people, accounting for 1.5 percent of the total. With 8.5% of the total, eleven participants have been from three people households, 14 participants came from four individuals in one household, with 10.8 percent of the total. While 20 participants came from a family of five people, accounting for 15.4 percent of the total, and 28 people came from a household of six people, accounting for 21.5 percent of the total. 55 people from households with more than six members took part, accounting for 42.3 percent of the total. As can be seen the Shelle neighborhood is a very dense area, and most of the population lives in families that has more than six members.

1.4 Number of Floors of the Dwelling

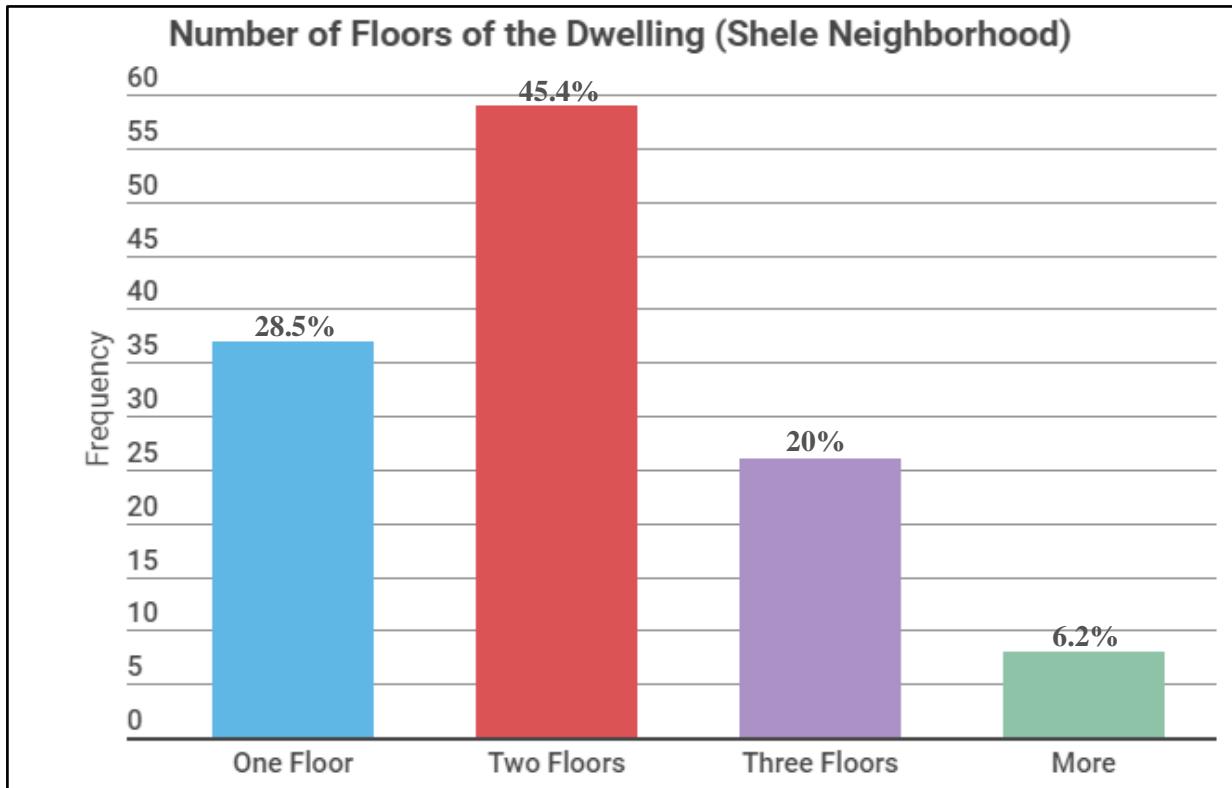


Figure 66: Number of Floors of the dwelling in Shele Neighborhood. Source: (Via Researchers ,2022).

The majority of the participants, 59 people, reside in a two-story house, accounting for 45.4 percent of the total. Then came 37 individuals who lived in Single-story residences, accounting for 28.5 percent of the total. Then 26 individuals who lived in three-story residences, accounting for 20.0% of the total. Finally, the lowest proportion goes to the houses with four or more than four floors, with 8 participants accounting for 6.2 percent of the total.

1.5 Education Level

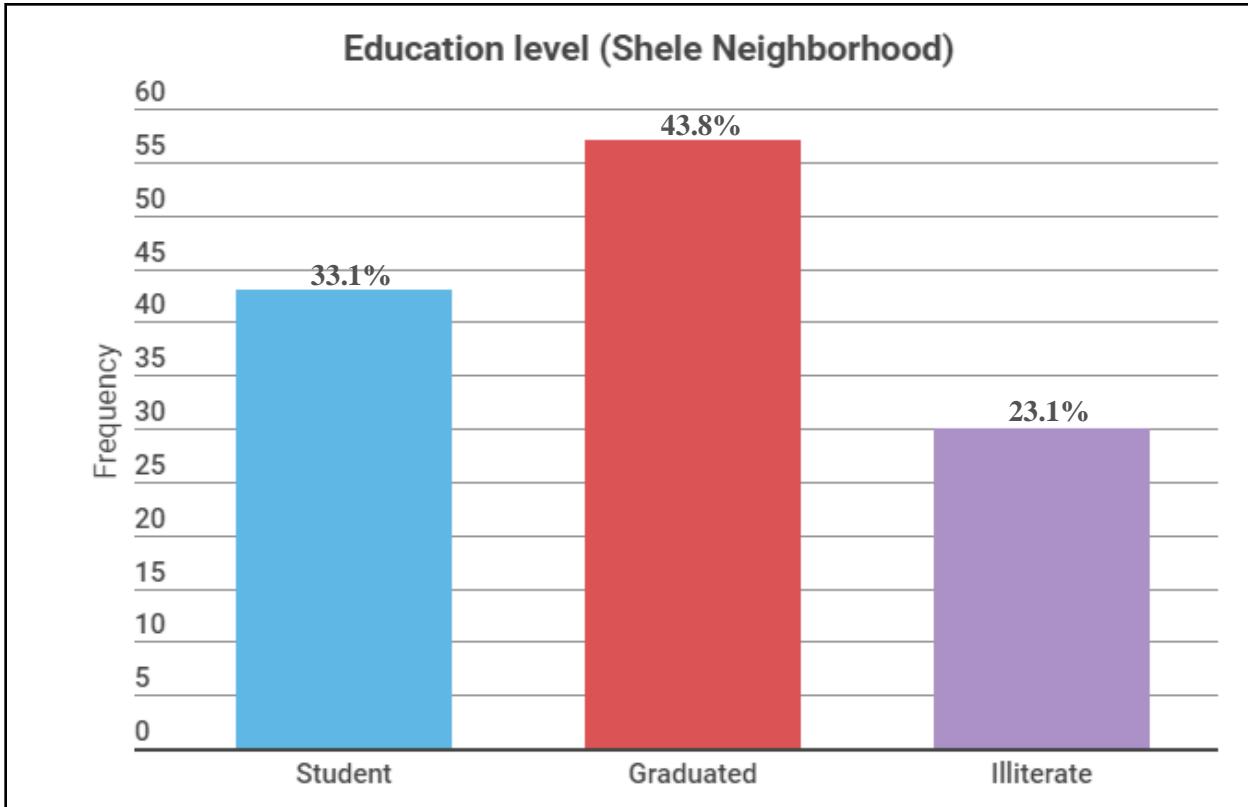


Figure 67: Education Level in Shele Neighborhood. Source: (Via Researchers ,2022).

43 of the 130 participants were students, accounting for 33.1 percent of the total. 57 people have completed high school, accounting for 43.8 percent of the total. Illiterate participants, who did not even complete basic school, came in 30 participants, accounting for 23.1 percent of the total which is a very high proportion in urban area.

B. Neighborhood Satisfaction Analysis

- **Masîka Rojava Neighborhood**

1.1 Budling Type & Housing

1.1.1 The Uncomfortable of People in their Houses

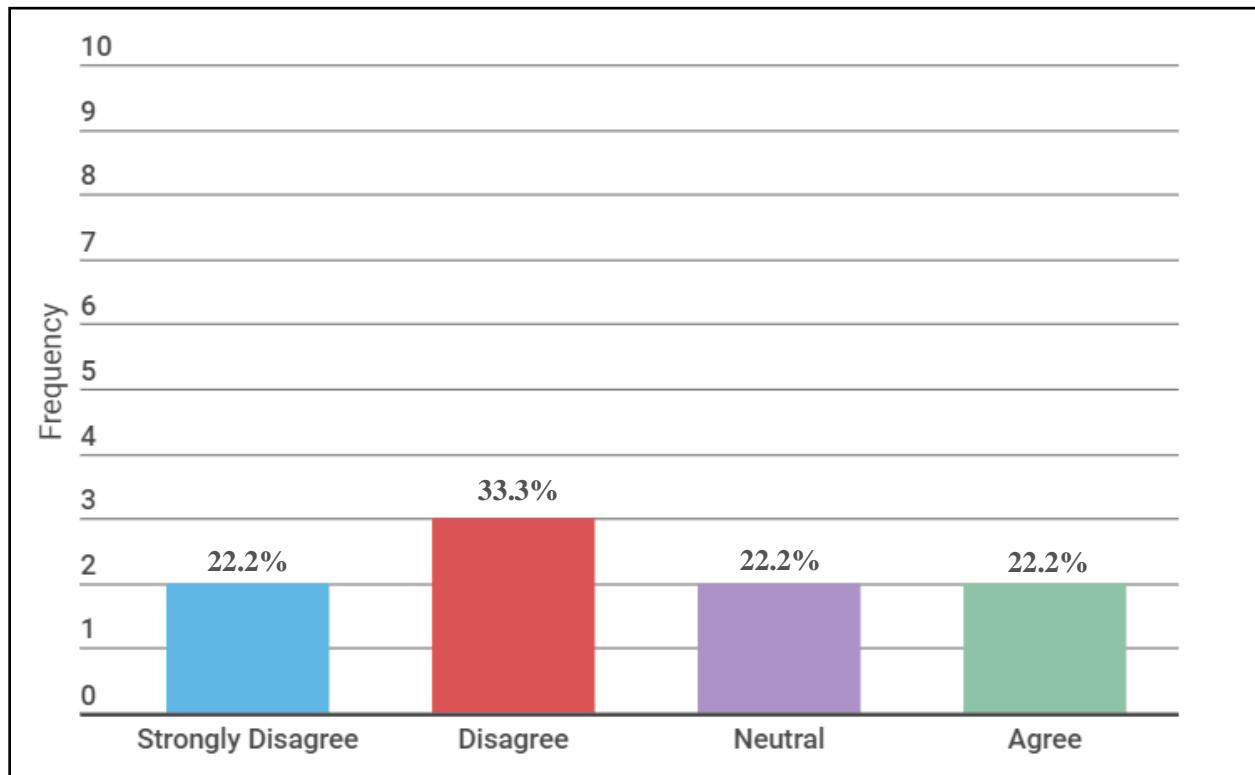


Figure 68: Percentage comfortable of People in their Houses in Masîka neighborhood. Source: (Via researchers, 2022).

Residents in Masîka are comfortable in their neighborhood even though, according to questionnaires, the majority of people did not agree with our proposition. If we look at the above figure, there are 2 people out of 9 who strongly disagree, which equals 22.2 percent, and 3 people who disagree, which denotes 33.3 percent, which means total 55.5 percent of Masîka's residents. Only two persons, or 22.2 percent, agreed with our assertion, and they are uncomfortable in the Masîka neighborhood, which need greater reform and government oversight. Also, two participants replied neutral, indicating that they were unsure whether they feel a comfortable in the Masîka neighborhood.

1.1.2 The Size of Dwelling does not Fit the Number of People in House

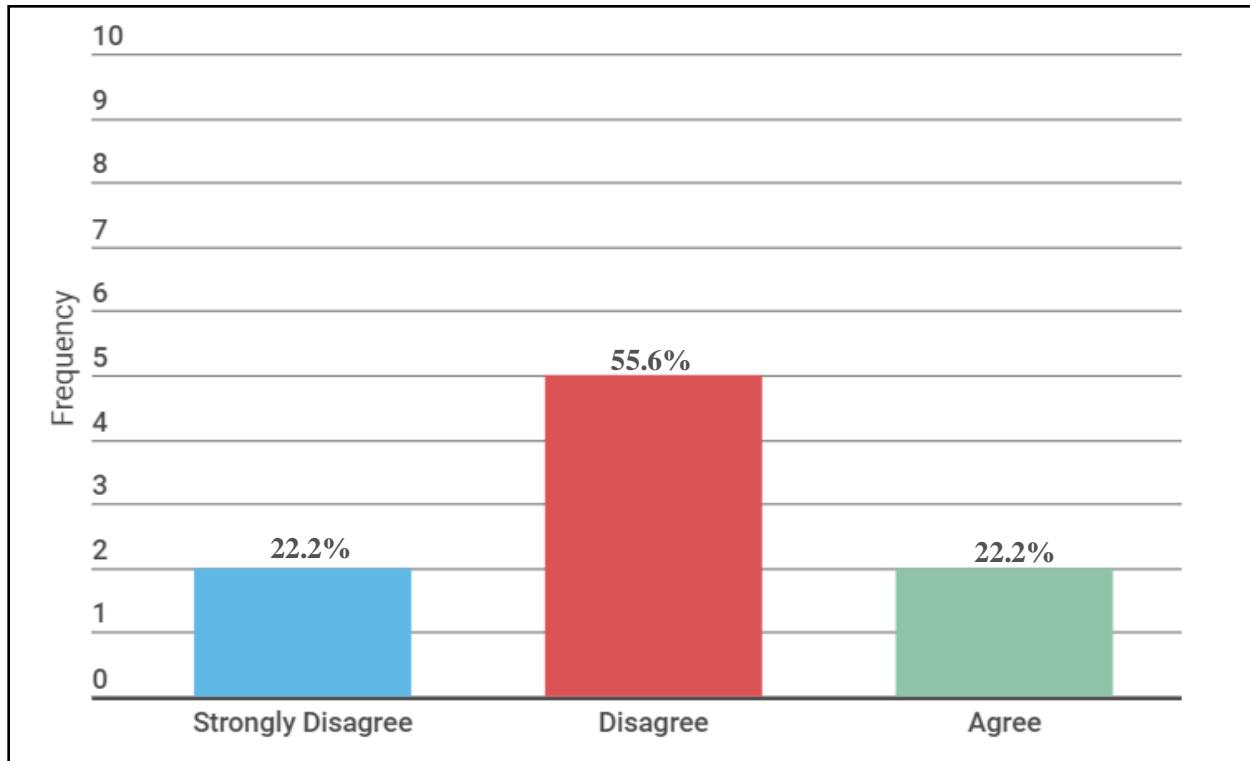


Figure 69: Size of Dwelling does not Fit the Number of People in Housed in Masike neighborhood. Source: (Via Researchers ,2022).

Due to the obvious low density in the Masike neighborhood, most residents did not agree with our notion that most inhabitants are satisfied with their size of home and have no concerns; according to our data from questioners, two people strongly disagreed (22.2 percentage), Furthermore, 5 participants disagreed, indicating that the majority of inhabitants in the Masike neighborhood have a great balance between housing size and number of people in the house. Nevertheless, some others agreed and responded that our house is insufficient for the amount of people who live there; two people agreed with our assertion.

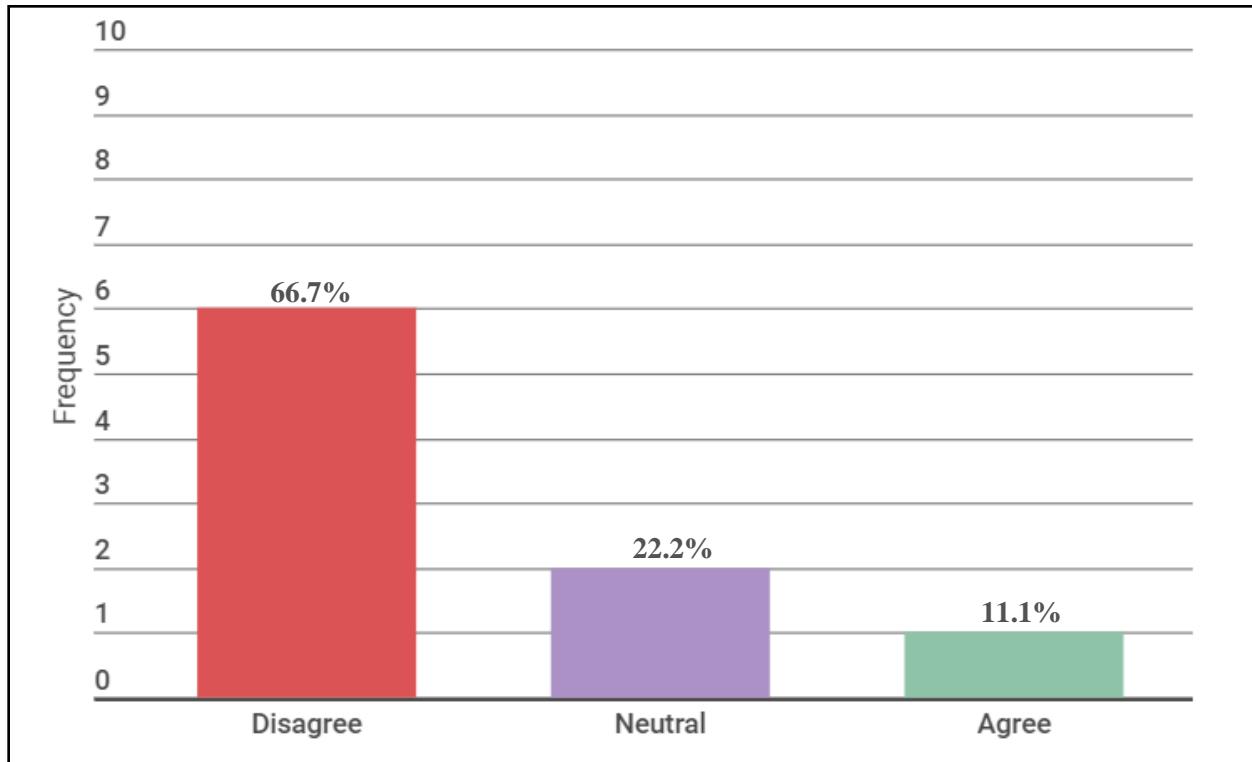
1.1.3 People Building more Floors than Number Allowed in the Neighborhood

Figure 70: People Building more Floors than Number Allowed in the Masike neighborhood. Source: (Via researchers, 2022).

Since the Masike neighborhood is not so ancient, the percentage numbers presented in the above figure indicate that residents are not constructing more stories than the number allowed for them, because 6 people disagreed, and they assume that everyone only builds the permitted number. Furthermore, 66.7 percent is a sufficient percentage to demonstrate that people only build the permissible number of floors. As a result, two persons, or 22.2 percent, were neutral on the matter, and just one person, or 11.1 percent, agreed that people build more floors than are authorized.

1.1.4 People Constructing Buildings Against Municipality Rules

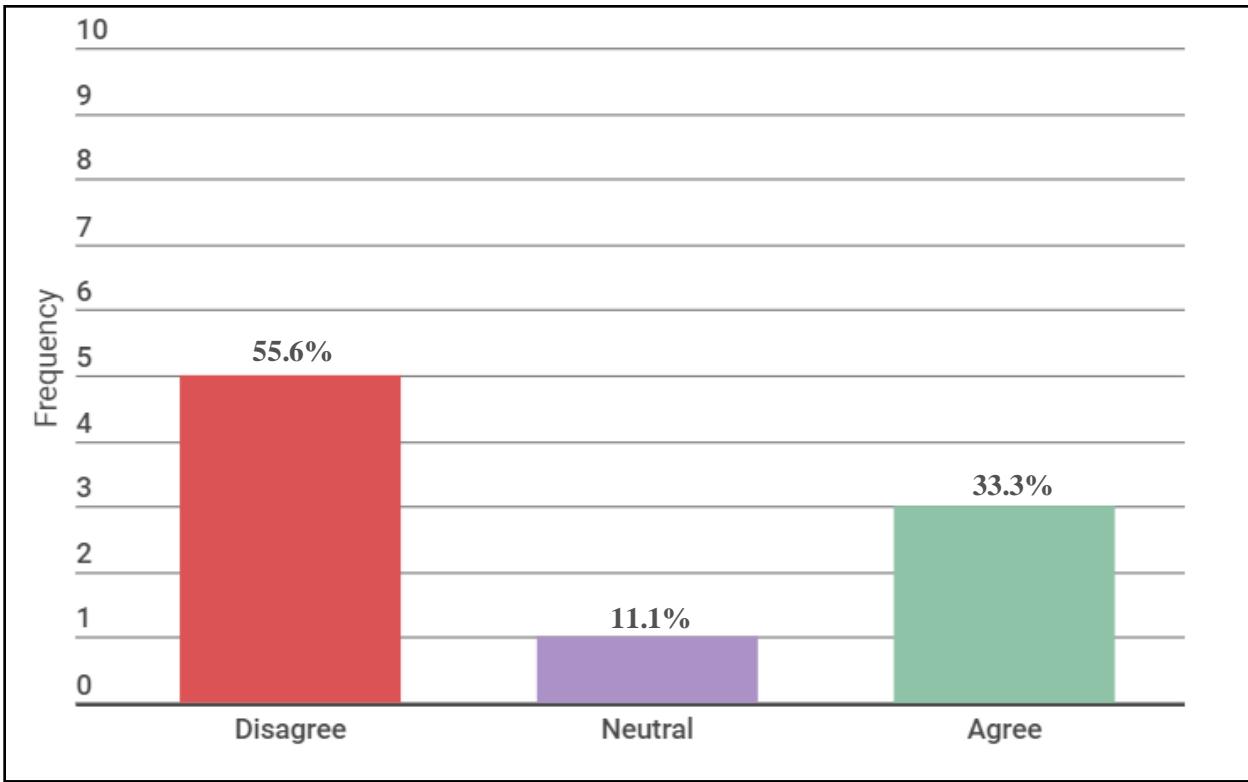


Figure 71: People Constructing Buildings Against Municipality Rules in Masike neighborhood. Source: (Via researcher, 2022).

Because the prevalent topic is related to this topic, there will be comparable responses; 5 persons did not agree that people construct their buildings without implementing municipality rules, and the percentage was 55.6. Also, one person remained neutral on the subject since he or she was unsure whether or not to provide a credible response. Furthermore, 3 people (33.3%) agreed with our opinion that their building was constructed in violation of municipal regulations.

1.2 Transportation

1.2.1 The Street Size Can Handle the Number of Cars in the Neighborhood

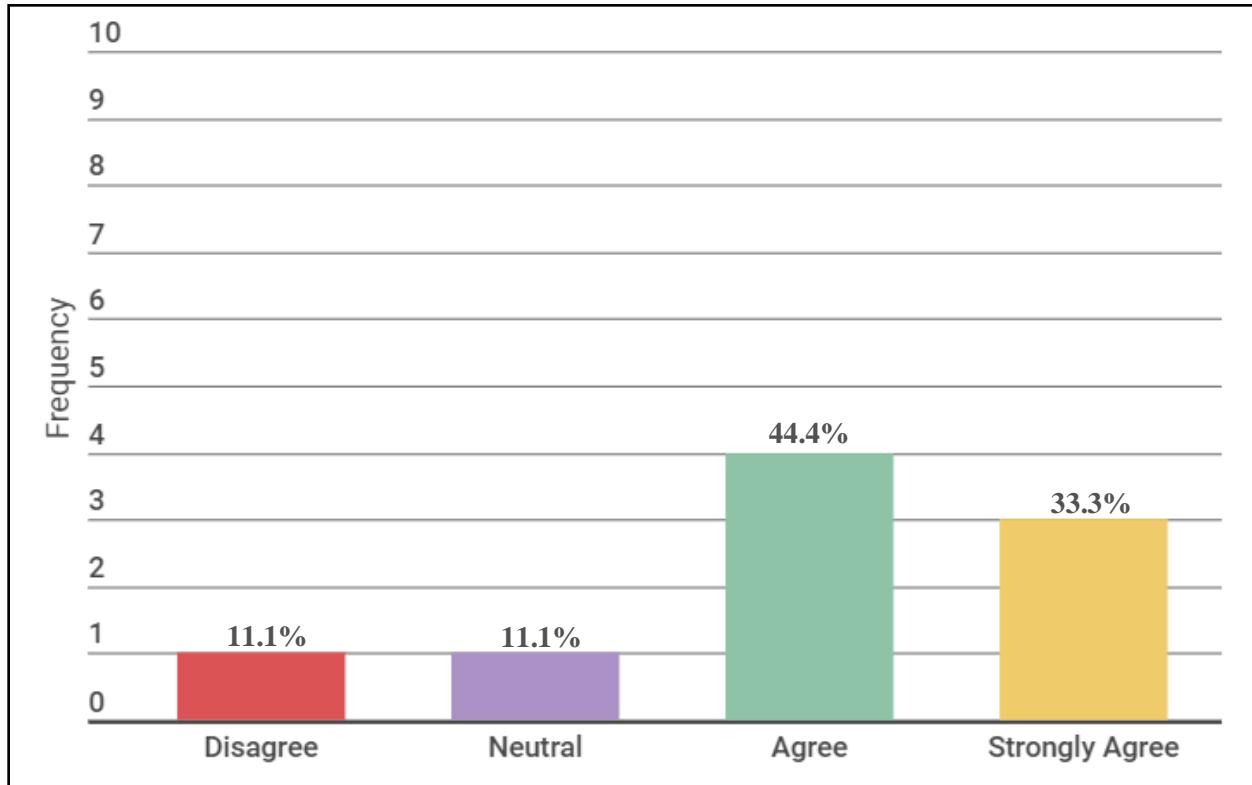


Figure 72: The Street Size Can Handle the Number of Cars in the Masike Neighborhood. Source: (Via researchers, 2022).

As per Masike's residents, the streets in their neighborhood can manage the cars, because 33.3 percent strongly agreed with the statement, and only 11.1 percent disagreed, implying that only one person disagreed. However, 44.4 percent answered agree, inferring that 77.7 percent agreed with our declaration, and the other was neutral, implying that only one person disagreed.

1.2.2 Enough Parking lots in Neighborhood

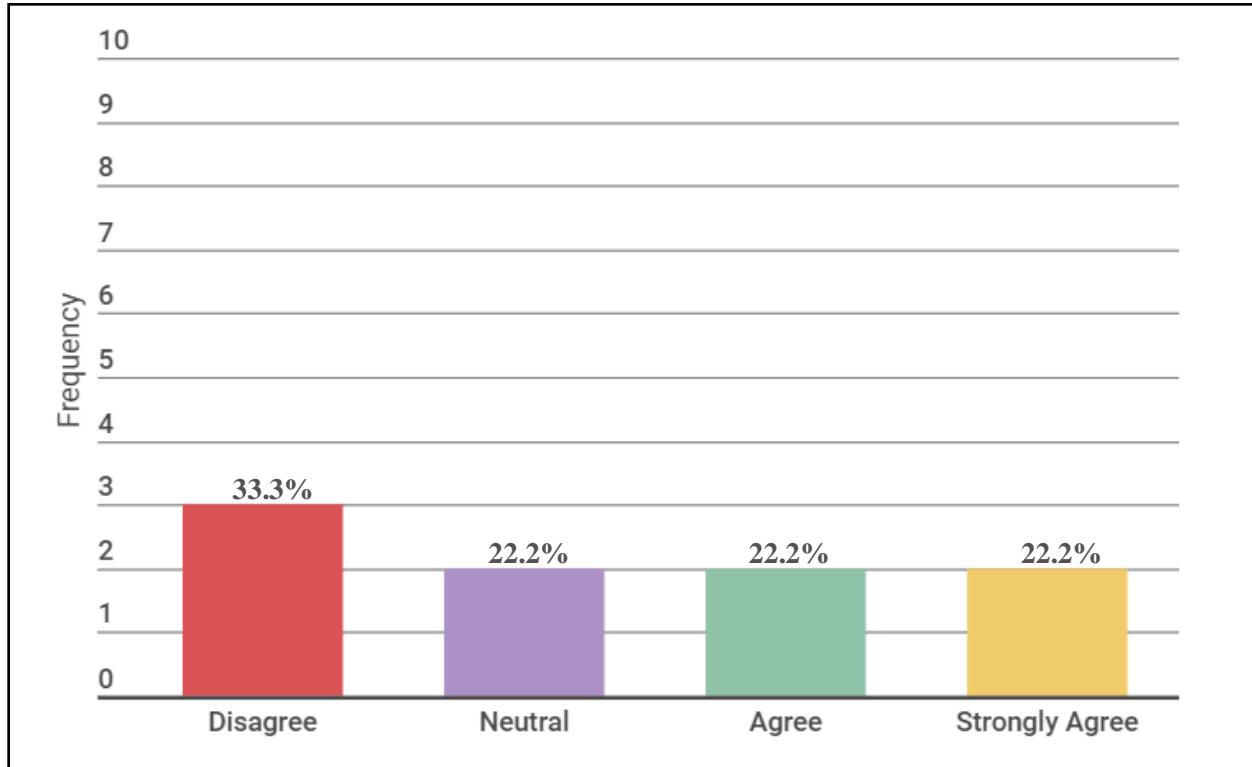


Figure 73: Enough Parking lots in Masike Neighborhood. Source: (Via researchers, 2022).

Considering parking is one of the most significant items that every neighborhood should have, 22.2 percent of Masike residents strongly agreed on having enough parking lots, and 2 persons agreed on obtaining sufficient parking for their cars. However, 33.3 percent (3 people) disagreed that there aren't enough parking spaces in their neighborhood, and 2 people were neutral, for a sum of 22.2 percent.

1.2.3 Public Transportation does not Appear in Neighborhood

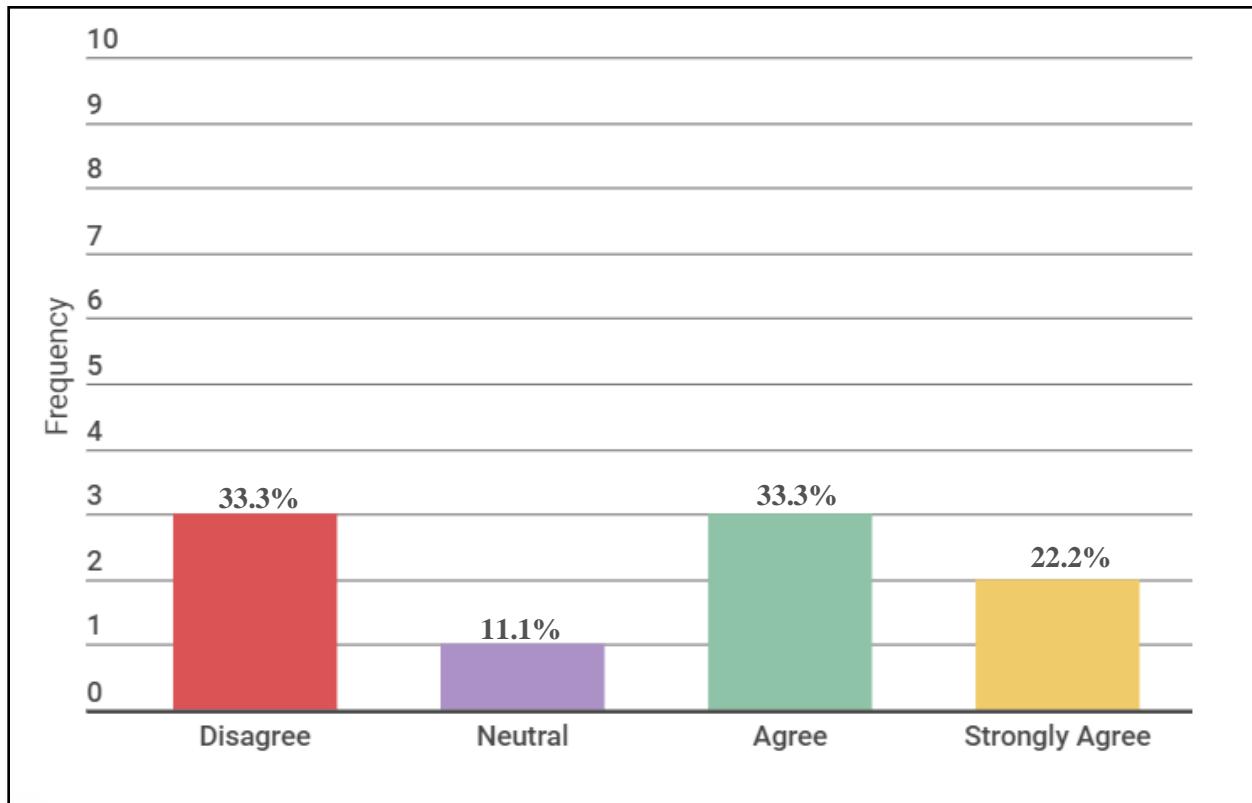


Figure 74: Public Transportation does not Appear in Masike Neighborhood. Source: (Via researchers, 2022).

A strong neighborhood needs address public transportation. In Masike, public transportation is not adequate since 22.2 percent (2 people) strongly agree that there is a lack of public transportation and 33.3 percent believe that utilizing the bass and mini bus is not available in their neighborhood. and the majority of people drive their own automobiles instead of taking public transportation, while almost 11.1 (person) were neutral, having no idea whether to use public transportation or not. In addition, three people (33.3 percent) disagreed and agreed that they have public transit and prefer it to private transportation.

1.2.4 Walking and Cycling Around Neighborhood is Safe

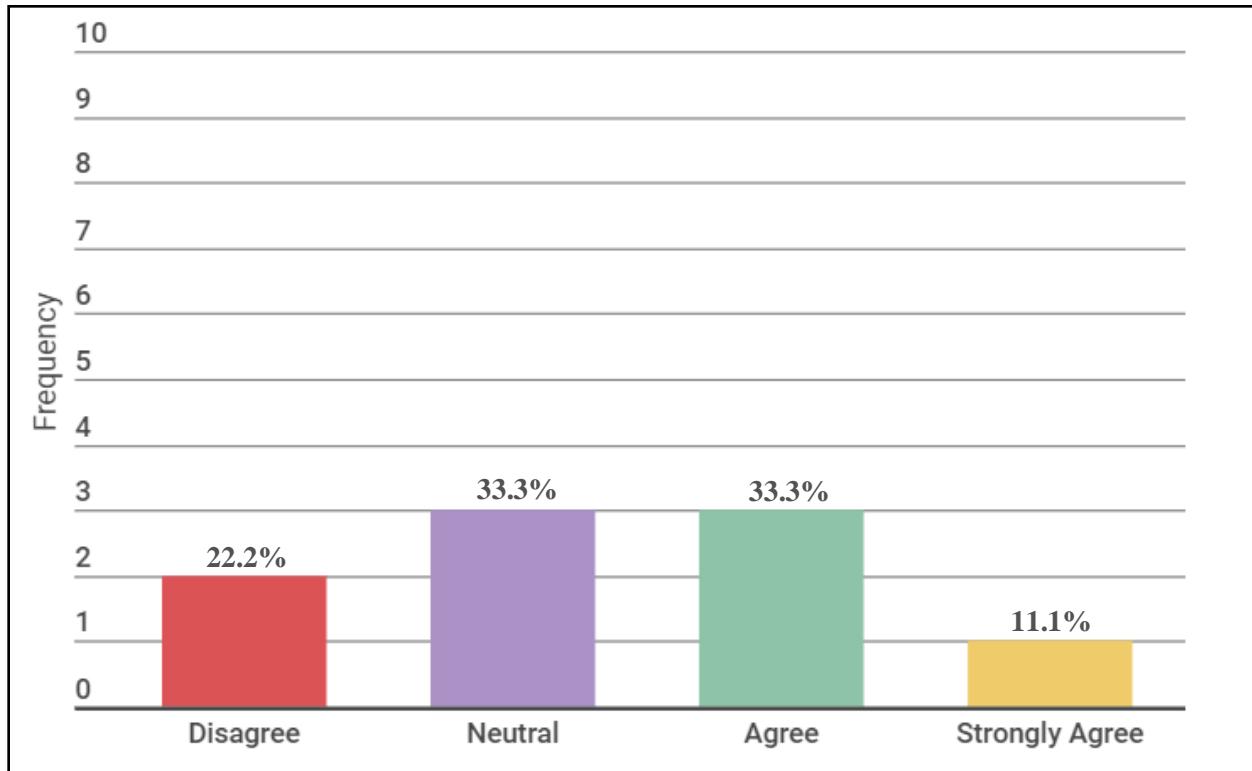


Figure 75: Walking and Cycling Around Masike Neighborhood is Safe. Source: (Via researchers, 2022).

Safety in the neighborhood is perhaps most essential, including walking and cycling, although in Masike, according to our sampling, 33.3 percent (3 people) were neutral and unsure whether their neighborhood is safe or not, and 33.3 percent agreed that their neighborhood is very safe for walking and cycling, and one person was strongly agree that they have safe neighborhood. But 22.2 percentage (2 person) were disagree, and they need more safety for walking and cycling since they don't have special streets for walking or cycling.

1.2.5 Crossing Main Street is Safe

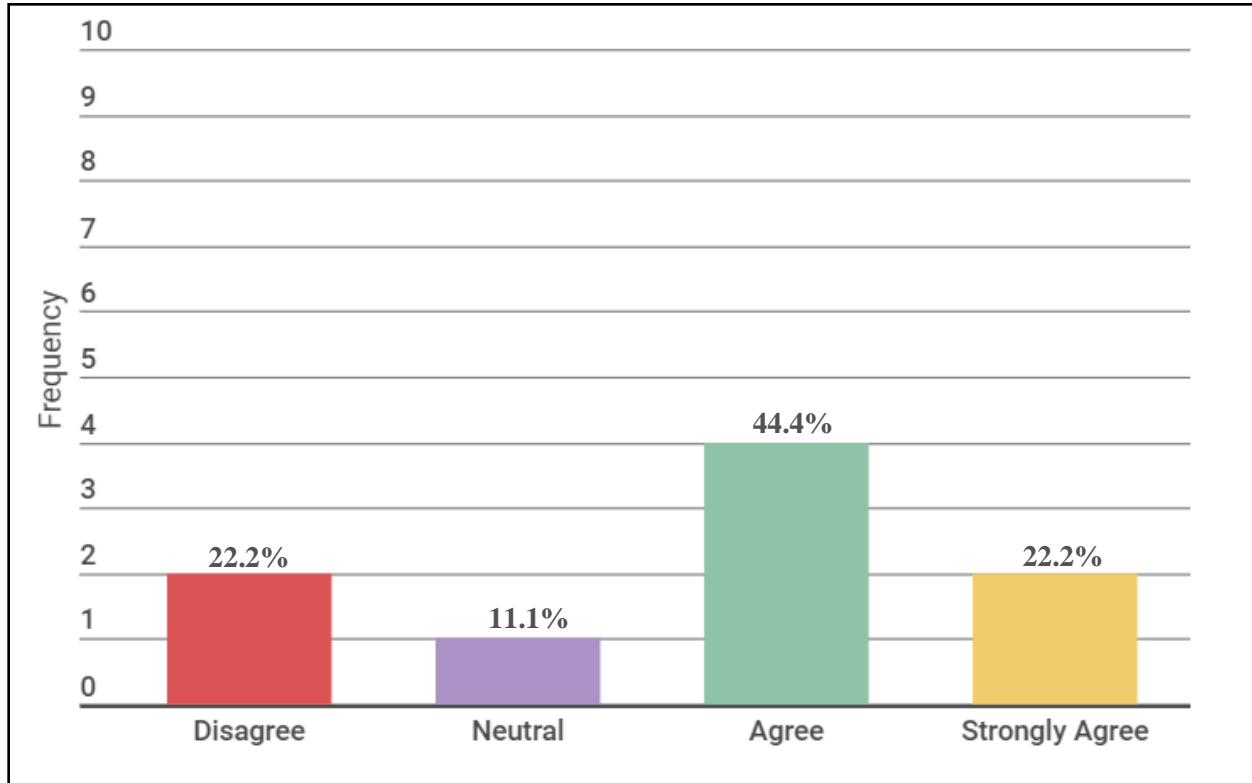


Figure 76: Crossing Main Street is Safe in Masike neighborhood. Source: (Via researchers, 2022).

Since the Masike area has many commercial establishments, two persons disagree that crossing into Main Street is safe for children or disabled people, we have a 22.2 higher probability that crossing into Main Street is unsafe. However, 44.4 percent (4 people) agree with 2 people strongly agree that around 66.6 percent of inhabitants in Masike area feel that crossing on the main street is safe, although one person is neutral about this issue.

1.2.6 All the Roads are Connected Together Within the Neighborhood

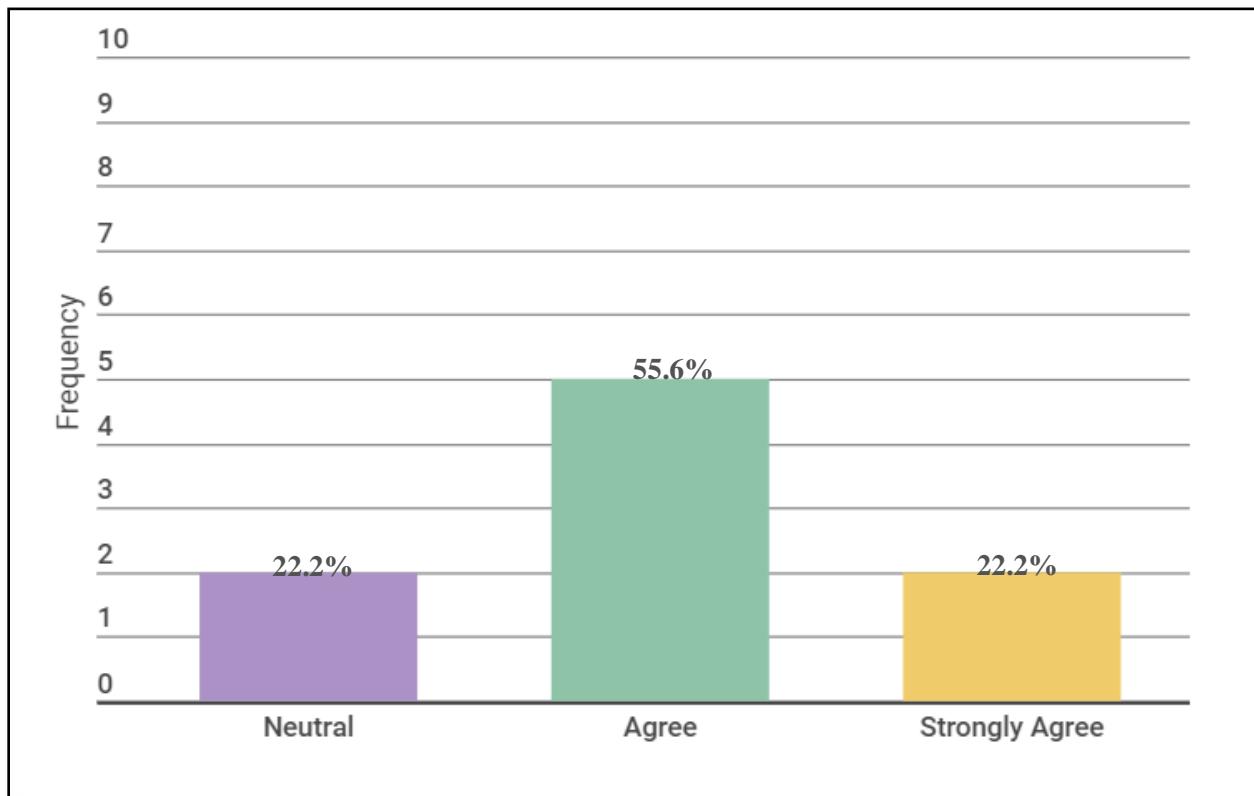


Figure 77: All the Roads are Connected Together Within the Masike Neighborhood. Source: (Via researchers, 2022).

Another of the decent points that make the neighborhood more contemporary is that all the roads are connected to gather within the neighborhood, and in the case of Masike, 55.6 percent (5 people) agreed that all people have access to main roads and the neighborhood is linked to gather, and 2 percent (22.2 percent) strongly agreed. However, 22.2 percent (2 individual) were neutral.

1.2.7 People have Access to Services Within the Neighborhood

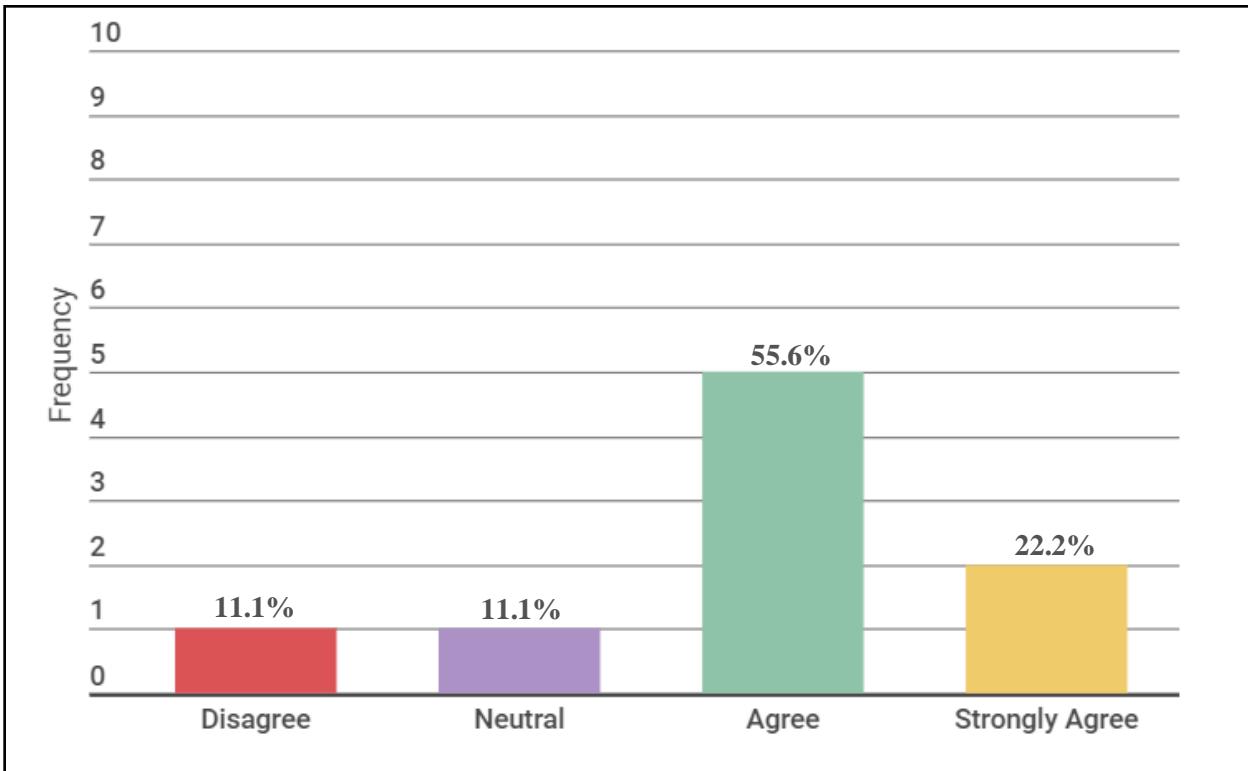


Figure 78: People have Access to Services Within the Masike Neighborhood. Source: (Via researchers, 2022).

Providing more services in the neighborhood will not demonstrate that this neighborhood is great; among these services, most individuals get access to those services; in the Masike neighborhood, 55.6 percent of the respondents indicated that all individuals are entitled to services in the neighborhood. Moreover, 2 persons (22.2%) strongly agreed that all people have access, implying that 77.8 percent of respondents agree on access to services. However, one person did not agree that there is a lack of accessibility, while another was neutral and was unsure about the occurrence of access to services.

1.3 Land Use

1.3.1 Each Block in Neighborhood has Multiple Land-Uses

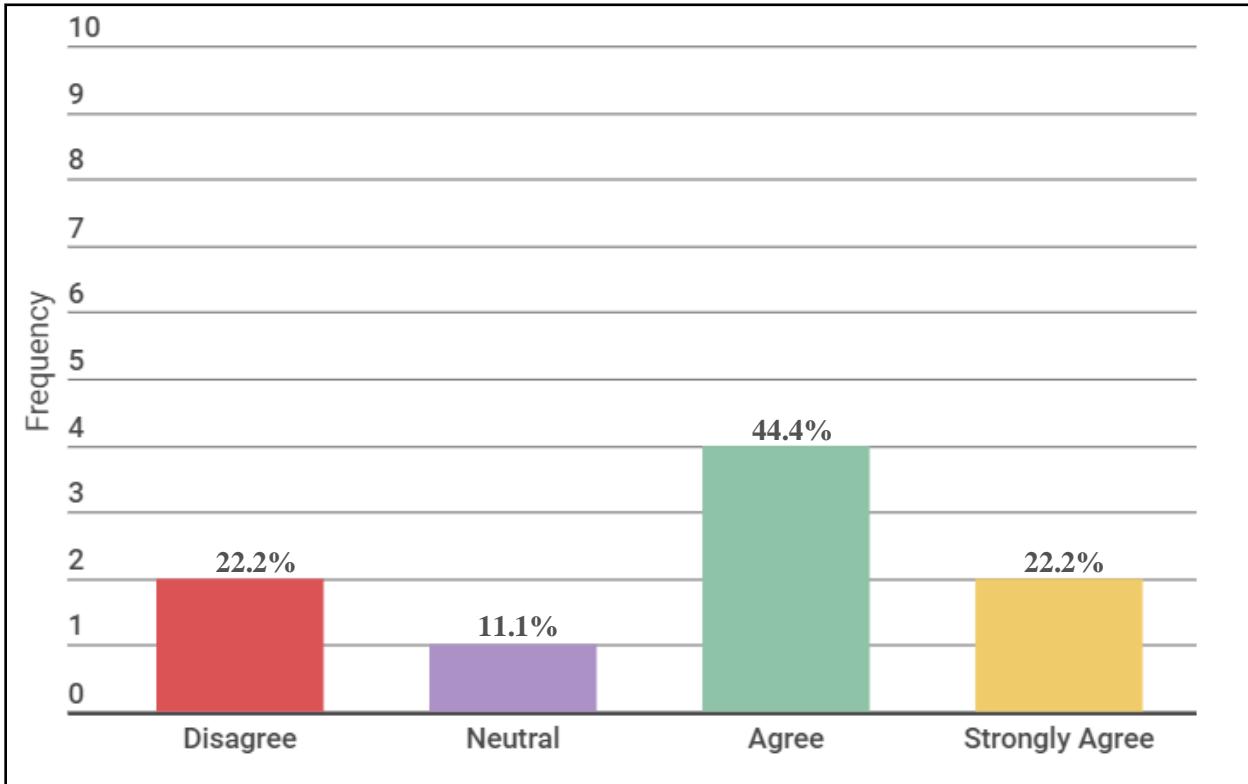


Figure 79: Each Block in Neighborhood has Multiple Land-Uses in Masike neighborhood. Source: (Via researchers, 2022).

Land use is one of the most basic characteristics, and most blocks have various uses of land. The percentage displayed in the above figure defines that 44.4 percent of the people agree with multiple uses of land, and 22.2 percent strongly agree that in the Masike neighborhood, there are different types of using land in one block. Also, two people disagreed that the Masike neighborhood did not have enough land uses for various purposes, and one person expressed neutral.

1.3.2 All the Houses are Built Properly with Good Aesthetic View

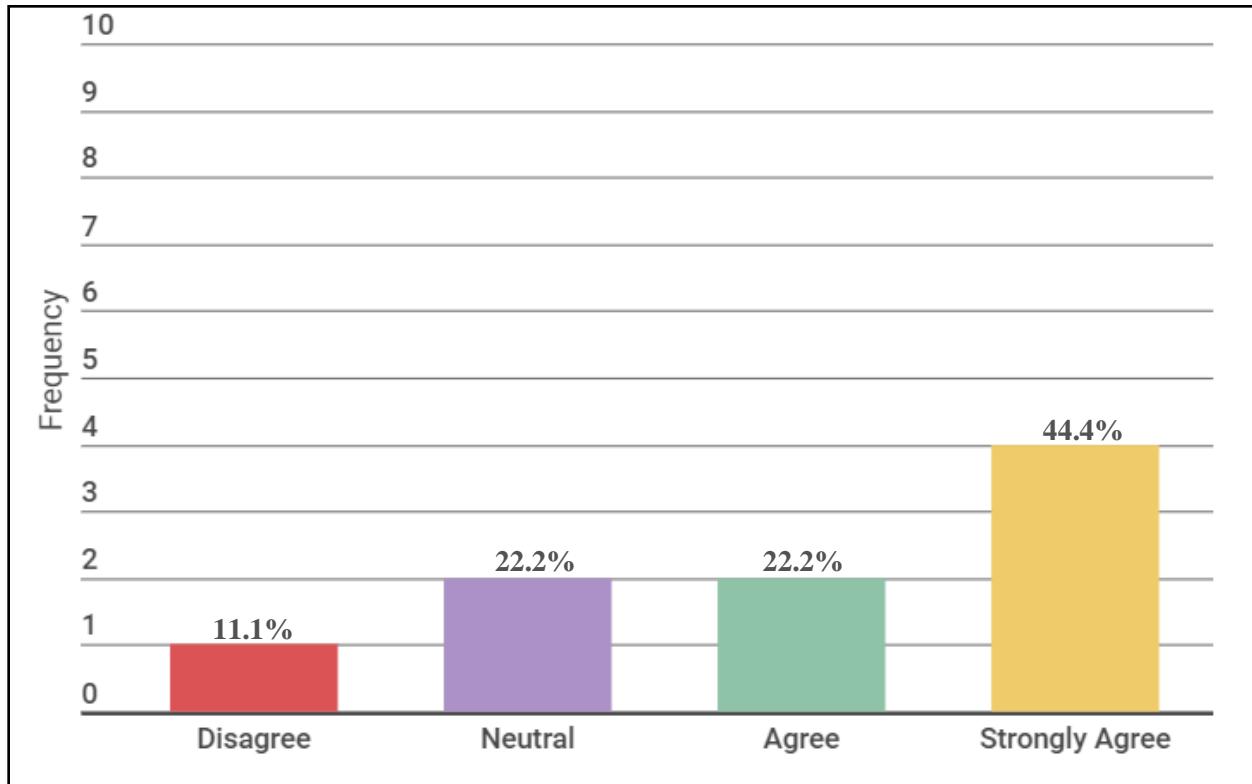


Figure 80: All the Houses are Built Properly with Good View in Masike neighborhood. Source: (Via researchers, 2022).

While houses are the most used in all neighborhoods, adequate housing is important because it affects the aesthetic of the neighborhood; in Masike, residents agree that all houses were built in a satisfactory manner. According to the data, 44.4 percent (4 people) strongly agree and 2 percent (22.2 people) agree that Masike area has a wonderful view and that the manner houses are built is excellent, while 2 people were neutral. In addition, only one person was opposed to building dwellings in a proper manner in the Masike community.



Summary

According to this study, a question being asked to Masike citizens demonstrated that the majority agree with their neighborhood and the major portion of the elements such as (Building type, Transportation, and Land use); obtainable in Masike neighborhood so there is compromise among these elements, because the above figures suggest the response from neighborhood members as well as from the first declaration that the vast majority of the people agree that many of individuals are comfortable in the neighborhood. Furthermore, the second assertion that most people agreed the number of people fit in their house and they don't even have a difficulty with something like this, because 77.8 agreed and strongly agreed regarding their number of members of the house. Per that data, the bulk of citizens in Masike neighborhood implement the municipality rules and construct only the permitted number of floors, and the large percentage of them agree that people in Masike neighborhood do not build more floors than allowed, approximately 66.7 percent agreed, but since this situation is more attached to the municipality, some people were neutral about such matter. Although transportation is crucial, Masike, as a new neighborhood, has enough roadway space to accommodate cars since, according to available data, 44.4 percent agreed, but what is absent are parking lots, and most people think that there aren't enough parking spaces in Masike. The accessibility of transportation and street connectivity are all well-built, as seen by the numbers. Moreover, individuals in this neighborhood feel more safe walking and cycling, and 44.4 percent think that crossing the street is safe, with access to all services in the neighborhood. Participants in the Masike neighborhood agreed that each block has a varied land use, comprising commercial and residential, also the manner houses are built is a decent method, and 44.4 percent strongly agree with a neighborhood outlook, indicating that the Masike area has an appropriate attitude. Therefore, Masike neighborhood used the majority of the elements depending on the available data.

- **Ashty Neighborhood**

To know the neighborhood resident's satisfaction a set of questions were set, the answers were classified into five categories ranging from (strongly disagree, disagree, neutral, agree, and strongly agree).

1.1Budling Type & Housing

1.1.1 The Uncomfortable of People in their Houses

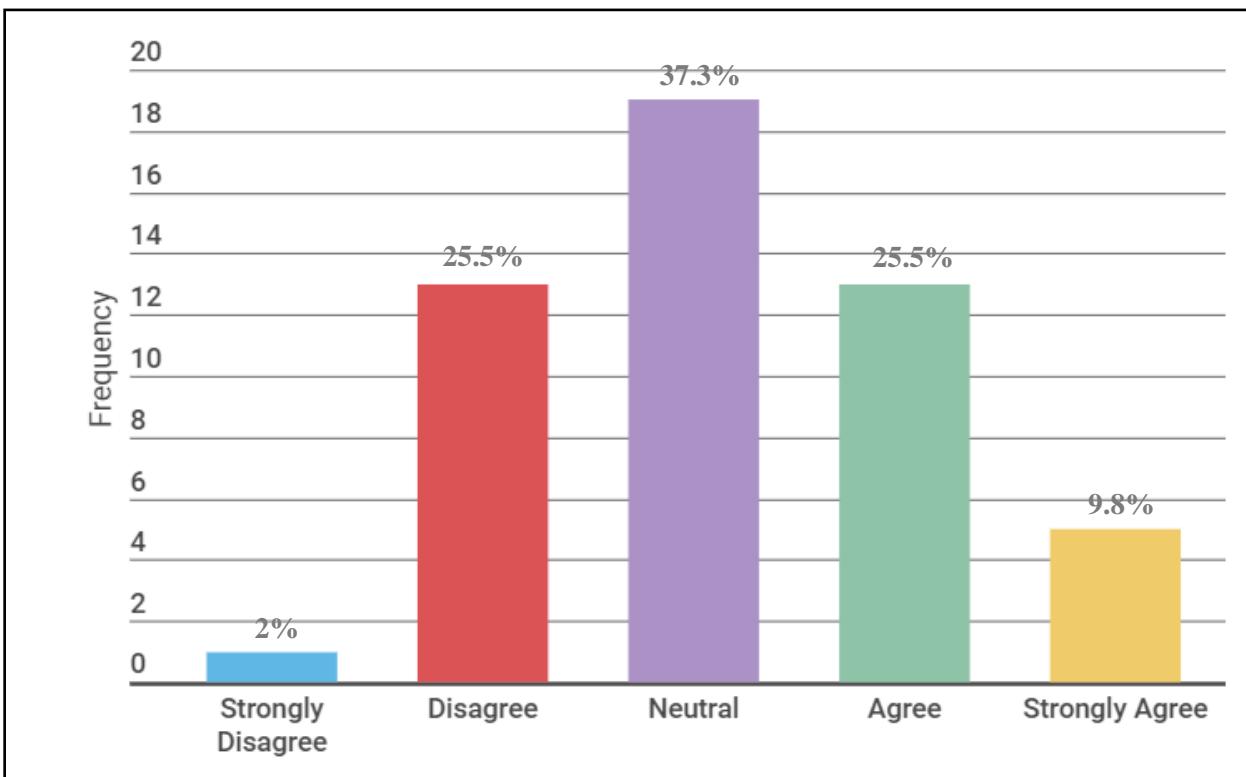


Figure 8I: Percentage comfortable of People in their Houses in Ashty neighborhood. Source: (Via researchers, 2022).

Only one participant in the Ashty neighborhood survey, out of 51, strongly disagrees with the statement and believes the neighborhood is very comfortable to live in. While 13 participants, or 25.5 percent of the total, disagree with the notion that the area as a whole lacks comfort. The biggest percentage of participants 37.3% are impartial with the statement, followed by 13 participants with 25.5 percent. And only 9.8% of the participants (out of a total of 5) believe that people in the Ashty neighborhood are very uncomfortable.

1.1.2 The Size of Dwelling does not Fit the Number of People in House

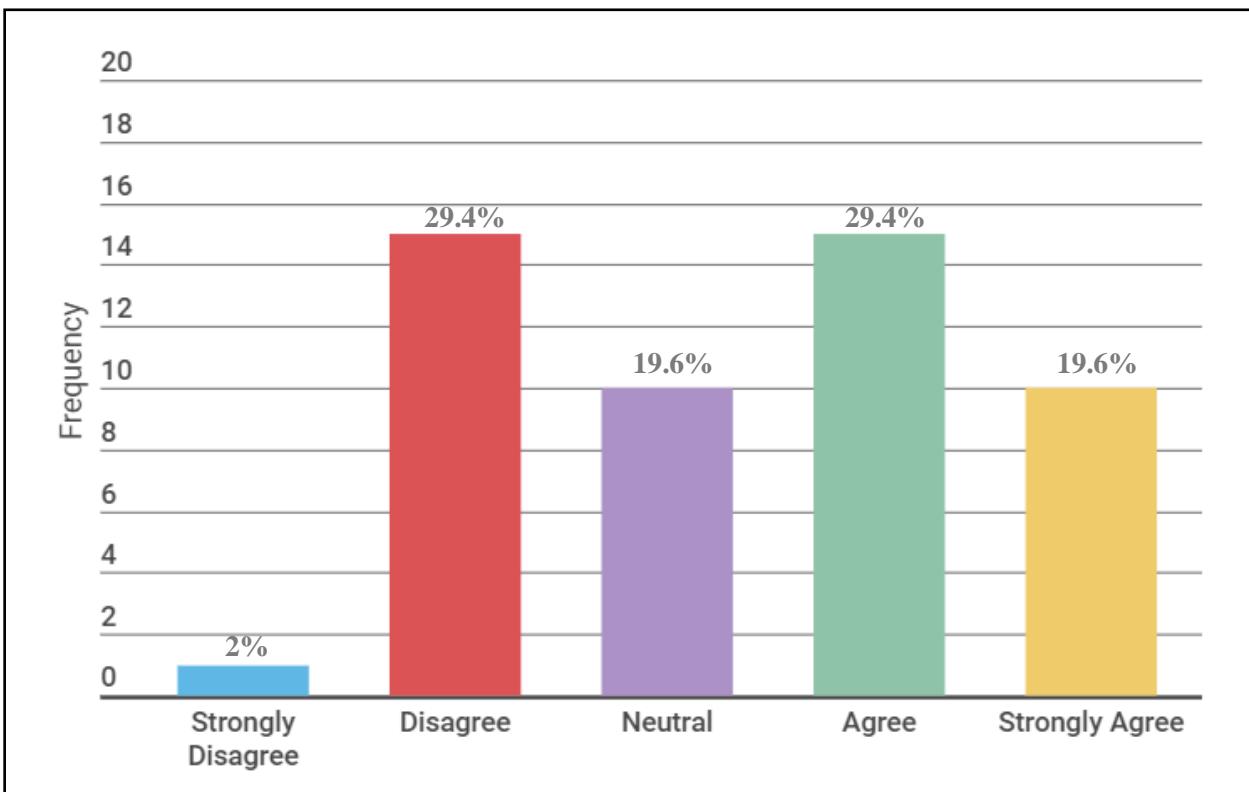


Figure 82: Size of Dwelling does not Fit the Number of People in Housed in Ashty neighborhood. Source: (Via Researchers, 2022).

Only one person out of 51 strongly disagrees with the statement that the housing size does not fit the household size and believes the occupation size is perfectly fine, accounting for 2% of the total. With 29.4 %, 15 people disagree with the statement and say the size of the residence is suitable for the family. With 19.6 %, 10 people are neutral on the statement. With 29.6% of the total, 15 people agree with the statement and consider that homes are modest. Finally, 10 people, or 19.6% of the total, completely agree with the statement and believe the residence is too tiny to accommodate the number of people in the household. As can be observed, the number of people who agree and disagree with the statement is nearly equal, implying that roughly half of the houses do not accommodate family sizes.

1.1.3 People Building more Floors than Number Allowed in the Neighborhood

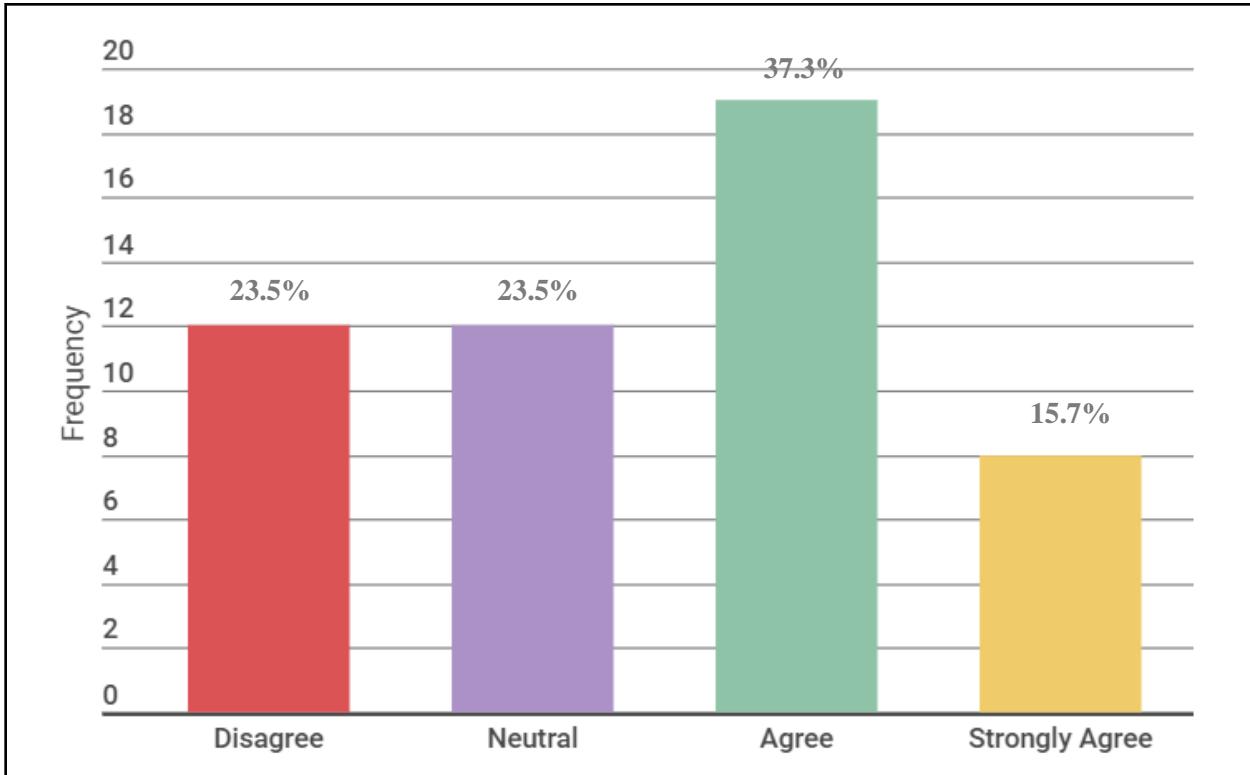


Figure 83: People Building more Floors than Number Allowed in the Ashty neighborhood. Source: (Via researchers, 2022).

With 23.5 percent of the total, 12 of the 51 participants disagree with the statement and claim that people are bound by the rules they must follow. While 12 people (23.5%) say that people follow or do not follow the roles. And 37.3 percent say that people are able to develop more floors than the municipality allows. The lowest number, 15.7 percent, with eight people, agrees completely with the statement. As can be seen, more people agree that residents are not following to the roles and are adding floors as they choose, causing problems in their areas such as sun blockage.

1.1.4 People Constructing Buildings Against Municipality Rules

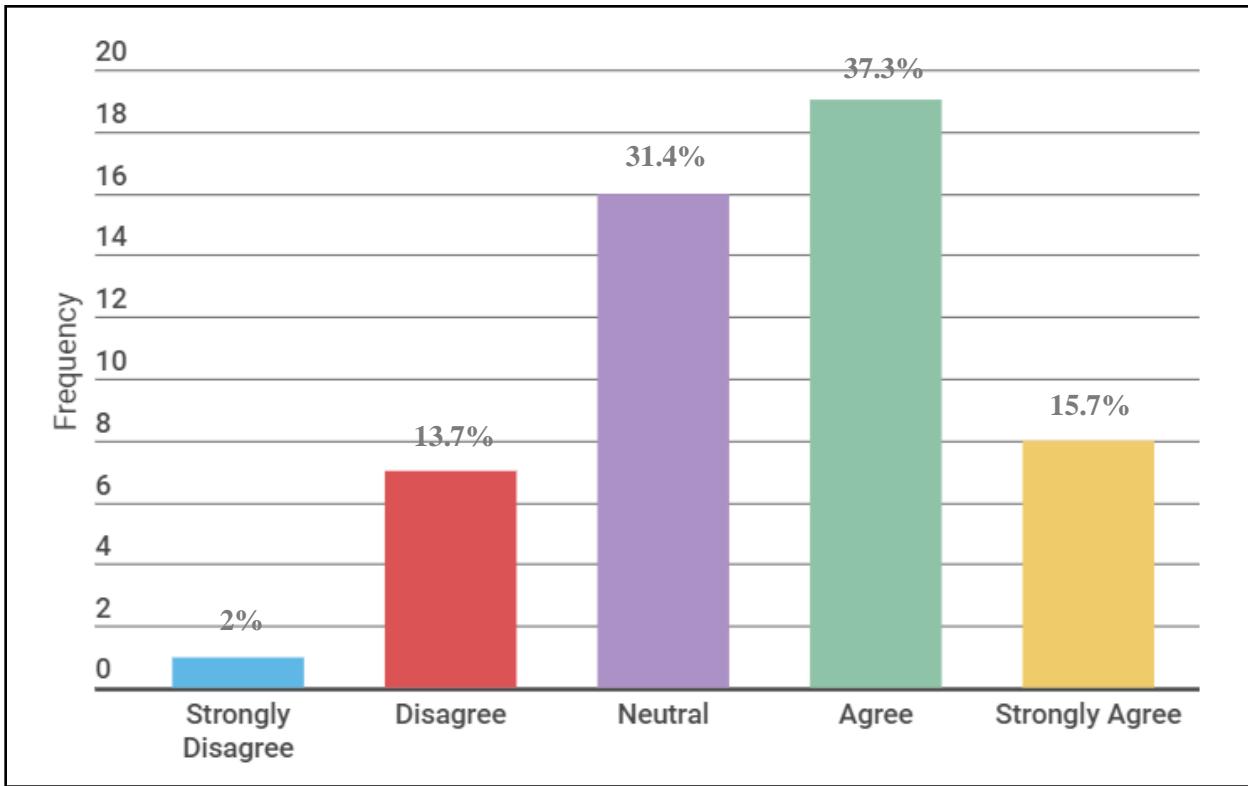


Figure 84: People Constructing Buildings Against Municipality Rules in Ashty neighborhood. Source: (Via researcher, 2022).

Only one member (2% of the total) strongly disagrees with the statement, claiming that all inhabitants' buildings have an authorizing certificate from the municipality. While 7 people, or 13.7 percent of the total, disagree with the assertion. And 16 individuals (31.4%) are undecided about the statement, claiming that some people's structures exceed municipal limits. While the biggest percentage (37.3%) believes that people can develop anything they want in their neighborhood. Finally, 8 people strongly agree with the statement (15.7 percent). As a result, in the Ashty area, people's responsibilities are less stringent, and people are free to develop buildings.

1.2 Transportation

1.2.1 The Street Size Can Handle the Number of Cars in the Neighborhoods

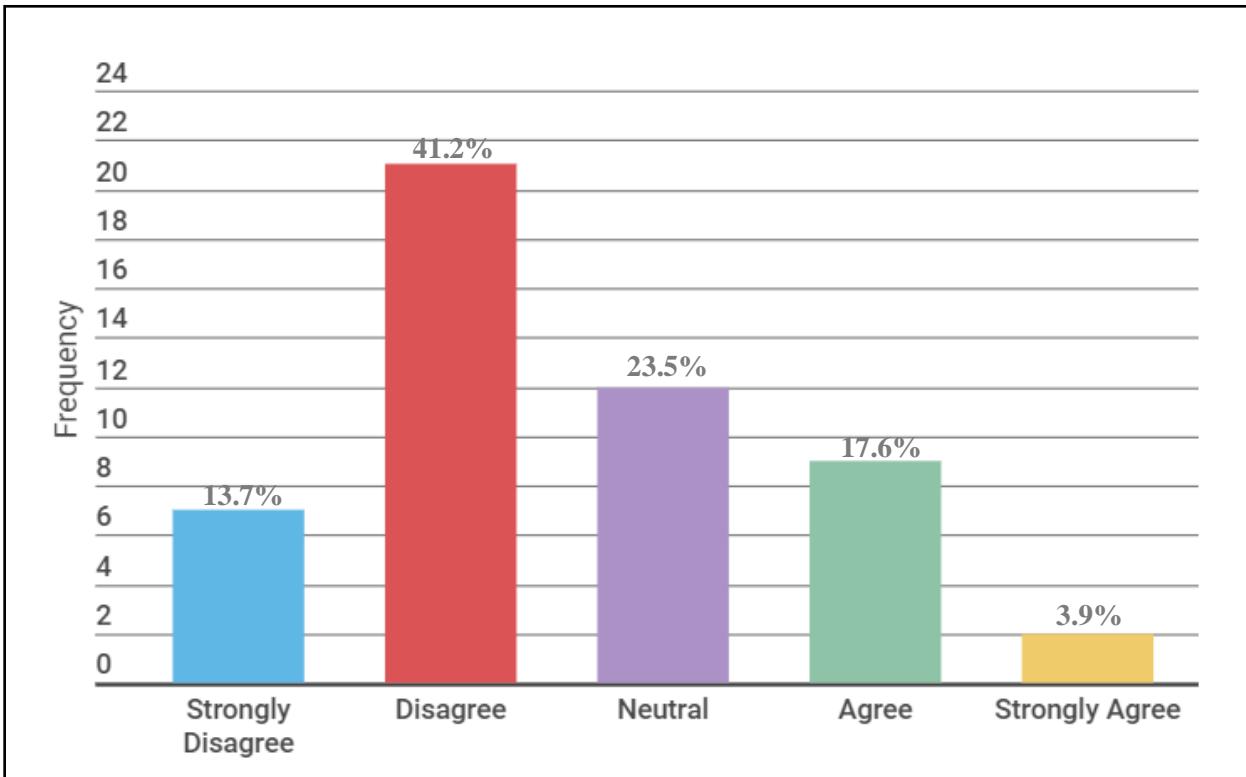


Figure 85: The Street Size Can Handle the Number of Cars in the Ashty Neighborhood. Source: (Via researchers, 2022).

With 13.7 percent, 7 respondents out of 51 strongly disagreed with the statement and claimed that the street space is sufficient for the available cars and that parking on the street doesn't cause traffic within the area. In addition, 21 participants (41.2%) disagree with the statement. And 12 people (23.5%) are unconcerned about the statement. And of the 9 participants, 17.6% believe the street size is inadequate to manage the available autos. Finally, just two individuals (3.9%) completely agree with the statement, claiming that the size of the street is not insufficient.

1.2.2 Enough Parking lots in Neighborhood

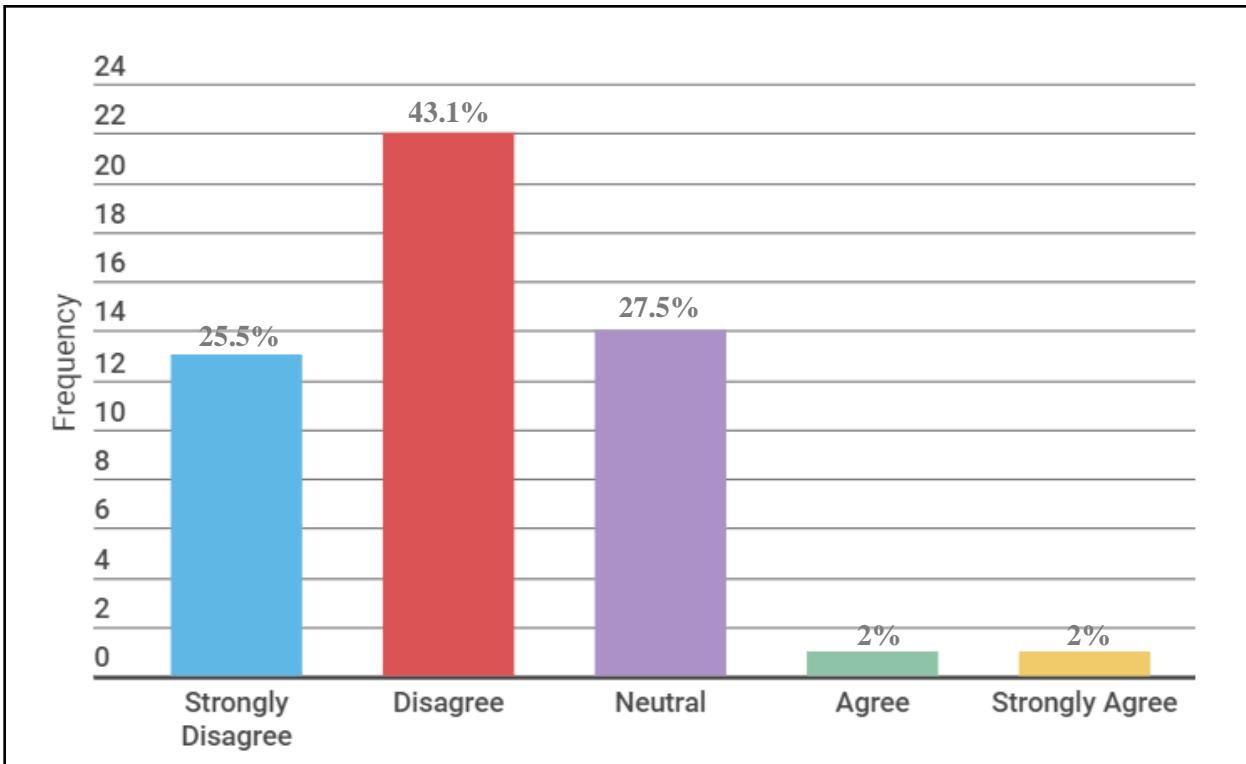


Figure 86: Enough Parking lots in Ashty Neighborhood. Source: (Via researchers, 2022).

Out of 51 participants, 13 strongly disagree with the statement and claim that there aren't enough parking spaces, whereas 22 strongly disagree with the statement and claim that there isn't enough parking. There are 13 participants that are neutral to the statement, out of a total of 27.5 percent. Only one person, accounting for 2% of the total, agrees with the statement, while only one participant, accounting for 2% of the total, claims there are enough parking places for neighborhood residents. As can be seen from the numbers above, the majority of households face parking difficulties due to a lack of parking places.

1.2.3 Public Transportation does not Appear in Neighborhood

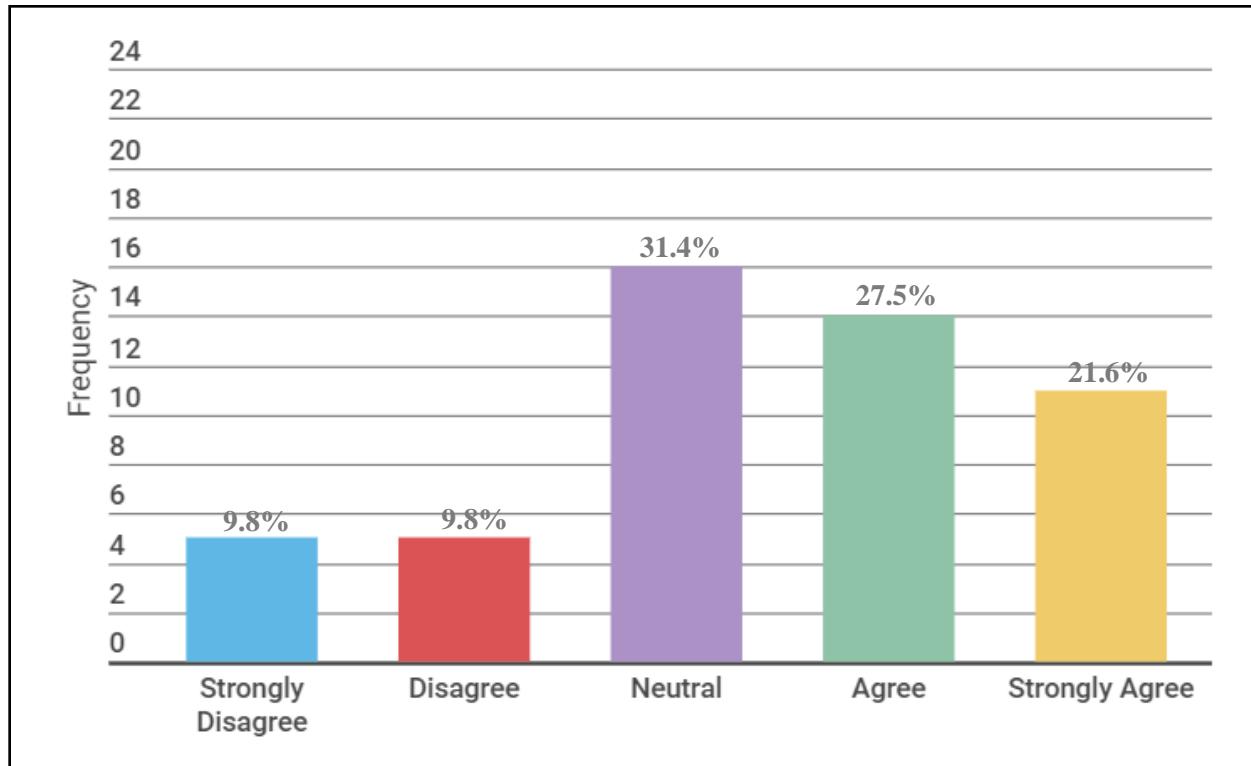


Figure 87: Public Transportation does not Appear in Ashty Neighborhood. Source: (Via researchers, 2022).

Only 5 people (9.8%) out of 51 strongly disagree with the assertion, claiming that public transportation is readily available in the area. Other 5 people, accounting for 9.8% of the total, disagree with the assertion. The statement is impartial to the greatest number of participants (17), accounting for 31.4 percent of the total. And 14 people agree with the assertion, believing that public transit is infrequent in the area. Finally, 11 individuals (21.6%) think that public transportation does not present in the neighborhood at all. As a result, most individuals in the neighborhood have never seen or used public transportation, and they rely on alternative means of transportation to go around. As a result, most of the people claim that the residents of the neighborhood do not depend on the public transportation for their movement. And the main transportation mode in the neighborhood is automobiles.

1.2.4 Walking and Cycling Around Neighborhood is Safe

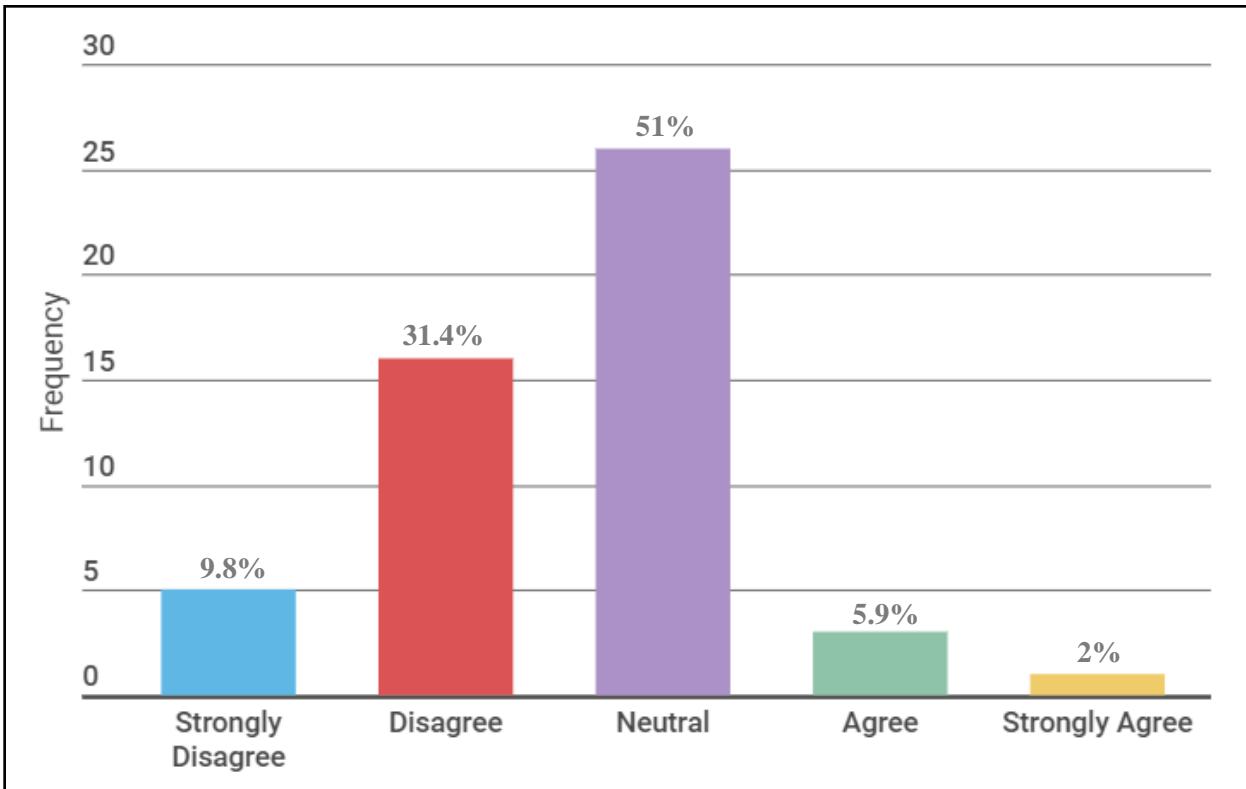


Figure 88: Walking and Cycling Around Ashty Neighborhood is Safe. Source: (Via researchers, 2022).

Only five of the 51 participants 9.8% strongly disagree with the assertion, claiming that the neighborhood is extremely risky for walking and cycling. The statement is also disagreed with by 16 individuals (31.4 percent). The statement is neutral with the highest percentage of 51 percent and 26 participants stating that the neighborhood is comfortable or not comfortable for walking and cycling. Only three individuals 5.9% agreed with the statement. Finally, only one participant (with a score of 2%) firmly believes the neighborhood is pedestrian-friendly. Based on participants responses the neighborhood is not pedestrian friendly and transportation infrastructure only supports the car-oriented areas.

1.2.5 Crossing Main Street is Safe

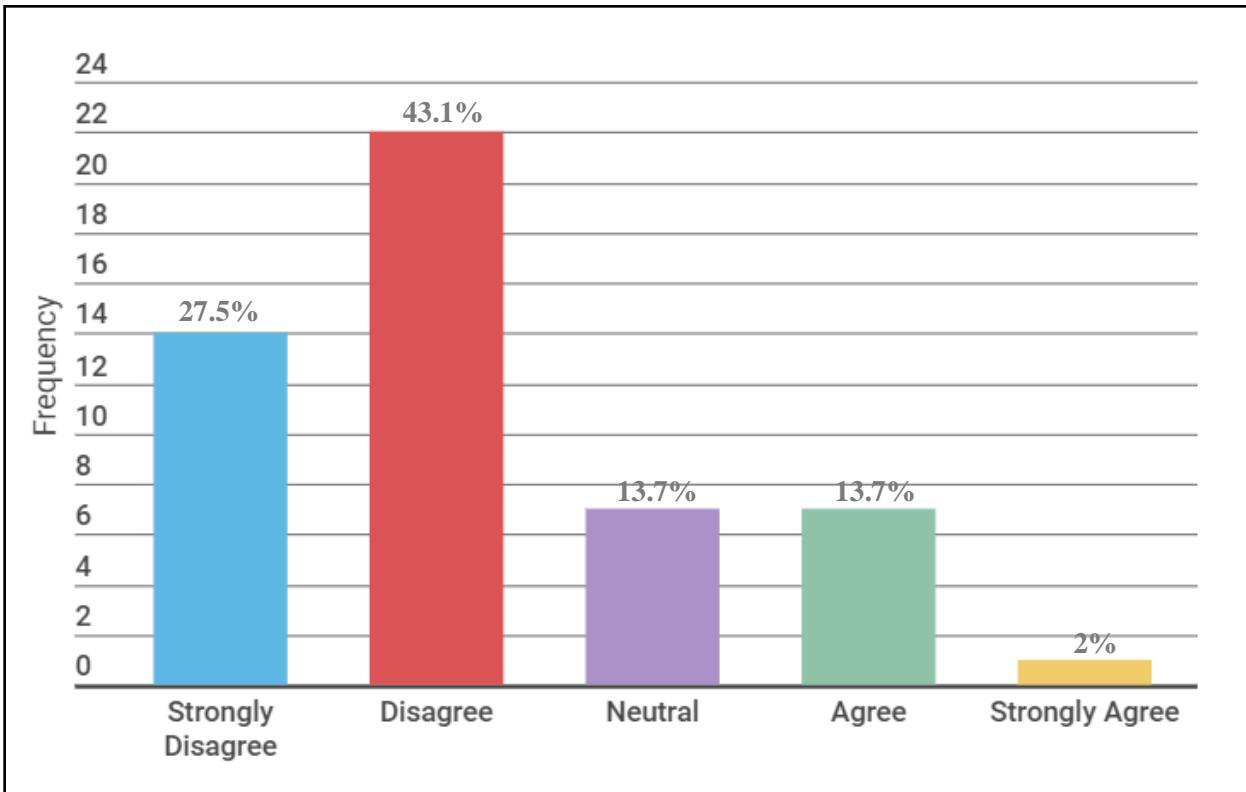


Figure 89: Crossing Main Street is Safe in Ashty neighborhood. Source: (Via researchers, 2022).

Out of 51 participants, 14 27.5% strongly disagree with the statement, claiming that the neighborhood roads are exceedingly risky for all residents to pass through. The greatest percentage, 43.1 percent, is followed by 22 participants who disagree with the assertion. And 7 people 13.7% are undecided about the statement. Furthermore, seven people out of ten agree with the statement and believe that driving on the highway is safe. Finally, only one member, who has the lowest percentage of 2%, strongly thinks that the neighborhood roadways are extremely safe for pedestrians to cross. As a result, it is apparent that the neighborhood is unsafe for children, the disabled, the old, and adults.

1.2.6 All the Roads are Connected Together Within the Neighborhood

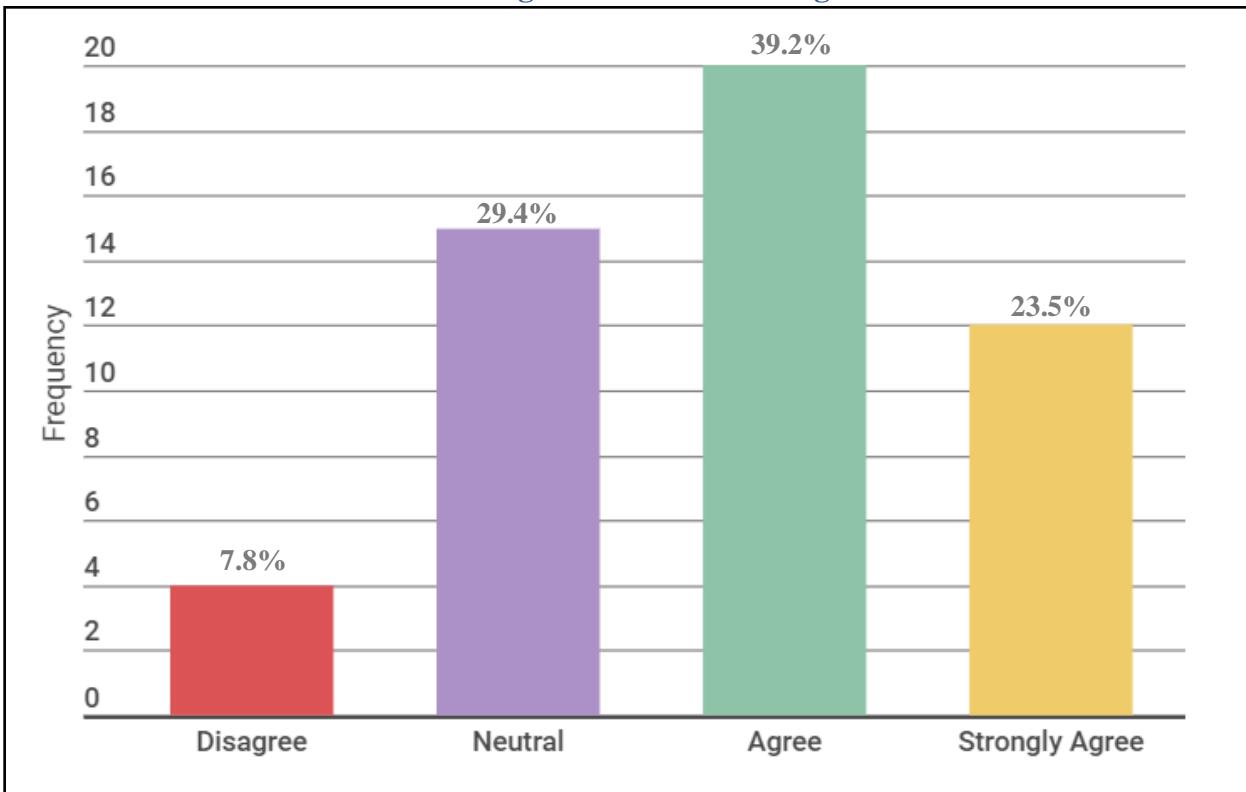


Figure 90: All the Roads are Connected Together Within the Ashty Neighborhood. Source: (Via researchers, 2022).

Only four respondents out of 51 strongly disagree with the statement, with the lowest percentage being 7.8% claiming that not all roads are connected. And 15 people, or 29.4% of the total, are undecided about the statement. And the statement and claim roads are connected to the highest proportion of 39.2 percent and 20 participants, while 12 people with 23.5 percent strongly agree with the statement and claim roads are very well joined together and access to the major road is available everywhere. According to the responses of the participants, the road infrastructure is well connected.

1.2.7 People have Access to Services Within the Neighborhood

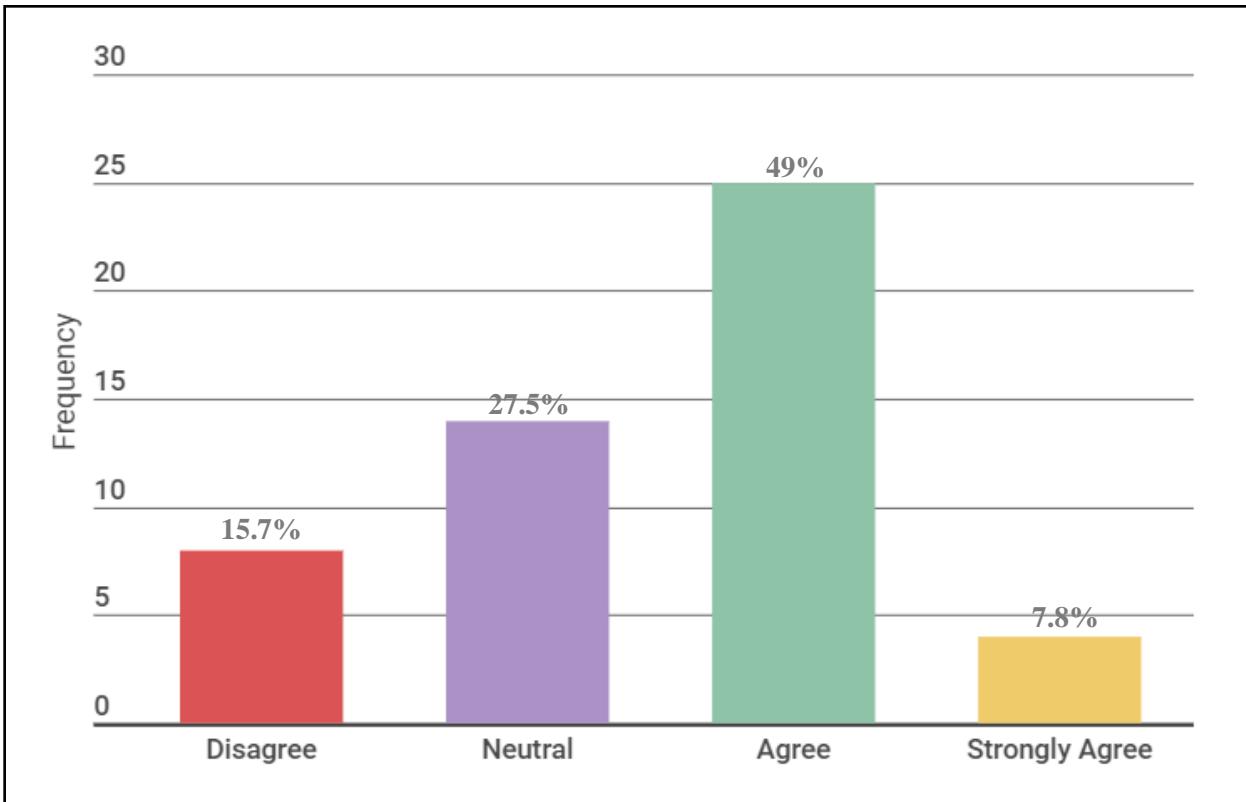


Figure 91: People have Access to Services Within the Ashty Neighborhood. Source: (Via researchers, 2022).

Eight of the 51 participants (15.7 percent) disagree with the statement and believe that such services are not available to all citizens. And 14 individuals (27.5%) are undecided about the statement. With the greatest participation rate of 25 participants, 49 percent agree with the statement and believe that citizens have access to such services. Finally, only four people with the lowest proportion of 7.8% strongly agree with the statement, claiming that the availability of services for residents is very sufficient. As a result of the participants' responses, services such as shops, police stations, and schools are located inside the neighborhood, and the majority of inhabitants have easy access to them.

1.3 Land Use

1.3.1 Each Block in Neighborhood has Multiple Land-Uses

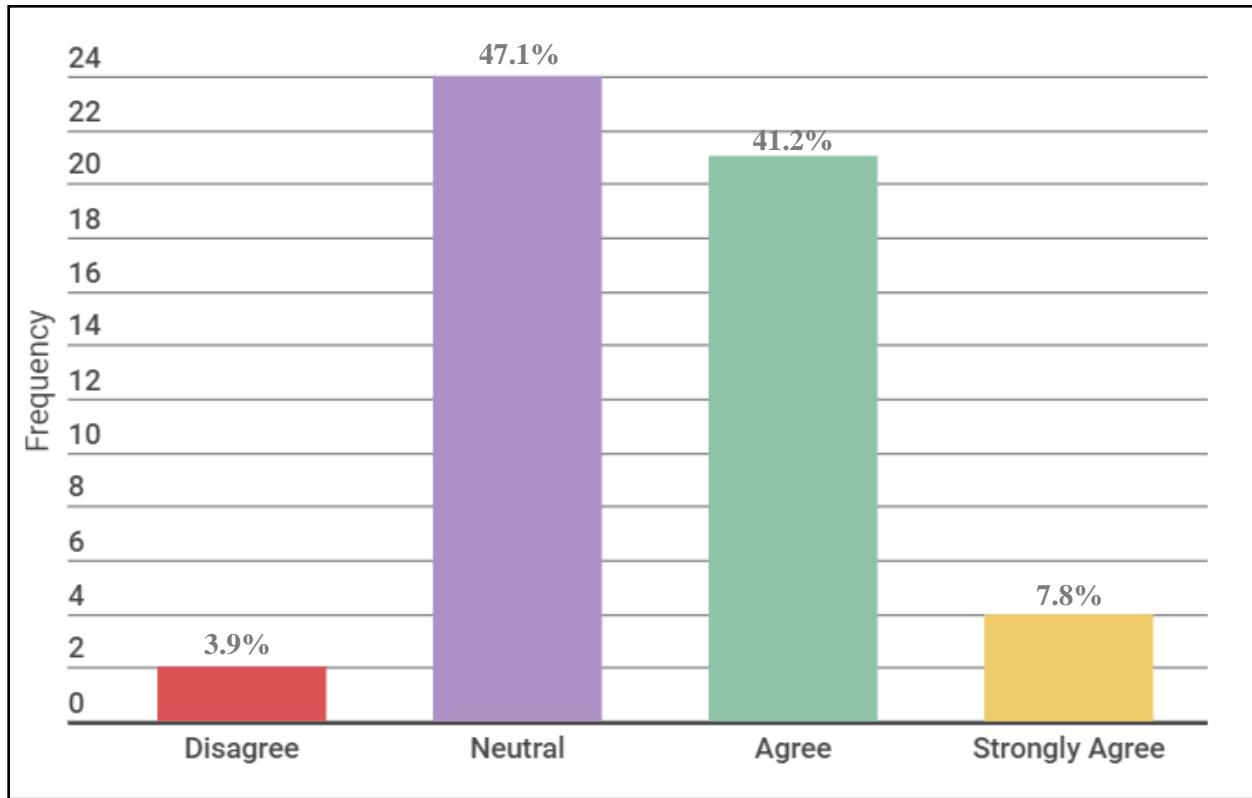


Figure 92: Each Block in Neighborhood has Multiple Land-Uses in Ashty neighborhood. Source: (Via researchers, 2022).

Only two of the 51 participants, with a total proportion of 3.9 percent, disagree with the statement, claiming that the neighborhood's blocks are only suitable for one sort of land use. While the statement is neutral with the maximum percentage of 47.1 percent and 24 participants. While 21 of the participants (41.2%) agree with the statement. Finally, just four people (7.8%) strongly agree with the statement and claim that each block has several land-uses. As a result of the responses, it can be seen that some of the blocks serve for one type of land-use while others serve for multiple types of land-uses.

1.3.2 All the Houses are Built Properly with Good Aesthetic View

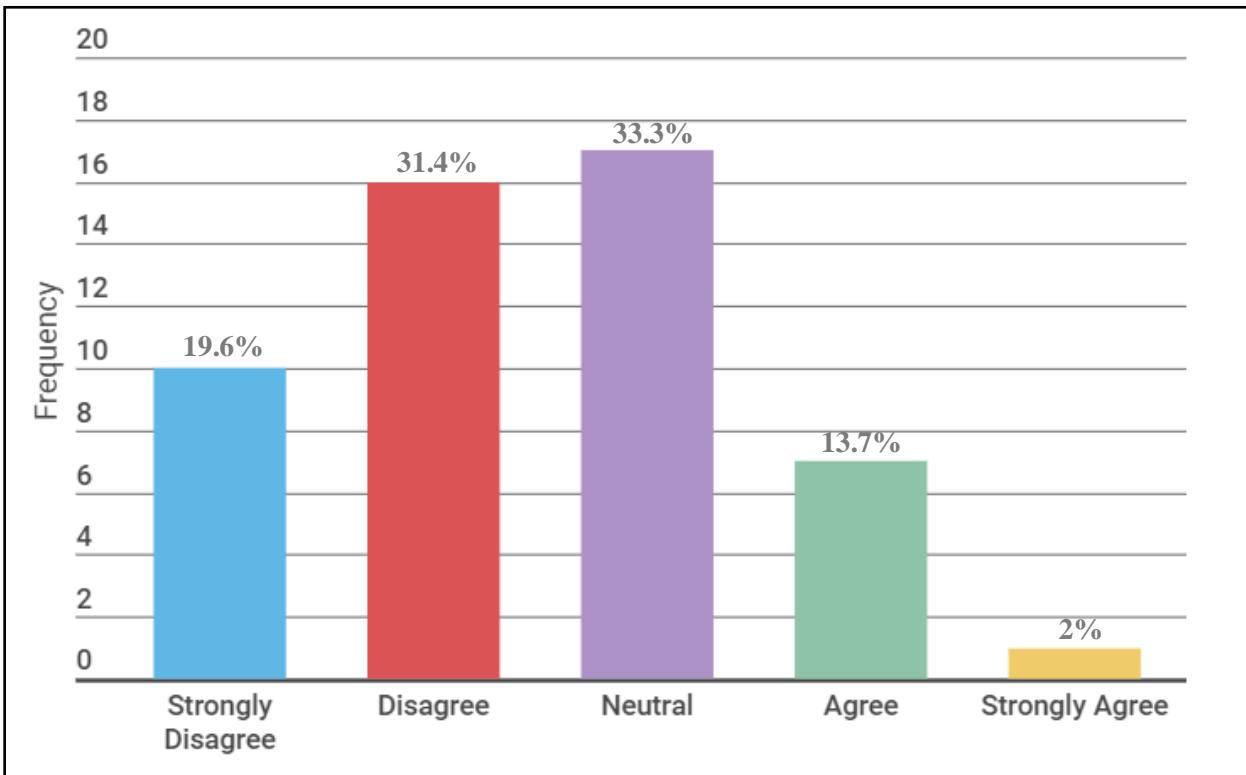


Figure 93: All the Houses are Built Properly with Good View in Ashty neighborhood. Source: (Via researchers, 2022).

Ten of the 51 participants, or 19.6%, strongly disagree with the statement, claiming that not all of the properties have a beautiful view. In addition, 16 participants 31.4% disagree with the statement. With 17 participants, the biggest percentage 33.3% is neutral to the statement. And seven persons 13.7% agree with the statement. Finally, only one participant, who ranked the lowest at 2%, strongly agreed with the statement. As a result, most of the houses obscure other houses' views, and the houses have no aesthetic view of the neighborhood or city.



Summary

According to the available report, being comfortable in this neighborhood is equal to agreeing or disagreeing, although the majority of people were neutral in this instance, half of the people are comfortable and the other half are uncomfortable in Ashty neighborhood. Furthermore, the Ashty neighborhood seems to have medium density because, which is shown in the second sentence, some people agreed on the stability of size of dwelling and number of people, while others did not, but 37.3 percent of people agreed on having to build more floors than the number authorized for them, and 37.3 percent agreed on individuals not following the municipality rules in the Ashty neighborhood, while 15.7 percent strongly agreed. Transportation in the Ashty neighborhood is lacking in many sectors, including street size and parking availability. 41.2 percent agreed that the size of the street in the Ashty neighborhood cannot accommodate a large number of cars, and 43.1 percent agreed that there's not enough parking spaces in the neighborhood. As well, public transportation is lacking, and people prefer to drive their own cars rather than take the bus or minibus; however, this does not imply that a bus station is missing, and the majority of people don't really agree on safety in this neighborhood, with 43.1 percent disagreeing that crossing the street is secure, and cycling and walking are also not very safe, but connectivity and accessibility to public services are great in Ashty neighborhood, with 49 percent agreeing. Land use in the Ashty neighborhood, every block has various uses of lane using more than one usage land including commercial and residential together, but because the Ashty neighborhood is not recent, the outlook of the neighborhood is not adequate and all houses are not planned in the same way, and 31.4 were disagree about the view of the Ashty neighborhood. Eventually, some of the elements are used in the Ashty neighborhood, but others are lacking.

- **Shele Neighborhood**

To know the neighborhood resident's satisfaction a set of questions were set, the answers were classified into five categories ranging from (strongly disagree, disagree, neutral, agree, and strongly agree).

1.1 Building Type & Housing

1.1.1 The Comfortability of People in their Houses

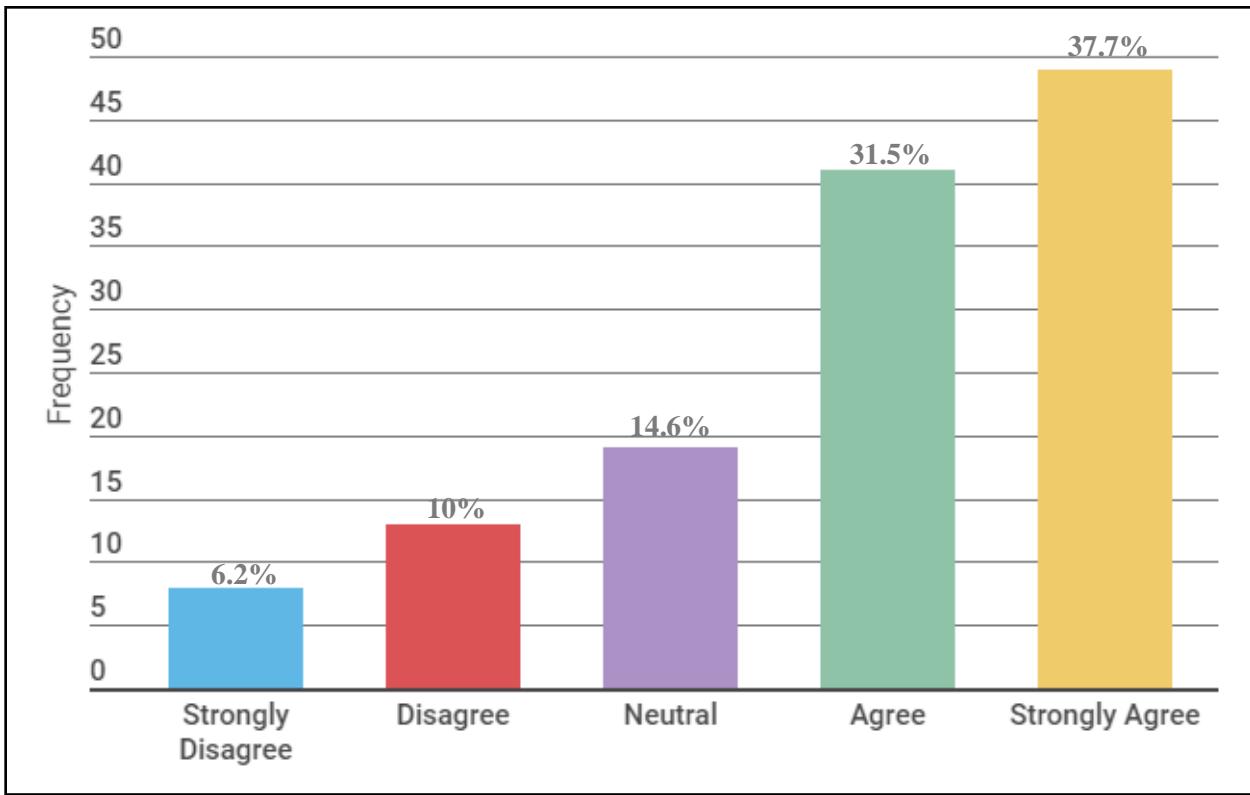


Figure 94: Percentage comfortable of People in their Houses in Shele neighborhood. Source: (Via researchers, 2022).

Only 8 participants in the Shele neighborhood survey, out of 130, strongly disagrees with the statement and believes the neighborhood is very comfortable to live in. While 13 participants, or 10 percent of the total, disagree with the notion that the area as a whole lacks comfort. And only 14.6% (out of a total of 19) of the participants are impartial to the statement. And 41 people 31.5% believe that the neighborhood isn't a pleasant place to live. The biggest percentage of participants 37.7% believe that people in the Shele neighborhood are very uncomfortable followed by 49 participants with 37.7 percent.

1.1.2 The Size of Dwelling does not Fit the Number of People in House

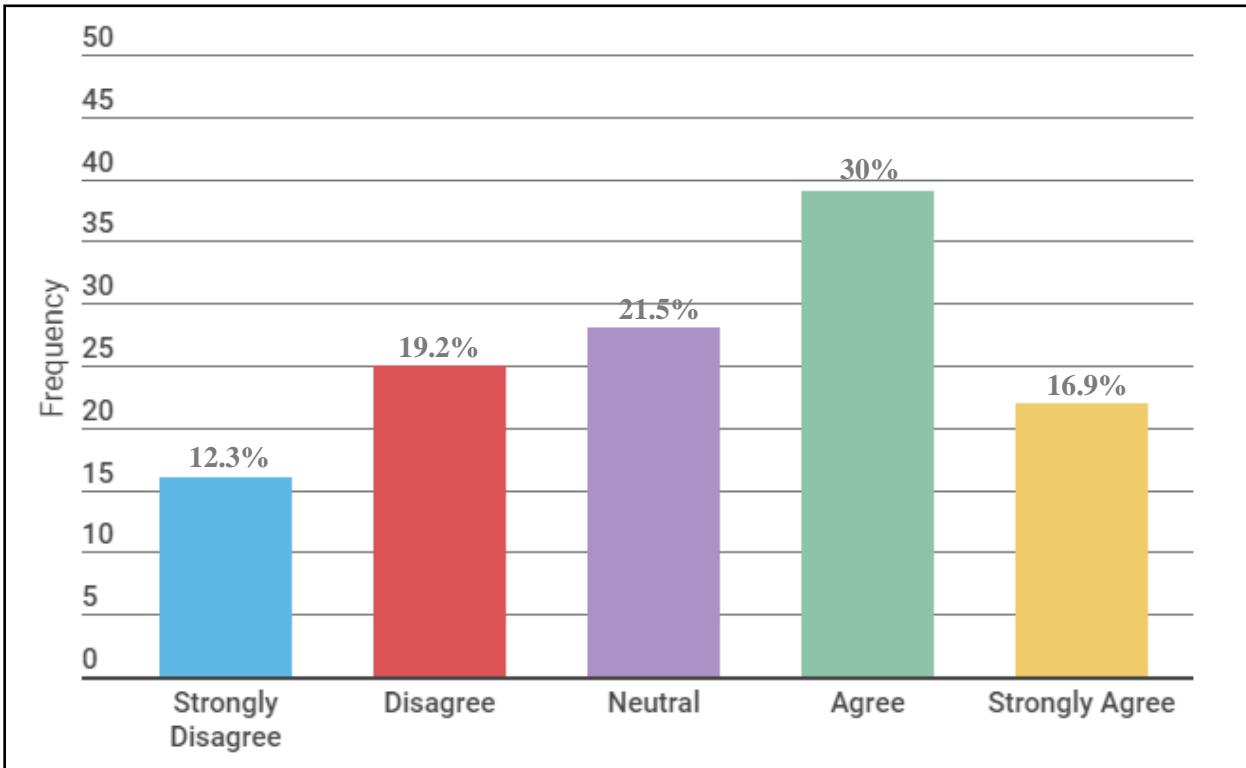


Figure 95: Size of Dwelling does not Fit the Number of People in Housed in Shele neighborhood. **Source:** (Via Researchers ,2022).

Only 16 persons out of 130 strongly disagrees with the statement that the housing size does not fit the household size and believes the occupation size is perfectly fine, accounting for 12.3% of the total. With 19.2 %, 25 people disagree with the statement and say the size of the residence is suitable for the family. With 21.5 %, 28 people are neutral on the statement. With 30% of the total, 39 people agree with the statement and consider that homes are modest. Finally, 22 people, or 16.9% of the total, completely agree with the statement and believe the residence is too tiny to accommodate the number of people in the household.

1.1.3 People Building more Floors than Number Allowed in the Neighborhood

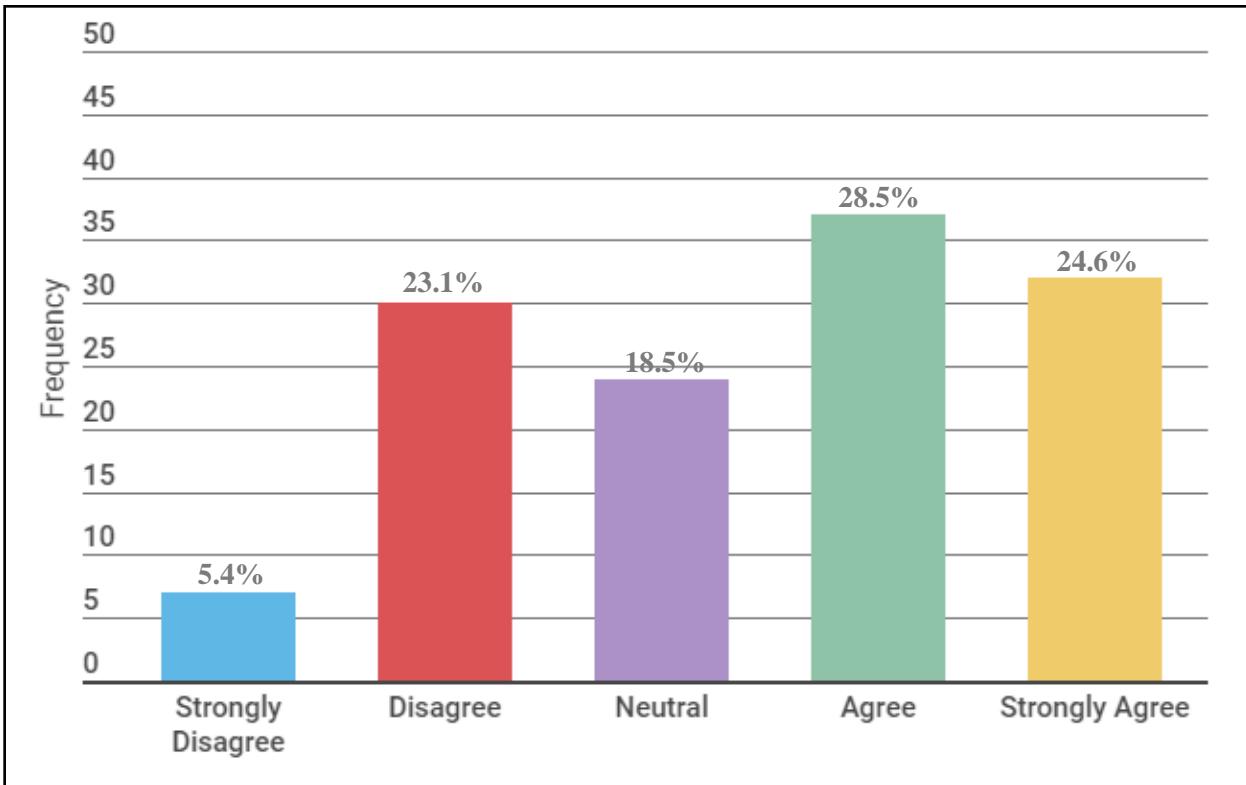


Figure 96: People Building more Floors than Number Allowed in the Shale neighborhood. Source: (Via researchers, 2022).

With 5.4 percent of the total, 7 of the 130 participants strongly disagree with the statement and claim that people are bound by the rules they must follow. Also, with 23.1% of the total, 30 disagree with the statement and claim that people are bound by the rules they must follow. While 24 people (18.5%) say that people follow or do not follow the roles. And 37 of people (28.5%) say that people are able to develop more floors than the municipality allows. and with 32people (24.6%), strongly agrees completely with the statement.

1.1.4 People Constructing Buildings Against Municipality Rules

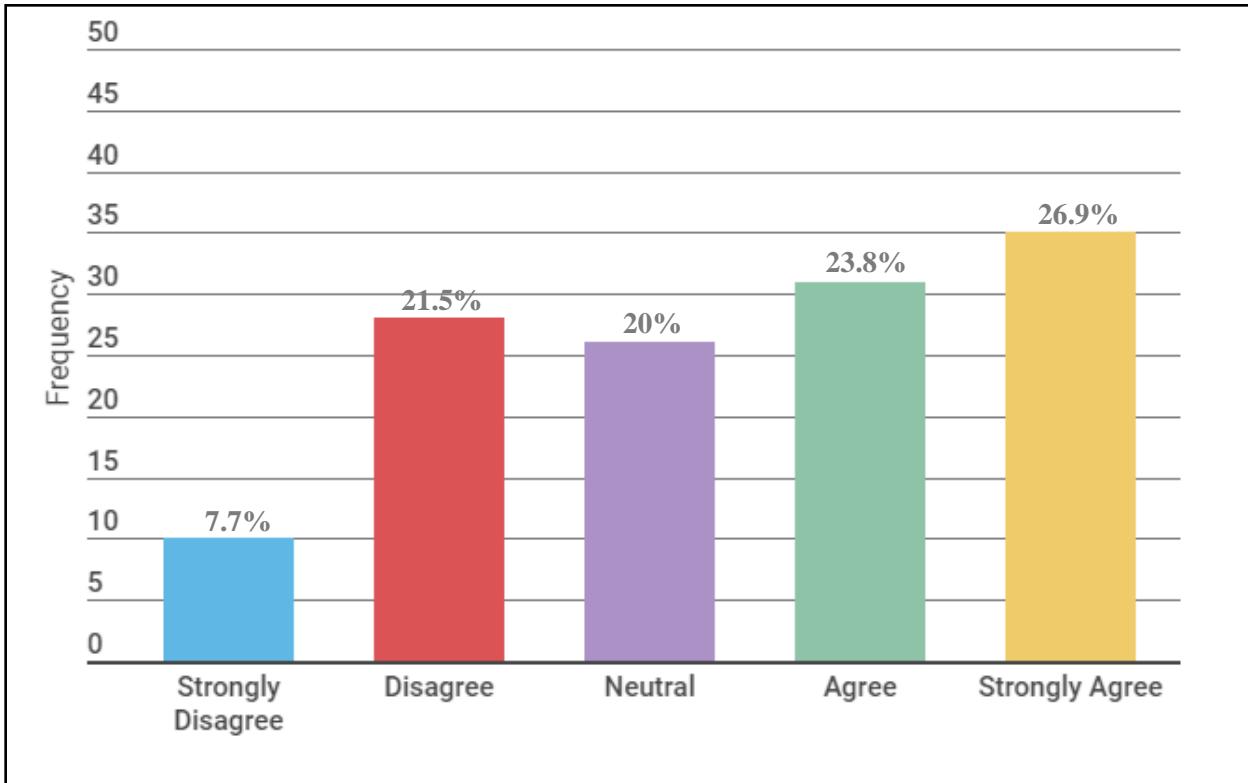


Figure 97: People Constructing Buildings Against Municipality Rules in Shele neighborhood. Source: (Via researcher, 2022).

Only 10 member (7.7% of the total) strongly disagrees with the statement, claiming that all inhabitants' buildings have an authorizing certificate from the municipality. While 28 people, or 21.5% of the total, disagree with the assertion. And 26 individuals (20%) are undecided about the statement, claiming that some people's structures exceed municipal limits. and 31 people (23.8%) believe that people can develop anything they want in their neighborhood. While the biggest percentage of 35 people strongly agree with the statement (26.9%).

1.2 Transportation

1.2.1 The Street Size Can Handle the Number of Cars in the Neighborhoods

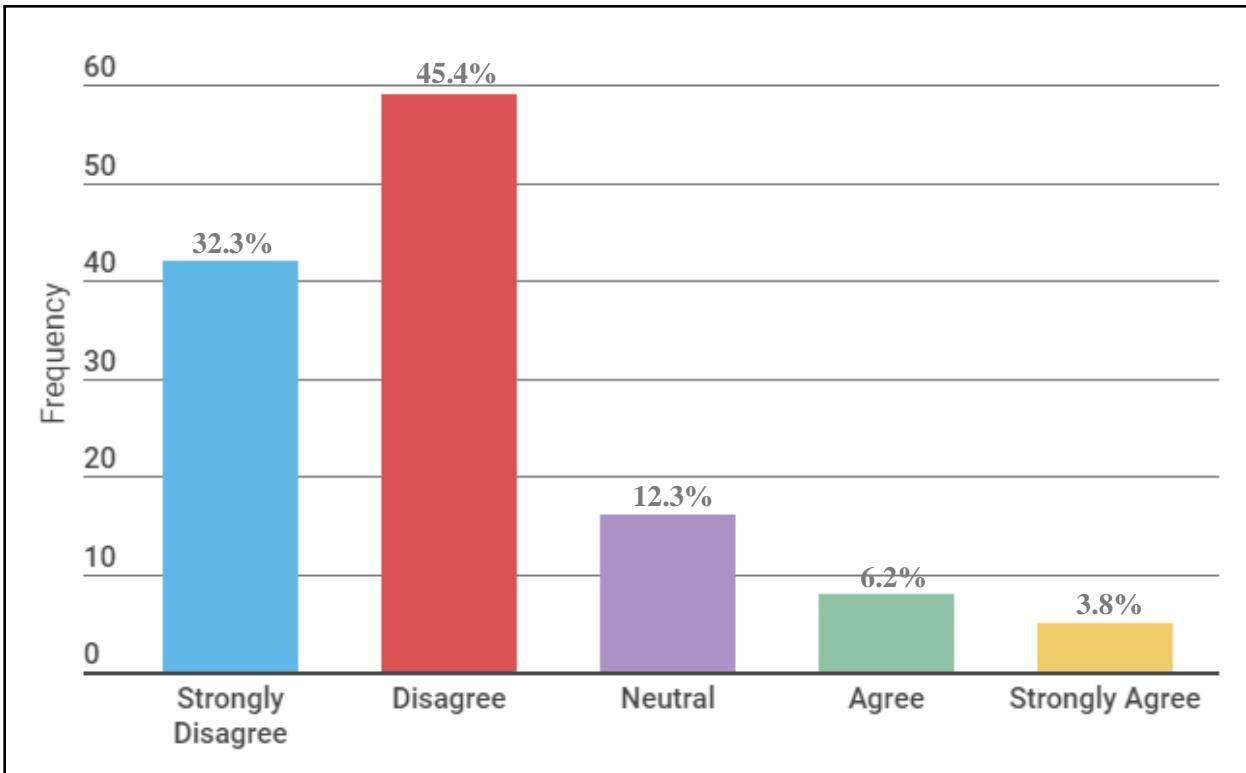


Figure 98: The Street Size Can Handle the Number of Cars in the Shele Neighborhood. Source: (Via researchers, 2022).

With 32.3 percent, 42 respondents out of 130 strongly disagreed with the statement and claimed that the street space is sufficient for the available cars and that parking on the street doesn't cause traffic within the area. In addition, 59 participants (45.4%) disagree with the statement. And 16 people (12.3%) are unconcerned about the statement. And of the 8 participants, 6.2% believe the street size is inadequate to manage the available autos. Finally, just 5 individuals (3.8%) strongly agree with the statement, claiming that the size of the street is not insufficient.

1.2.2 Enough Parking lots in Neighborhood

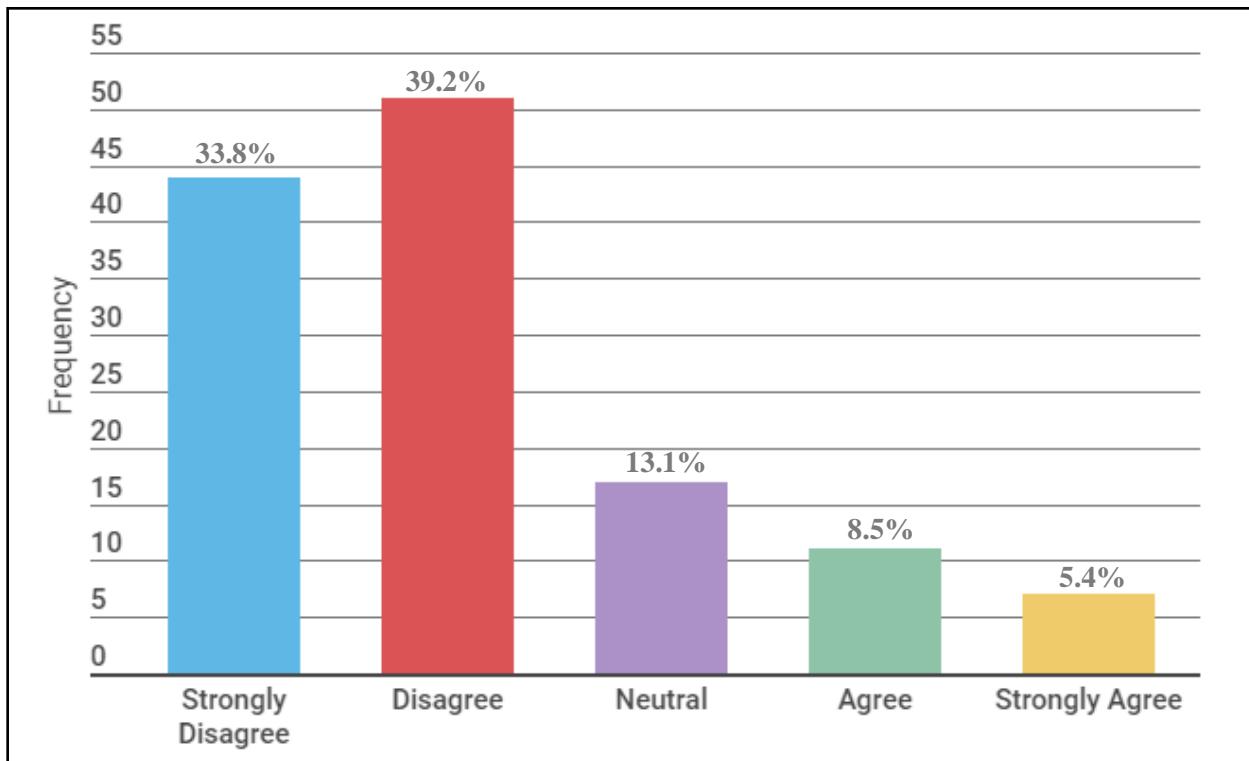


Figure 99: Enough Parking lots in Shele Neighborhood. Source: (Via researchers, 2022).

Out of 130 participants, 44 (33.8%) strongly disagree with the statement and claim that there aren't enough parking spaces, whereas 51 (39.2%) disagree with the statement and claim that there isn't enough parking. There are 17 participants that are neutral to the statement, out of a total of 13.1% percent. 11 persons, accounting for 8.5% of the total, agrees with the statement, while only 7 participants, accounting for 5.4% of the total, claim there are enough parking places for neighborhood residents. As can be seen from the numbers above, the majority of households face parking difficulties due to a lack of parking places.

1.2.3 Public Transportation does not Appear in Neighborhood

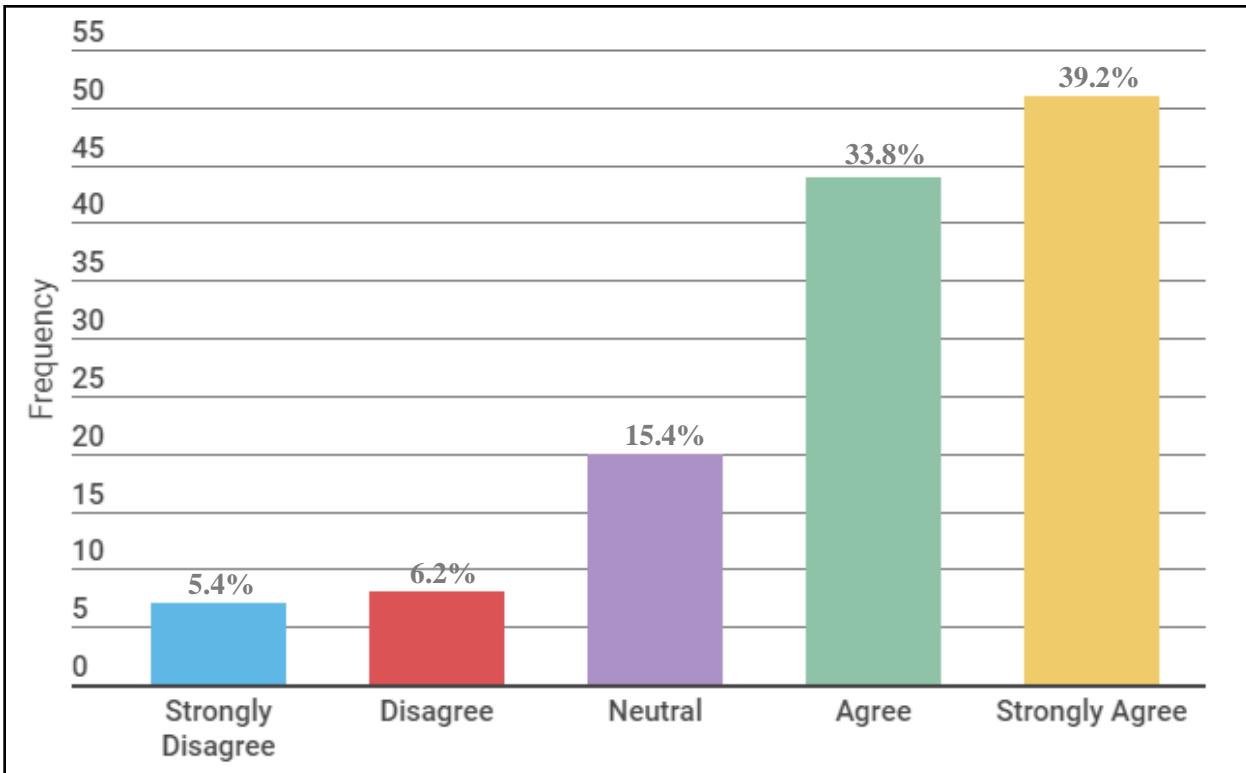


Figure 100: Public Transportation does not Appear in Shele Neighborhood. Source: (Via researchers, 2022).

Only 7 people (5.4%) out of 130 strongly disagree with the assertion, claiming that public transportation is readily available in the area. Other 8 people, accounting for 6.2% of the total, disagree with the assertion. The statement is impartial to the greatest number of participants (20), accounting for 15.4 percent of the total. And 44 people (33.8%) agree with the assertion, believing that public transit is infrequent in the area. Finally, 51 individuals (39.2%) think that public transportation does not present in the neighborhood at all. As a result, most individuals in the neighborhood have never seen or used public transportation, and they rely on alternative means of transportation to go around. As a result, most people claim that the residents of the neighborhood do not depend on public transportation for their movement. And the main transportation mode in the neighborhood is automobiles.

1.2.4 Walking and Cycling Around Neighborhood is Safe

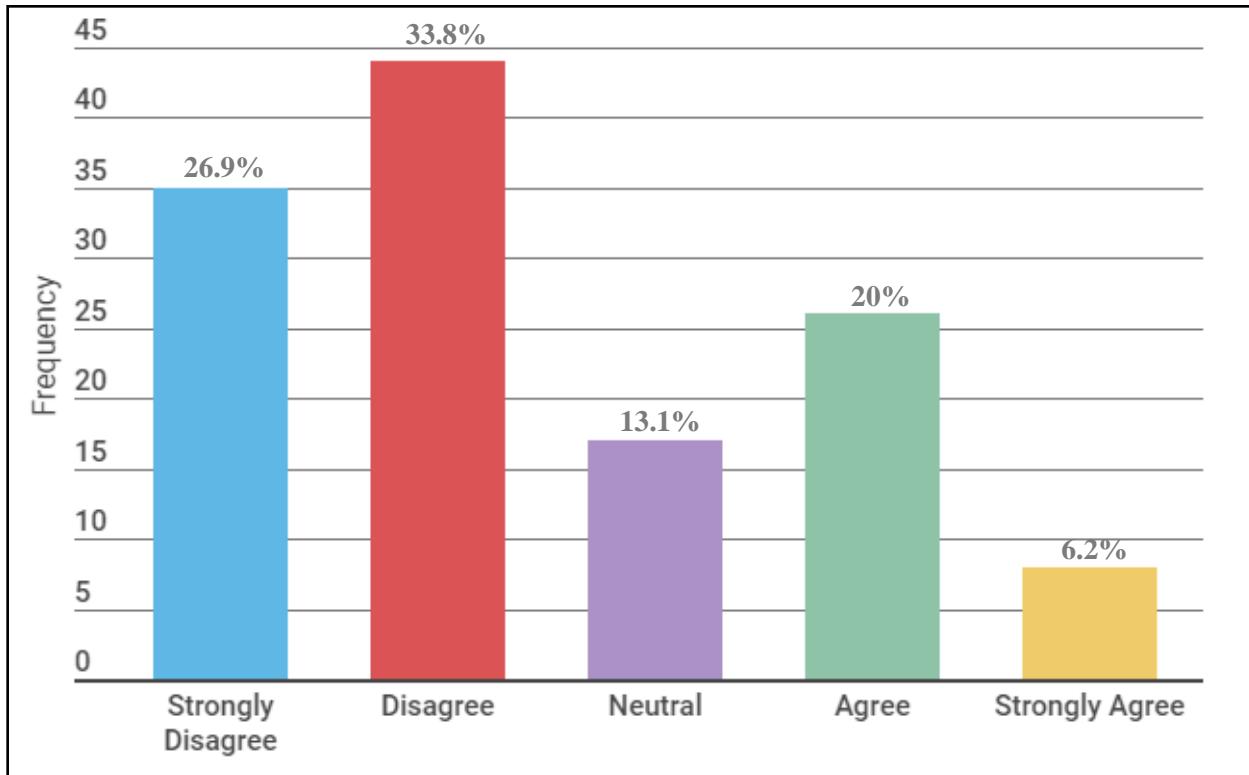


Figure 101: Walking and Cycling Around Shele Neighborhood is Safe. Source: (Via researchers, 2022).

35 of the 130 participants 26.9% strongly disagree with the assertion, claiming that the neighborhood is extremely risky for walking and cycling. The statement is also disagreed with by 44 individuals (33.8 percent). The statement is neutral with 13.1 percent and 17 participants stating that the neighborhood is comfortable or not comfortable for walking and cycling. 26 individuals 520% agreed with the statement. Finally, only 8 participants (with a score of 6.2%) firmly believes the neighborhood is pedestrian-friendly. Based on participants' responses the neighborhood is not pedestrian-friendly and transportation infrastructure only supports the car-oriented areas.

1.2.5 Crossing Main Street is Safe

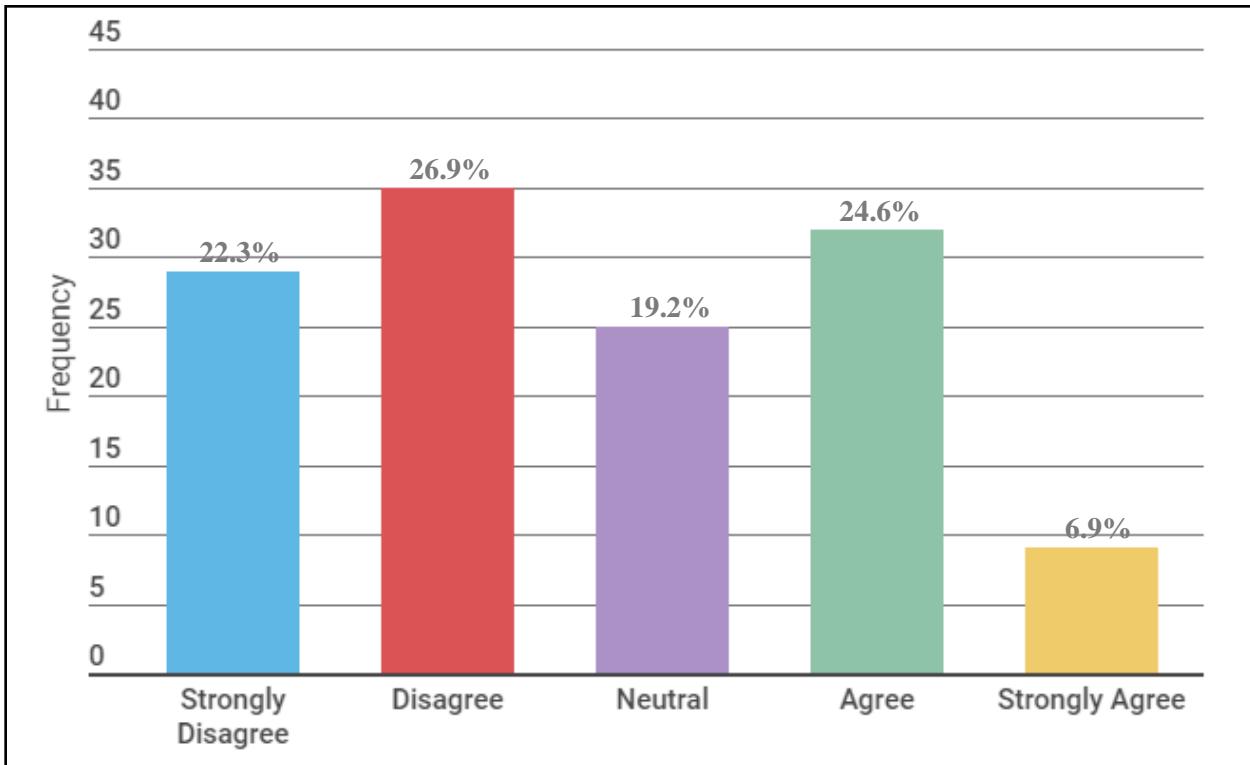


Figure 102: Crossing Main Street is Safe in Shele neighborhood. Source: (Via researchers, 2022).

Out of 130 participants, 29 (22.3%) strongly disagree with the statement, claiming that the neighborhood roads are exceedingly risky for all residents to pass through. The greatest percentage, 26.9 percent, is followed by 35 participants who disagree with the assertion. And 25 people 19.2% are undecided about the statement. Furthermore, 32 (24.6%) people agree with the statement and believe that driving on the highway is safe. Finally, only 9 members, who has the lowest percentage of 6.9%, strongly thinks that the neighborhood roadways are extremely safe for pedestrians to cross. As a result, it is apparent that the neighborhood is unsafe for children, the disabled, the old, and adults.

1.2.6 All the Roads are Connected Together Within the Neighborhood

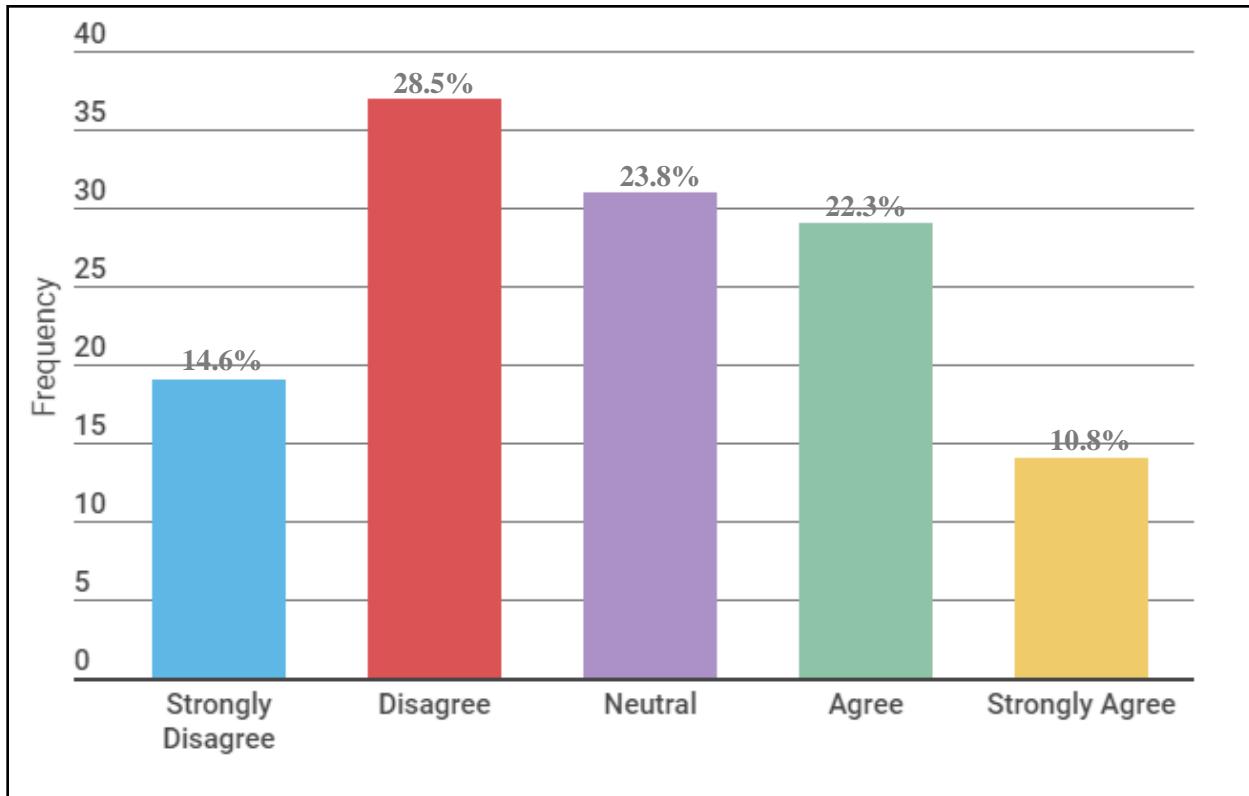


Figure 103: All the Roads are Connected Together Within the Shele Neighborhood. Source: (Via researchers, 2022).

19 respondents out of 130 strongly disagree with the statement, with a percentage of 14.6% claiming that not all roads are connected. And 37 people with a percentage (28.5%) disagree with the statement. And 31 people, or 23.8% of the total, are undecided about the statement. And the statement and claim roads are connected by the proportion of 22.3% percent and 29 participants, while 14 people with 10.8% percent strongly agree with the statement and claim roads are very well joined together and access to the major road is available everywhere. According to the responses of the participants, the road infrastructure is not well connected.

1.2.7 People have Access to Services Within the Neighborhood

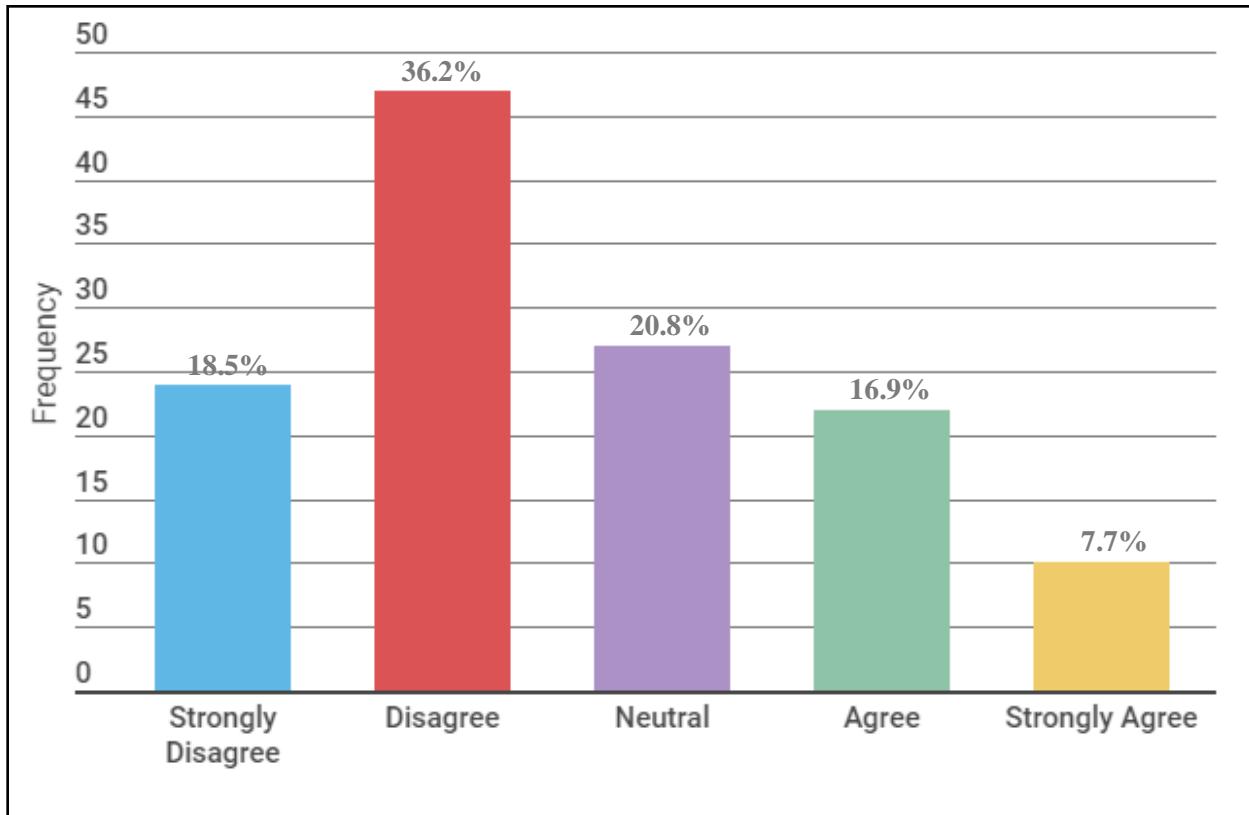


Figure 104: People have Access to Services Within the Shele Neighborhood. Source: (Via researchers, 2022).

With 24 of the 130 participants (18.5 percent) strongly disagree with the statement and believe that such services are not available to all citizens. And 47 (36.2%) people disagree with the statement and believe that such services are not available to all citizens. And 27 individuals (20.8%) are undecided about the statement. With the greatest participation rate of 22 participants, 16.9% percent agree with the statement and believe that citizens have access to such services. Finally, only 10 people with the lowest proportion of 7.7% strongly agree with the statement, claiming that the availability of services for residents is very sufficient. As a result of the participants' responses, services such as shops, police stations, and schools are located inside the neighborhood, and the majority of inhabitants have easy access to them.

1.3 Land Use

1.3.1 Each Block in Neighborhood has Multiple Land-Uses

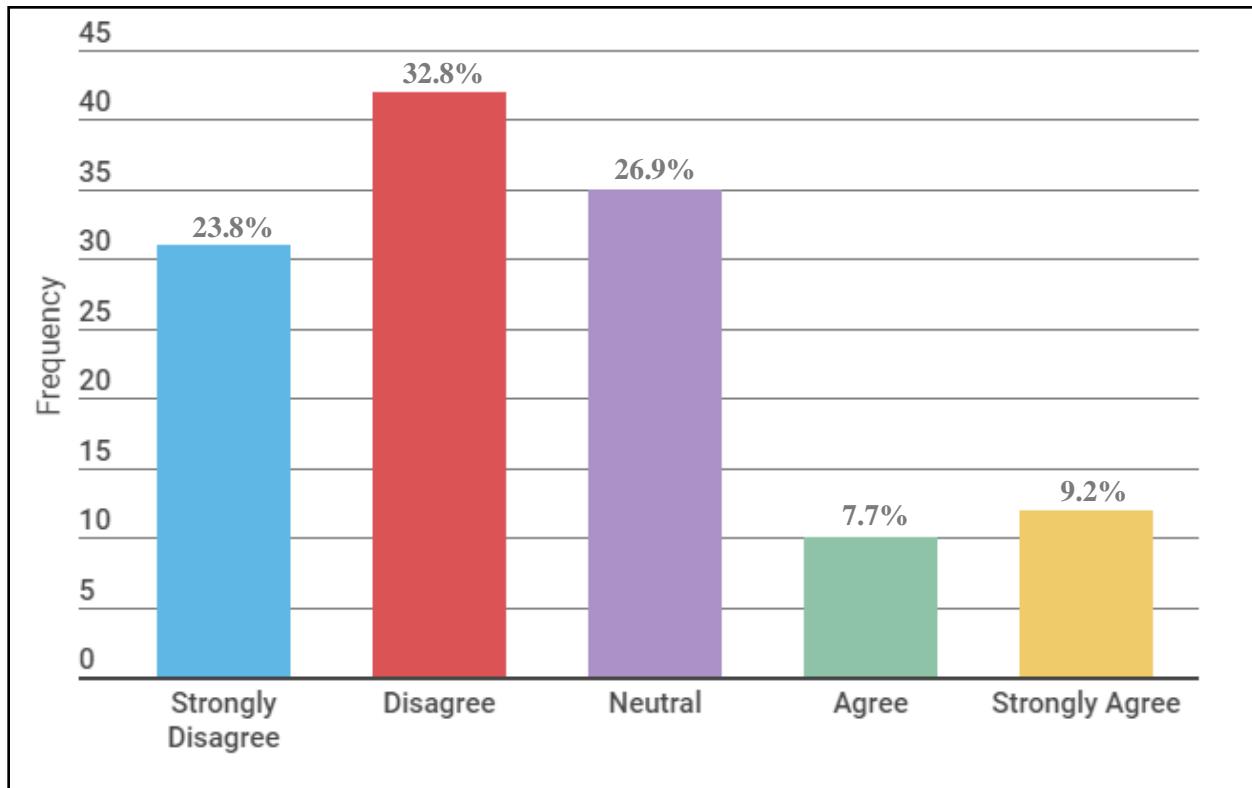


Figure 105: Each Block in Neighborhood has Multiple Land-Uses in Shele neighborhood. Source: (Via researchers, 2022).

With 31 of the 130 participants, with a total proportion of 23.8% percent, strongly disagree with the statement, claiming that the neighborhood's blocks are only suitable for one sort of land use. And with 42 participants 32.3% percent disagree with the statement. While the statement is neutral with a maximum percentage of 26.9 percent and 35 participants. While 10 of the participants (7.7%) agree with the statement. Finally, just 12 people (9.2%) strongly agree with the statement and claim that each block has several land uses.

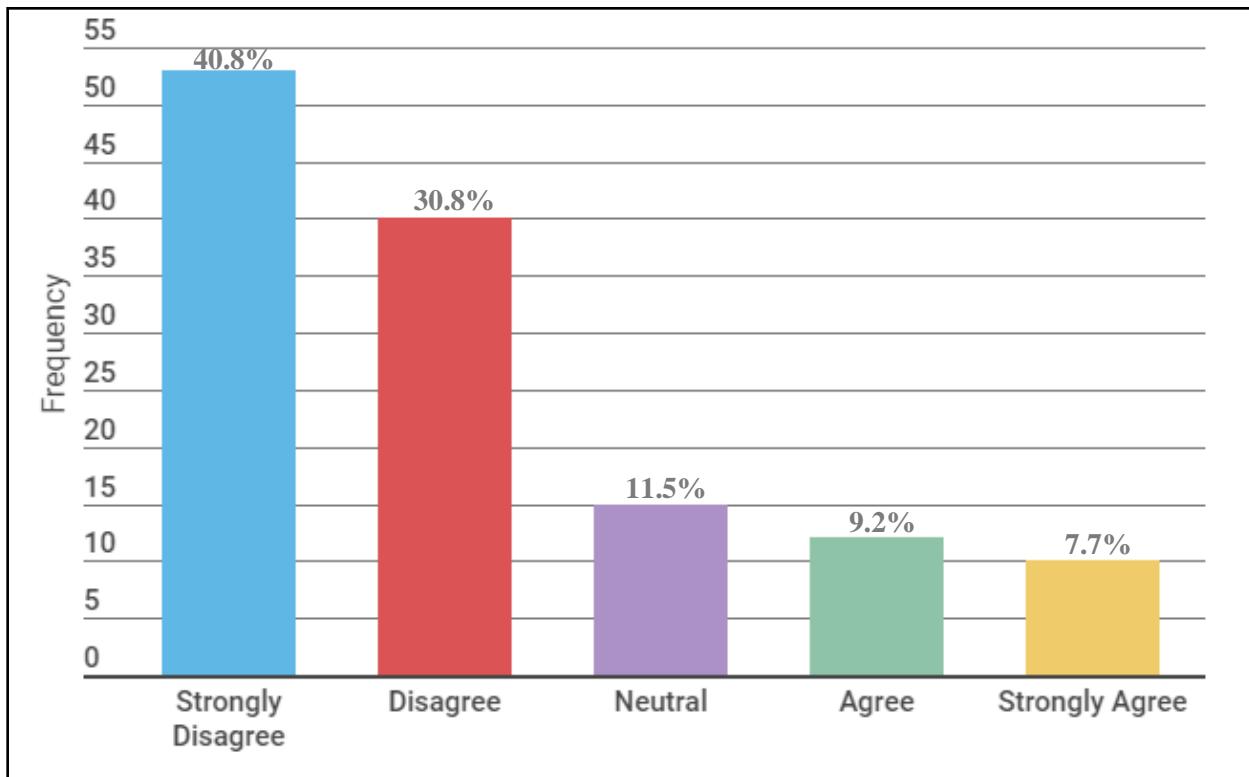
1.3.2 All the Houses are Built Properly with Good Aesthetic View

Figure 106: All the Houses are Built Properly with Good View in Shele neighborhood. Source: (Via researchers, 2022).

53 of the 130 participants, or 40.8%, strongly disagree with the statement, claiming that not all of the properties have a beautiful view. In addition, among 40 participants, 30.8% disagree with the statement. With 15 participants, the percentage of 11.5% is neutral to the statement. And 12 persons 9.2% agree with the statement. Finally, only 10 participants, who ranked the lowest at 2%, strongly agreed with the statement. As a result, most of the houses obscure other houses' views, and the houses have no aesthetic view of the neighborhood or city.



Summary

According with obtainable report, individuals in Shele neighborhood are strongly agreed that they are uncomfortable in this neighborhood, since the size of dwelling is not fit the number of people, and 46.9 are agree, and Shele really does have high density, and most people are not pursuing the municipality rules, because 53.1 percentage agreed that people in Shele neighborhood are constructed more floors than the number of permitted for them, which means there is no monitoring from municipality. In terms of transportation, because the Shele area is dense, the size of the street cannot hold a maximum number of cars, according to 45.4 percent of respondents. On the other hand, parking lots are insufficient, according to 33.8 percent of respondents. Furthermore, people were not in agreement about having public transportation, with the majority 39.2 strongly agreeing that people do not have access to public transportation, including safety in Shele neighborhood. As well, most people were not in agreement that there is safety in Shele neighborhood crossing in the main street for kids and disabled people, as there is no particular street for cycling and no pavements for walking. Citizens in the Shele area did not agree on accessibility to public places since there is a lack of connectivity in this neighborhood, with approximately 43.1 percent disagreeing on connectivity. Land use in Shele neighborhood is for one purpose only, with no alternative uses of land in the same block, and 56.6 agreed on this. Shele neighborhood 40.8 percent of individuals strongly disagreed about the outlook of the neighborhood because residents are not implementing municipality rules and lack of transportation, and there are no various uses of land. Therefore, according to the aforesaid numbers for the Shele neighborhood, there is a shortage of elements applied to the neighborhood.



Chapter Five: Conclusion & Recommendations

5.1 Conclusion

This research aims to demonstrate how planning restrictions influence the aspects of urban form. It is based on what is apparent in the visible constructed environment and is focused with attempting to make sense of the world around us.

After gathering standards from experts on urban form elements, data was collected in the chosen case studies (Ashty, Masike rojava, and Shele) neighborhoods through observations, land-use measurements, and distribution of questionnaires to people. It has been determined that the regulations in place do not equally value all of the aspects, resulting in a lack of restrictions and, in particular, disregard of the layout element. Furthermore, the available standards do not follow any long-term approaches.

According to urban form components, Shele, which began construction in the 1960s, is the most damaged of the three neighborhoods. Beginning with unregulated land uses and the lack of many necessary lands uses and community buildings. Without counting public gardens, the majority of the green space is allocated to agricultural activities. Following that is a deteriorating transportation system with many dead-ends and unpaved small roads that limit people' access to vital services, as well as many roadways with no safe pedestrian walkways. With a high population density and no land-use balance, and a high density of homes per hectare. As can be seen the Shelle neighborhood has issues that needed to be solved regarding all urban form elements that needs to be solved.

In the case of the Ashty area, which began growth in the 1980s, several components of urban form have deteriorated. Residents have access to the majority of required services and land usage. The transportation infrastructure in some parts of the neighborhood is inadequate, ranging from the lack of sidewalks to degraded sidewalks to the usage of roadways for private uses such as house iteration stairs. According to the standards, the population density in the neighborhood is medium, however land-uses are not evenly distributed. Residents' reactions and data obtained from



University of Duhok, College of Spatial Planning, Department of Spatial Planning the community show that the Ashty neighborhood has a number of difficulties with urban form features that need to be addressed.

Masike rojava is the third case study, which began developing in the 2000s. Despite the fact that it has evolved almost two decades after Ashty, it still has concerns with urban form aspects such as the lack of some important community buildings. In terms of transportation infrastructure, some of the roadways lack walkways, and individuals use the sidewalks that are available for personal reasons. In terms of density, the population is low in comparison to standards, and land-uses are not balanced in contrast to standards.

Finally, the issue of standard implementation has been problematic from the beginning of the city's growth until recently, highlighting the need of long-term regulations of urban form features. As well as effective administration to enforce the city's future growth standards.



5.2 Recommendations

5.2.1 Density Element

- Create a national population policy built around an optimal population size for all neighborhoods in Duhok city, and work to achieve it
- Set aside the remaining landscape from intensive development and dedicate it to biodiversity protection to stop the increasing population in Shele neighborhood.
- Duhok municipality should set growth management boundaries, discouraging sprawl development that is occurring in Shele neighborhood.

5.2.2 Land-Use Element

- Having a stable set of formal rules and policies for all directorates and other public and private businesses or offices that are linked to neighborhood planning and design.
- Enforce existing regulations and policies in the old neighborhoods, regarding the distribution of services and reconstruction of services.

5.2.3 Transportation Infrastructure Element

- For the sidewalks, stakeholders should force the owner of the markets to make space accessible for pedestrians.
- Most of the roads in neighborhoods are not as recommended, so it's the local government's responsibility to redesign them according to the standards.

5.2.4 Building Type/ Housing Element

- Modify federal codes and standards and design new codes again for Kurdistan region's geography.
- Land distribution should not just emphasize dwelling or community and social or transportation; it must be allocated in accordance with regulations that integrate numerous uses of land.
- Providing appropriate building codes to mitigate the sunlight issue caused by dwelling and construction.



5.2.5 Layout element

- In Duhok city, there are no regulations to be followed for layout elements. Therefore, the grid layout is the most appropriate type to follow in Duhok city since the grid layout type provides for an easy and orderly layout of the services in the city.
- Using grid layout to ensure that further infrastructure development is well organized.



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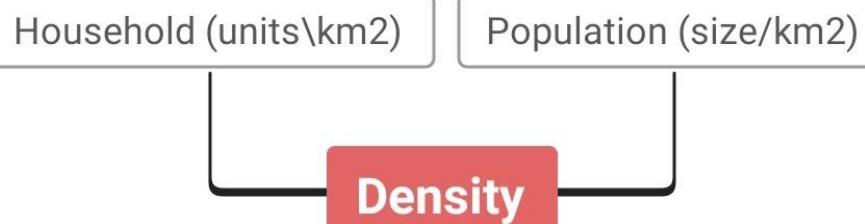
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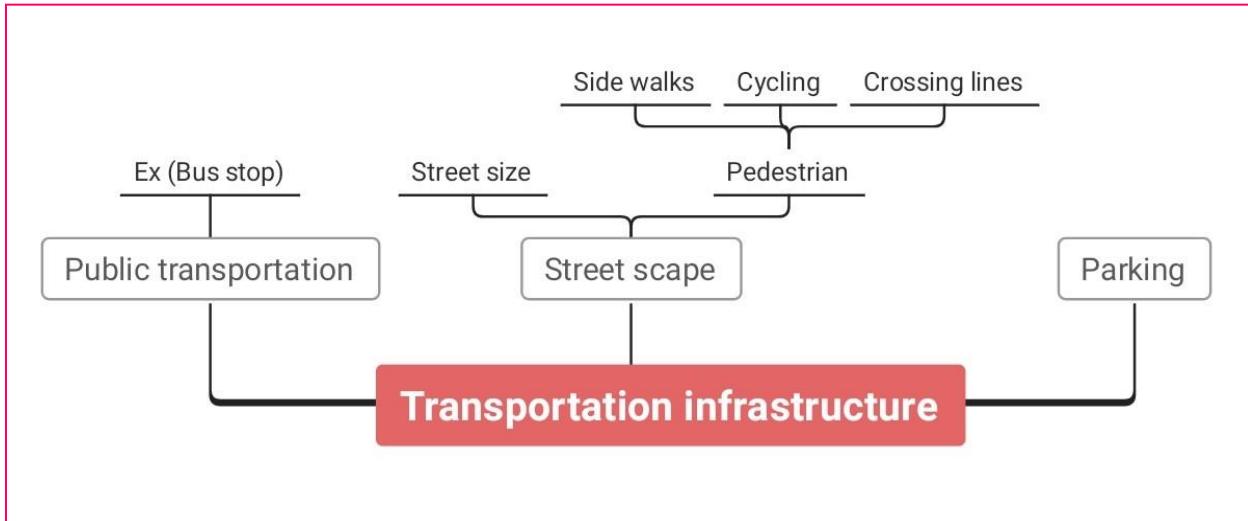
A. Interview Questions

Q1/ 1 To what extent are the Iraqi national housing standards contributed to shaping urban form?

A. Questions Regarding Density:



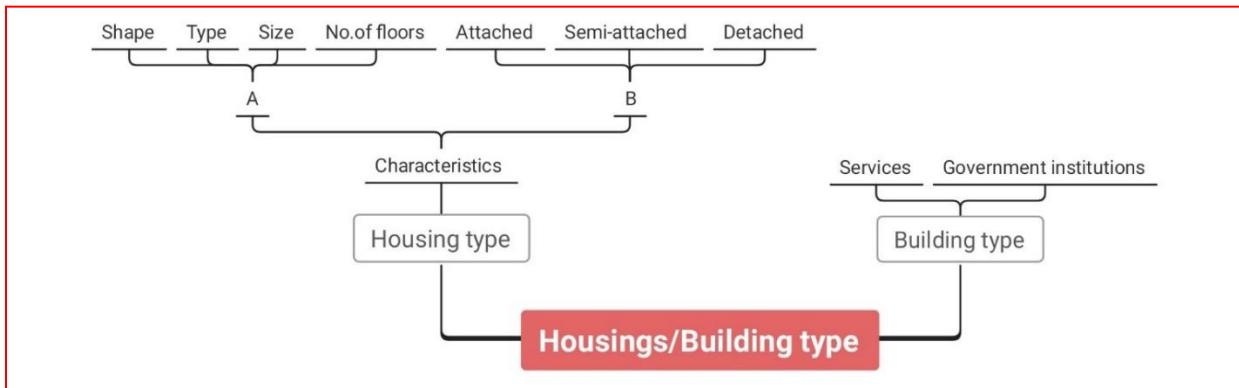
1. Has density element given its priority in the Iraqi standards?
2. What are the policies written regarding the density of the neighborhood?
3. What are the requirements of the density for urban neighborhoods?
4. Is the density element mentioned in polices on neighborhood, city, and region scale or a general concept?
5. What is the mechanism that is used to create standards and codes?

B. Questions Regarding Transportation Infrastructure:

1. Do policies regarding transportation infrastructure exist?
2. Do the policies involve public and private transport infrastructure or only prioritize one of them?
3. What are the standards regarding bus stops and their locations at the neighborhood level?
4. What are the policies for the streetscape at the neighborhood level, and are these standards only for car-oriented areas or include pedestrians?
5. If pedestrians' standards exist, how is the distribution of pedestrian lines between sidewalks and cycling lines?
6. For crossing lines, what should be the distance between each crossing line?
7. What parking lot standards exist, and do they differ between the commercial area in the neighborhood and residential areas?



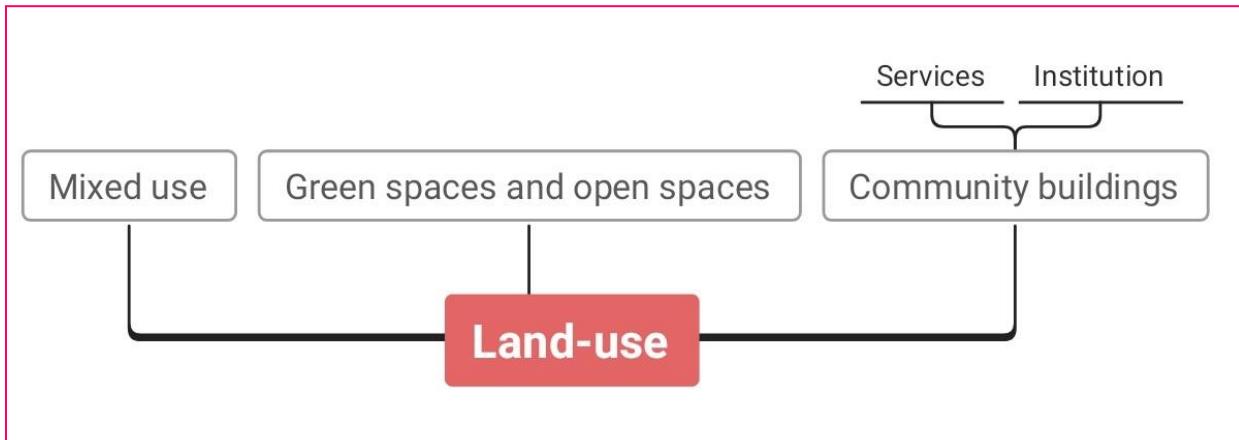
C. Questions Regarding Housing/Building Type:



1. Are there any standards for the housing and building type?
2. What are the policies regarding the housing type per street?
3. What are the required standards for the shape of houses in the neighborhood?
4. Based on the Iraqi standards, which sort of houses should people build in the neighborhood?
5. Are there any standards for the housing size? What is the proper size for the houses to build in the neighborhood?
6. What are the guidelines for the types of buildings permitted to build at the neighborhood level?



D. Questions Regarding Land-Uses:



1. What type of buildings are allowed in neighborhoods (this question can be used even for the above indicator)?
2. How many acres of land should be set aside for residential, commercial, street network, green & open spaces, and parking?
3. How should community buildings be placed according to standards?
4. Are factors such as religion, culture, population size considered for facilities such as schools and religious buildings?



Q2) What strategies and mechanisms are used to legalize and follow up regulations by planning institutions?

1. What is the regulatory process for putting urban form components into action?
2. Where did Kurdistan (Duhok city) obtain its standards from, and did they apply the same standards as Iraq?
3. Is there any rule for standards based on the city's topography, or has the city's topography influenced regulations?
4. What criteria are used to establish a standard?
5. Is it possible to modify standards if they are inconvenient for citizens or if citizens disagree with them?
6. What are the standards for each urban form element in Iraqi (Kurdistan)?

Q3) To what extent are the rules & standards of urban form elements enforced in the current case study?

- 1- How many green spaces were allocated in traditional (old) and newly developed neighborhoods?
- 2- Which types of community building were allocated in neighborhoods?
- 3- Does population density in each neighborhood match with the regulation regarding density?
- 4- Is there any plan to help resolve high-density issues in certain neighborhoods?
- 5- Has density policy affected the urban population?
- 6- Which types of housing types were applied in Shele, Ashty, Masike neighborhoods?
- 7- For secondary, local roads in a neighborhood which size was applied according to standards?
- 8- Which types of land use were allocated to build parking in neighborhoods?
- 9- Does the existing transport infrastructure support all modes of traveling (Vehicles, cycling, walking)?
- 10- Overall, in the old neighborhood, were the regulations considered while developing?
- 11- Has the adaption of policies become more serious with time?



B. Questioner Questions

Neighborhood satisfaction questionnaire

Dear resident, your opinion and ideas are important to us. Therefore, we would like to take approximately 10-15 minutes from your valued time to answer the following question which will benefit us in conducting research.

عزيزي المواطن، رأيك و افكارك مهمة بالنسبة لنا. لذلك، نود ان نأخذ تقريرا من 10 الى 15 دقيقة من وقتكم الثمين للإجابة على الأسئلة أدناه التي سوف تستفيد منها للاتمام البحث.

هاللاتي خوشتقى. بير و بونتن ته بومه دگرنگن ژیهر هندى نهم دى 10-15 خولەكان ژ دەمىن ته بى بىها بېقىن ژیو بېرسەدان ئەقان پرسىارىن لخوارى بو تەمام كرنا ۋە كولىنى.

Gender (الجنس) (رەگەز):

Male (ذكر، نمر)، Female (أنثى، مى)

Age (العمر) (تەمەن):

(18-25 , 26-45 , 46-65 , 66+)

Number of people in the house: (عدد الأفراد في المنزل) (ھۈمارا كەسلىن خىزانى) (2, 3, 4, 5, 6, or more)

Number of floors of your dwelling: (One floor, Two floors, Three floors, Or more) (طبق واحد، طابقين، ثلاثة طوابق، او اكثىر) (نېڭ قات، دۇ قات، سى قات، يان پىتر)

Education level: (مستوى التعليم) (ناسىئى خىنندى)

(Student, Graduated, Illiterate)

(أمي، خريج، طالب)

(قوتابىي، دەرجىي، نە خويىندواف)

Statement	Strongly Agree موافق بشدة گەلەك رازىمە	Agree موافق رازىمە	Neutral حيادي بى لەيمەن	Disagree غير موافق نە رازىمە	Strongly Disagree غير موافق پشدة گەلەك نە رازىمە
People are uncomfortable with their house in your neighborhood. الناس غير مرتاحين مع منازلهم في حييك. خەلەك ژرموشى خۇ نەدرازى نە ل تاخى تە.					
The size of your dwelling does not fit the number of people in your house. حجم السكن الخاص بك لا يتناسب مع عدد الأفراد في المنزل. قىبىارىي جەنى ژيانا وە نە بى گونجايە دگەل ھۈمارا كەسىن خىزانى.					



<p>People build more floors than the number allowed in your neighborhood.</p> <p>يبني السكان طوابق اكثراً مما هو مسموح به في حييك. ناکنچي پنر ژیارى پئى داي قاتان لىسلىخانىن خو تاھى دىكەن ل تاھى ھموه.</p>				
<p>People constructing buildings against municipality rules.</p> <p>يبني السكان المباني ضد قوانين البلدية. ناکنچى ناقاهىيەن دىرى ياسا يېن بازىر قانۇنى ناقادىكەن.</p>				
<p>Your street size can handle the number of cars in your neighborhoods.</p> <p>حجم الشارع قادر على استيعاب عدد السيارات في حييك. قىمىارى جادى تىنرا ھند ترومبىنلا ھېمە ئەقىن ل تاھى ھموه.</p>				
<p>There are enough parking lots in your neighborhood.</p> <p>يوجد عدد كافى من مواقف السيارات في حييك. جەھى راومىستاندا ترومبىنلا ھەتتا ئاستى پىندىقى ل تاھى ھموه ھەنە.</p>				
<p>Public transportation (Bus, Mini Bus) does not appear in your neighborhood.</p> <p>المواصلات العامة مثل (الحافلات، الحافلات الصغيرة) لا تظهر في حييك. قۇمۇڭىزى ئەستىن ئەستىن (پاس. پاسئەن بىچىك) ل تاھى ھموه نە دېرىجاقىن.</p>				
<p>Walking and cycling around neighborhood is safe.</p> <p>المشى و ركوب الدراجات حول الحي آمن. رەۋەمچىن و سىياربونا پىلسكلان ل تاھى ھموه ياخىرىتىيە.</p>				
<p>Crossing main street is safe for (Kids, disable, elderly, and adults).</p>				



عبور الشارع الرئيسي امن ل(الاطفال، المعوقين، الكبار في السن، و المراهقين). دربازبون ل جادا گشتى يا پاراستىه بو (زاروك، كەسەن ژناف سال قە جوی، سەنلان).				
All the roads are connected together within the neighborhood, and access to main road is available from every road. جميع الطرق متصلة مع بعض داخل الحي، و الوصول الى الشارع الرئيسي متاح من كل الطرق الاخرى. ھەمى رىنك پىنك قە دىرىنداينە ل تاخى ھەمە دا و خەلک دىشىن دەھىمى رىنكا دا بىجىنە جادا گشتى.				
People have access to services such as (shops, police station, schools, etc.) all within the neighborhood. لدى السكان امكانية الوصول الى الخدمات مثل(المحلات، قسم الامن، المدارس، الخ). ناكچىيان شىانلىن گەھىشتى خزمەتگۈز ارىيان ھەمە ب شۇمەكى پاراستى بو (قوتابخانى، دكان، جەھى پوليسا...هەت).				
Each block in neighborhood has multiple land-uses. كل قطعة ارض في الحي لها استخدامات متعددة للارض. ھەر بلوکەكى بكارىنانىن جودا يېن نەمردى ھەنە.				
All the houses are built properly with good aesthetic view. كل المنازل مبنية بشكل صحيح مع منظر جمالي جيد. ھەمى خانى بىشۇمەكى درست ھاتىنە ئاقاڭرن ب شۇوازەكى جوان.				



C. SPSS Data

1. Ashty Neighborhood

1.1 Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	29	56.9	56.9	56.9
	Female	22	43.1	43.1	100.0
	Total	51	100.0	100.0	

Statistics		
Gender		
N	Valid	51
	Missing	0
Mean		1.4314
Median		1.0000
Mode		1.00
Std. Deviation		.50020

1.2 Age

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	22	43.1	43.1	43.1
	26-45	16	31.4	31.4	74.5
	46-65	12	23.5	23.5	98.0
	66+	1	2.0	2.0	100.0
	Total	51	100.0	100.0	

Statistics		
Age		
N	Valid	51
	Missing	0
Mean		1.8431
Median		2.0000
Mode		1.00
Std. Deviation		.85726

1.3 Number of People in the house

Number of people in the house					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Three people	2	3.9	3.9	3.9
	Four people	5	9.8	9.8	13.7
	Five people	14	27.5	27.5	41.2
	Six people	10	19.6	19.6	60.8
	More	20	39.2	39.2	100.0
	Total	51	100.0	100.0	

Statistics		
Number of people in the house		
N	Valid	51
	Missing	0
Mean		4.8039
Median		5.0000
Mode		6.00
Std. Deviation		1.18355



1.4 Number of floors of the dwelling

Number of floors of the dweling					Statistics
	Frequency	Percent	Valid Percent	Cumulative Percent	Number of floors of the dweling
Valid					N
	One floor	25	49.0	49.0	51
	Two floors	22	43.1	43.1	Missing
	Three floors	3	5.9	5.9	Mean
	More	1	2.0	2.0	Median
	Total	51	100.0	100.0	Mode

1.5 Education Level

Education Level					Statistics
	Frequency	Percent	Valid Percent	Cumulative Percent	Education Level
Valid					N
	Student	21	41.2	41.2	51
	Graduated	19	37.3	37.3	Missing
	Illiterate	11	21.6	21.6	Mean
	Total	51	100.0	100.0	Median

Statement

1.1 Budling Type & Housing

The Uncomfortable of People in their Houses

Q1					Statistics
	Frequency	Percent	Valid Percent	Cumulative Percent	Q1
Valid					N
	Strongly Disagree	1	2.0	2.0	51
	Disagree	13	25.5	25.5	Missing
	Neutral	19	37.3	37.3	Mean
	Agree	13	25.5	25.5	Median
	Strongly Agree	5	9.8	9.8	Mode
	Total	51	100.0	100.0	Std. Deviation



The Size of Dwelling does not Fit the Number of People in House

Q2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	2.0	2.0	2.0
	Disagree	15	29.4	29.4	31.4
	Neutral	10	19.6	19.6	51.0
	Agree	15	29.4	29.4	80.4
	Strongly Agree	10	19.6	19.6	100.0
	Total	51	100.0	100.0	

Statistics

Q2		
N	Valid	51
	Missing	0
Mean		3.35294
Median		3.00000
Mode		2.000 ^a
Std. Deviation		1.163160

People Building more Floors than Number Allowed in the Neighborhood

Q3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	12	23.5	23.5	23.5
	Neutral	12	23.5	23.5	47.1
	Agree	19	37.3	37.3	84.3
	Strongly Agree	8	15.7	15.7	100.0
	Total	51	100.0	100.0	

Statistics

Q3		
N	Valid	51
	Missing	0
Mean		3.45098
Median		4.00000
Mode		4.000
Std. Deviation		1.025938

People Constructing Buildings Against Municipality Rules

Q4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	2.0	2.0	2.0
	Disagree	7	13.7	13.7	15.7
	Neutral	16	31.4	31.4	47.1
	Agree	19	37.3	37.3	84.3
	Strongly Agree	8	15.7	15.7	100.0
	Total	51	100.0	100.0	

Statistics

Q4		
N	Valid	51
	Missing	0
Mean		3.50980
Median		4.00000
Mode		4.000
Std. Deviation		.987371



1.2 Transportation

The Street Size Can Handle the Number of Cars in the Neighborhoods

Q5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	13.7	13.7	13.7
	Disagree	21	41.2	41.2	54.9
	Neutral	12	23.5	23.5	78.4
	Agree	9	17.6	17.6	96.1
	Strongly Agree	2	3.9	3.9	100.0
	Total	51	100.0	100.0	

Statistics

Q5

N	Valid	51
	Missing	0
Mean		2.56863
Median		2.00000
Mode		2.000
Std. Deviation		1.063107

Enough parking lots in Neighborhood

Q6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	13	25.5	25.5	25.5
	Disagree	22	43.1	43.1	68.6
	Neutral	14	27.5	27.5	96.1
	Agree	1	2.0	2.0	98.0
	Strongly Agree	1	2.0	2.0	100.0
	Total	51	100.0	100.0	

Statistics

Q6

N	Valid	51
	Missing	0
Mean		2.11765
Median		2.00000
Mode		2.000
Std. Deviation		.886500

Public Transportation does not Appear in Neighborhood

Q7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.8	9.8	9.8
	Disagree	5	9.8	9.8	19.6
	Neutral	16	31.4	31.4	51.0
	Agree	14	27.5	27.5	78.4
	Strongly Agree	11	21.6	21.6	100.0
	Total	51	100.0	100.0	

Statistics

Q7

N	Valid	51
	Missing	0
Mean		3.41176
Median		3.00000
Mode		3.000
Std. Deviation		1.219450



Statistics

Q8					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	5	9.8	9.8	9.8
	Disagree	16	31.4	31.4	41.2
	Neutral	26	51.0	51.0	92.2
	Agree	3	5.9	5.9	98.0
	Strongly Agree	1	2.0	2.0	100.0
	Total	51	100.0	100.0	

Q8

N	Valid	51
	Missing	0
Mean		2.58824
Median		3.00000
Mode		3.000
Std. Deviation		.828890

Crossing Main Street is Safe

Q9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	14	27.5	27.5	27.5
	Disagree	22	43.1	43.1	70.6
	Neutral	7	13.7	13.7	84.3
	Agree	7	13.7	13.7	98.0
	Strongly Agree	1	2.0	2.0	100.0
	Total	51	100.0	100.0	

Statistics

N	Valid	51
	Missing	0
Mean		2.19608
Median		2.00000
Mode		2.000
Std. Deviation		1.058671

All the Roads are Connected Together Within the Neighborhood

Q10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	7.8	7.8	7.8
	Neutral	15	29.4	29.4	37.3
	Agree	20	39.2	39.2	76.5
	Strongly Agree	12	23.5	23.5	100.0
	Total	51	100.0	100.0	

Q10

N	Valid	51
	Missing	0
Mean		3.78431
Median		4.00000
Mode		4.000
Std. Deviation		.901415



People have Access to Services Within the Neighborhood

Statistics

Q11					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Disagree	8	15.7	15.7	15.7
	Neutral	14	27.5	27.5	43.1
	Agree	25	49.0	49.0	92.2
	Strongly Agree	4	7.8	7.8	100.0
	Total	51	100.0	100.0	

Q11

N	Valid	51
	Missing	0
Mean		3.49020
Median		4.00000
Mode		4.000
Std. Deviation		.857264

1.3 Land Use

Each Block in Neighborhood has Multiple Land-Uses

Statistics

Q12					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Disagree	2	3.9	3.9	3.9
	Neutral	24	47.1	47.1	51.0
	Agree	21	41.2	41.2	92.2
	Strongly Agree	4	7.8	7.8	100.0
	Total	51	100.0	100.0	

Q12

N	Valid	51
	Missing	0
Mean		3.52941
Median		3.00000
Mode		3.000
Std. Deviation		.702935

All the Houses are Built Properly with Good Aesthetic View

A13

A13					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Strongly Disagree	10	19.6	19.6	19.6
	Disagree	16	31.4	31.4	51.0
	Neutral	17	33.3	33.3	84.3
	Agree	7	13.7	13.7	98.0
	Strongly Agree	1	2.0	2.0	100.0
	Total	51	100.0	100.0	

Statistics

A13	N	Valid	51
		Missing	0
Mean		2.47059	
Median		2.00000	
Mode		3.000	
Std. Deviation		1.026702	



2. Masike

1.1Gender

Gender					Statistics
	Frequency	Percent	Valid Percent	Cumulative Percent	Gender
Valid	Male	5	55.6	55.6	55.6
	Female	4	44.4	44.4	100.0
	Total	9	100.0	100.0	

1.2Age

Age					Statistics
	Frequency	Percent	Valid Percent	Cumulative Percent	Age
Valid	18-25	3	33.3	33.3	33.3
	26-45	4	44.4	44.4	77.8
	46-65	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

1.3Number of people in the house

Number of people in the house					Statistics
	Frequency	Percent	Valid Percent	Cumulative Percent	Number of people in the house
Valid	Three people	1	11.1	11.1	11.1
	Four people	1	11.1	11.1	22.2
	Five people	2	22.2	22.2	44.4
	Six people	2	22.2	22.2	66.7
	More	3	33.3	33.3	100.0
	Total	9	100.0	100.0	



1.4 Number of floors of the dwelling

Number of floors of the dwelling					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	One floor	2	22.2	22.2	22.2
	Two floors	5	55.6	55.6	77.8
	Three floors	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

Number of floors of the dweling		
N	Valid	9
	Missing	0
	Mean	2.0000
	Median	2.0000
	Mode	2.00
	Std. Deviation	.70711

1.5 Education level

Education Level					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Student	3	33.3	33.3	33.3
	Graduated	4	44.4	44.4	77.8
	Illiterate	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

Education Level		
N	Valid	9
	Missing	0
	Mean	1.8889
	Median	2.0000
	Mode	2.00
	Std. Deviation	.78174

Statement

1.1 Building Type & Housing

The Uncomfortable of People in their Houses

Q1					
	Frequency	Percent	Valid Percent	Cumulative Percent	
Valid	Strongly Disagree	2	22.2	22.2	22.2
	Disagree	3	33.3	33.3	55.6
	Neutral	2	22.2	22.2	77.8
	Agree	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

Statistics		
Q1	N	Valid
	Missing	0
	Mean	2.444444
	Median	2.000000
	Mode	2.0000
	Std. Deviation	1.1303883



The Size of Dwelling does not Fit the Number of People in House

Q2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	22.2	22.2	22.2
	Disagree	5	55.6	55.6	77.8
	Agree	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

Statistics

Q2

N	Valid	9
	Missing	0
Mean	2.222222	
Median	2.000000	
Mode	2.0000	
Std. Deviation	1.0929064	

People Building more Floors than Number Allowed in the Neighborhood

Q3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	6	66.7	66.7	66.7
	Neutral	2	22.2	22.2	88.9
	Agree	1	11.1	11.1	100.0
	Total	9	100.0	100.0	

Statistics

Q3

N	Valid	9
	Missing	0
Mean	2.444444	
Median	2.000000	
Mode	2.0000	
Std. Deviation	.7264832	

People Constructing Buildings Against Municipality Rules

Q4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	5	55.6	55.6	55.6
	Neutral	1	11.1	11.1	66.7
	Agree	3	33.3	33.3	100.0
	Total	9	100.0	100.0	

Statistics

Q4

N	Valid	9
	Missing	0
Mean	2.777778	
Median	2.000000	
Mode	2.0000	
Std. Deviation	.9718253	



1.2 Transportation

The Street Size Can Handle the Number of Cars in the Neighborhoods

Q5

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	11.1	11.1	11.1
	Neutral	1	11.1	11.1	22.2
	Agree	4	44.4	44.4	66.7
	Strongly Agree	3	33.3	33.3	100.0
	Total	9	100.0	100.0	

Statistics

Q5

N	Valid	9
	Missing	0
Mean	4.000000	
Median	4.000000	
Mode	4.0000	
Std. Deviation	1.0000000	

Enough parking lots in Neighborhood

Q6

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	33.3	33.3	33.3
	Neutral	2	22.2	22.2	55.6
	Agree	2	22.2	22.2	77.8
	Strongly Agree	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

Statistics

Q6

N	Valid	9
	Missing	0
Mean	3.333333	
Median	3.000000	
Mode	2.0000	
Std. Deviation	1.2247449	

Public Transportation does not Appear in Neighborhood

Q7

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	33.3	33.3	33.3
	Neutral	1	11.1	11.1	44.4
	Agree	3	33.3	33.3	77.8
	Strongly Agree	2	22.2	22.2	100.0
	Total	9	100.0	100.0	

Statistics

Q7

N	Valid	9
	Missing	0
Mean	3.444444	
Median	4.000000	
Mode	2.0000 ^a	
Std. Deviation	1.2360331	



Q8				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	22.2	22.2
	Neutral	3	33.3	55.6
	Agree	3	33.3	88.9
	Strongly Agree	1	11.1	100.0
	Total	9	100.0	100.0

Statistics		
Q8		
N	Valid	9
	Missing	0
Mean		3.333333
Median		3.000000
Mode		3.0000 ^a
Std. Deviation		1.0000000

Crossing Main Street is Safe

Q9				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	22.2	22.2
	Neutral	1	11.1	33.3
	Agree	4	44.4	77.8
	Strongly Agree	2	22.2	100.0
	Total	9	100.0	100.0

Statistics		
Q9		
N	Valid	9
	Missing	0
Mean		3.666667
Median		4.000000
Mode		4.0000
Std. Deviation		1.1180340

All the Roads are Connected Together Within the Neighborhood

Q10				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	2	22.2	22.2
	Agree	5	55.6	55.6
	Strongly Agree	2	22.2	22.2
	Total	9	100.0	100.0

Statistics		
Q10		
N	Valid	9
	Missing	0
Mean		4.000000
Median		4.000000
Mode		4.0000
Std. Deviation		.7071068

People have Access to Services Within the Neighborhood

Q11				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	11.1	11.1
	Neutral	1	11.1	22.2
	Agree	5	55.6	77.8
	Strongly Agree	2	22.2	100.0
	Total	9	100.0	100.0

Statistics		
Q11		
N	Valid	9
	Missing	0
Mean		3.888889
Median		4.000000
Mode		4.0000
Std. Deviation		.9279607



1.3 Land Use

Each Block in Neighborhood has Multiple Land-Uses

Q12					Statistics		
	Valid	Frequency	Percent	Valid Percent	Cumulative Percent	N	Valid
		Disagree	22.2	22.2	22.2		9
	Neutral	1	11.1	11.1	33.3		Missing
	Agree	4	44.4	44.4	77.8		Mean
	Strongly Agree	2	22.2	22.2	100.0		Median
	Total	9	100.0	100.0			Mode
							Std. Deviation

All the Houses are Built Properly with Good Aesthetic View

Q13					Statistics		
	Valid	Frequency	Percent	Valid Percent	Cumulative Percent	N	Valid
		Disagree	11.1	11.1	11.1		9
	Neutral	2	22.2	22.2	33.3		Missing
	Agree	2	22.2	22.2	55.6		Mean
	Strongly Agree	4	44.4	44.4	100.0		Median
	Total	9	100.0	100.0			Mode
							Std. Deviation



3. Shele

1.1Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	64	49.2	49.2	49.2
	Female	66	50.8	50.8	100.0
	Total	130	100.0	100.0	

Statistics		
Gender		
N	Valid	130
	Missing	0
Mean		1.5077
Median		2.0000
Mode		2.00
Std. Deviation		.50187

1.2Age

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	30	23.1	23.1	23.1
	26-45	52	40.0	40.0	63.1
	46-65	39	30.0	30.0	93.1
	66+	9	6.9	6.9	100.0
	Total	130	100.0	100.0	

Statistics		
Age		
N	Valid	130
	Missing	0
Mean		2.2077
Median		2.0000
Mode		2.00
Std. Deviation		.87777

1.3Number of people in the house

Number of people in the house					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Two people	2	1.5	1.5	1.5
	Three people	11	8.5	8.5	10.0
	Four people	14	10.8	10.8	20.8
	Five people	20	15.4	15.4	36.2
	Six people	28	21.5	21.5	57.7
	More	55	42.3	42.3	100.0
	Total	130	100.0	100.0	

Statistics		
Number of people in the house		
N	Valid	130
	Missing	0
Mean		4.7385
Median		5.0000
Mode		6.00
Std. Deviation		1.40074



1.4 Number of floors of the dwelling

Number of floors of the dweling

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	One floor	37	28.5	28.5
	Two floors	59	45.4	73.8
	Three floors	26	20.0	93.8
	More	8	6.2	100.0
	Total	130	100.0	100.0

Statistics

Number of floors of the dweling		
N	Valid	130
	Missing	0
	Mean	2.0385
	Median	2.0000
	Mode	2.00
	Std. Deviation	.85729

1.5 Education level

Education Level

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	43	33.1	33.1
	Graduated	57	43.8	76.9
	Illiterate	30	23.1	100.0
	Total	130	100.0	100.0

Statistics

Education Level		
N	Valid	130
	Missing	0
	Mean	1.9000
	Median	2.0000
	Mode	2.00
	Std. Deviation	.74553

Statement

1.1 Budling Type & Housing

The Uncomfortable of People in their Houses

Statistics

Q1				
	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	8	6.2	6.2
	Disagree	13	10.0	10.0
	Neutral	19	14.6	14.6
	Agree	41	31.5	31.5
	Strongly Agree	49	37.7	37.7
	Total	130	100.0	100.0

Q1

N	Valid	130
	Missing	0
	Mean	3.846154
	Median	4.000000
	Mode	5.0000
	Std. Deviation	1.2101735



Q2					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	16	12.3	12.3	12.3
	Disagree	25	19.2	19.2	31.5
	Neutral	28	21.5	21.5	53.1
	Agree	39	30.0	30.0	83.1
	Strongly Agree	22	16.9	16.9	100.0
	Total	130	100.0	100.0	

Statistics		
Q2		
N	Valid	130
	Missing	0
Mean	3.200000	
Median	3.000000	
Mode	4.0000	
Std. Deviation	1.2783225	

People Building more Floors than Number Allowed in the Neighborhood

Q3					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	7	5.4	5.4	5.4
	Disagree	30	23.1	23.1	28.5
	Neutral	24	18.5	18.5	46.9
	Agree	37	28.5	28.5	75.4
	Strongly Agree	32	24.6	24.6	100.0
	Total	130	100.0	100.0	

Statistics		
Q3		
N	Valid	130
	Missing	0
Mean	3.438462	
Median	4.000000	
Mode	4.0000	
Std. Deviation	1.2389283	

People Constructing Buildings Against Municipality Rules

Q4					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	10	7.7	7.7	7.7
	Disagree	28	21.5	21.5	29.2
	Neutral	26	20.0	20.0	49.2
	Agree	31	23.8	23.8	73.1
	Strongly Agree	35	26.9	26.9	100.0
	Total	130	100.0	100.0	

Statistics		
Q4		
N	Valid	130
	Missing	0
Mean	3.407692	
Median	4.000000	
Mode	5.0000	
Std. Deviation	1.2981570	



1.2 Transportation

The Street Size Can Handle the Number of Cars in the Neighborhoods

Q5						Statistics		
	Frequency	Percent	Valid Percent	Cumulative Percent	Q5			
					N	Valid	130	
Valid	Strongly Disagree	42	32.3	32.3	32.3			
	Disagree	59	45.4	45.4	77.7			
	Neutral	16	12.3	12.3	90.0			
	Agree	8	6.2	6.2	96.2			
	Strongly Agree	5	3.8	3.8	100.0			
	Total	130	100.0	100.0				

Enough parking lots in Neighborhood

Q6						Statistics		
	Frequency	Percent	Valid Percent	Cumulative Percent	Q6			
					N	Valid	130	
Valid	Strongly Disagree	44	33.8	33.8	33.8			
	Disagree	51	39.2	39.2	73.1			
	Neutral	17	13.1	13.1	86.2			
	Agree	11	8.5	8.5	94.6			
	Strongly Agree	7	5.4	5.4	100.0			
	Total	130	100.0	100.0				

Public Transportation does not Appear in Neighborhood

Q7						Statistics		
	Frequency	Percent	Valid Percent	Cumulative Percent	Q7			
					N	Valid	130	
Valid	Strongly Disagree	7	5.4	5.4	5.4			
	Disagree	8	6.2	6.2	11.5			
	Neutral	20	15.4	15.4	26.9			
	Agree	44	33.8	33.8	60.8			
	Strongly Agree	51	39.2	39.2	100.0			
	Total	130	100.0	100.0				



University of Duhok, College of Spatial Planning, Department of Spatial Planning
Walking and Cycling Around Neighborhood is Safe

Statistics

Q8

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	35	26.9	26.9	26.9
	Disagree	44	33.8	33.8	60.8
	Neutral	17	13.1	13.1	73.8
	Agree	26	20.0	20.0	93.8
	Strongly Agree	8	6.2	6.2	100.0
	Total	130	100.0	100.0	

Q8

N	Valid	130
	Missing	0
Mean		2.446154
Median		2.000000
Mode		2.0000
Std. Deviation		1.2517370

Crossing Main Street is Safe

Statistics

Q9

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	22.3	22.3	22.3
	Disagree	35	26.9	26.9	49.2
	Neutral	25	19.2	19.2	68.5
	Agree	32	24.6	24.6	93.1
	Strongly Agree	9	6.9	6.9	100.0
	Total	130	100.0	100.0	

Q9

N	Valid	130
	Missing	0
Mean		2.669231
Median		3.000000
Mode		2.0000
Std. Deviation		1.2599278

All the Roads are Connected Together Within the Neighborhood

Statistics

Q10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	19	14.6	14.6	14.6
	Disagree	37	28.5	28.5	43.1
	Neutral	31	23.8	23.8	66.9
	Agree	29	22.3	22.3	89.2
	Strongly Agree	14	10.8	10.8	100.0
	Total	130	100.0	100.0	

Q10

N	Valid	130
	Missing	0
Mean		2.861538
Median		3.000000
Mode		2.0000
Std. Deviation		1.2310822

People have Access to Services Within the Neighborhood

Statistics

Q11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	24	18.5	18.5	18.5
	Disagree	47	36.2	36.2	54.6
	Neutral	27	20.8	20.8	75.4
	Agree	22	16.9	16.9	92.3
	Strongly Agree	10	7.7	7.7	100.0
	Total	130	100.0	100.0	

Q11

N	Valid	130
	Missing	0
Mean		2.592308
Median		2.000000
Mode		2.0000
Std. Deviation		1.1923279



1.3 Land Use

Each Block in Neighborhood has Multiple Land-Uses

Statistics

Q12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	31	23.8	23.8	23.8
	Disagree	42	32.3	32.3	56.2
	Neutral	35	26.9	26.9	83.1
	Agree	10	7.7	7.7	90.8
	Strongly Agree	12	9.2	9.2	100.0
	Total	130	100.0	100.0	

Q12

N	Valid	130
	Missing	0
Mean		2.461538
Median		2.000000
Mode		2.0000
Std. Deviation		1.2017677

All the Houses are Built Properly with Good Aesthetic View

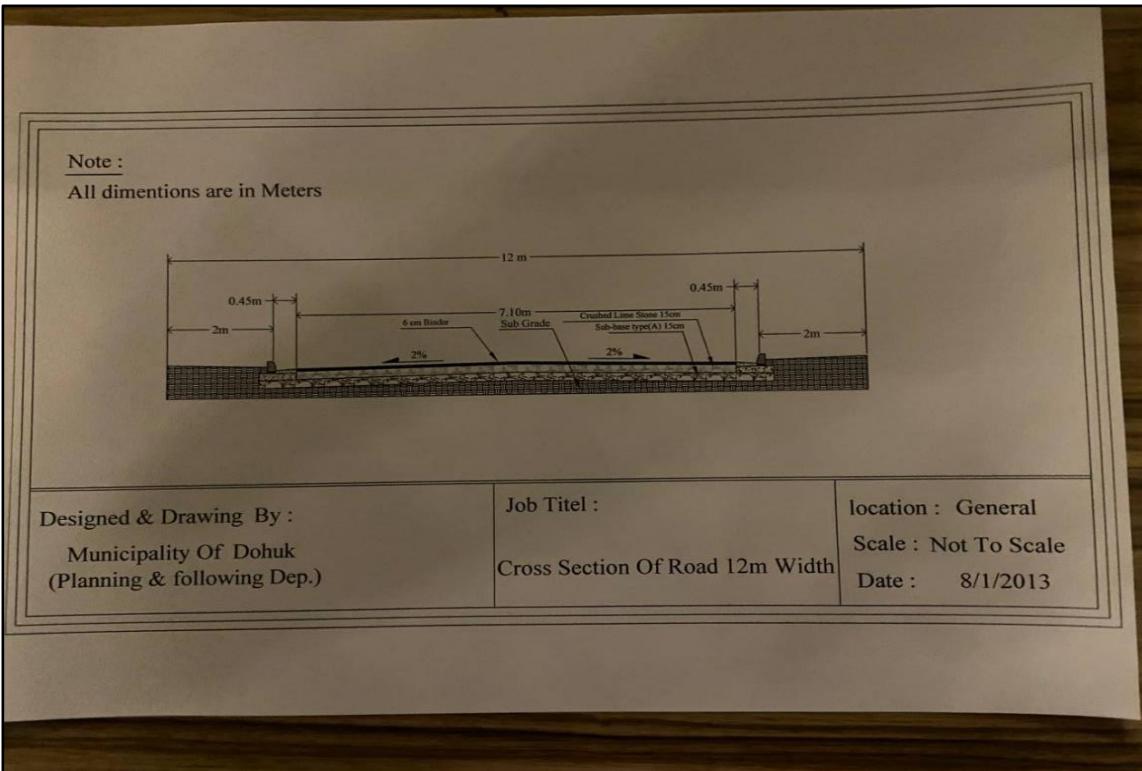
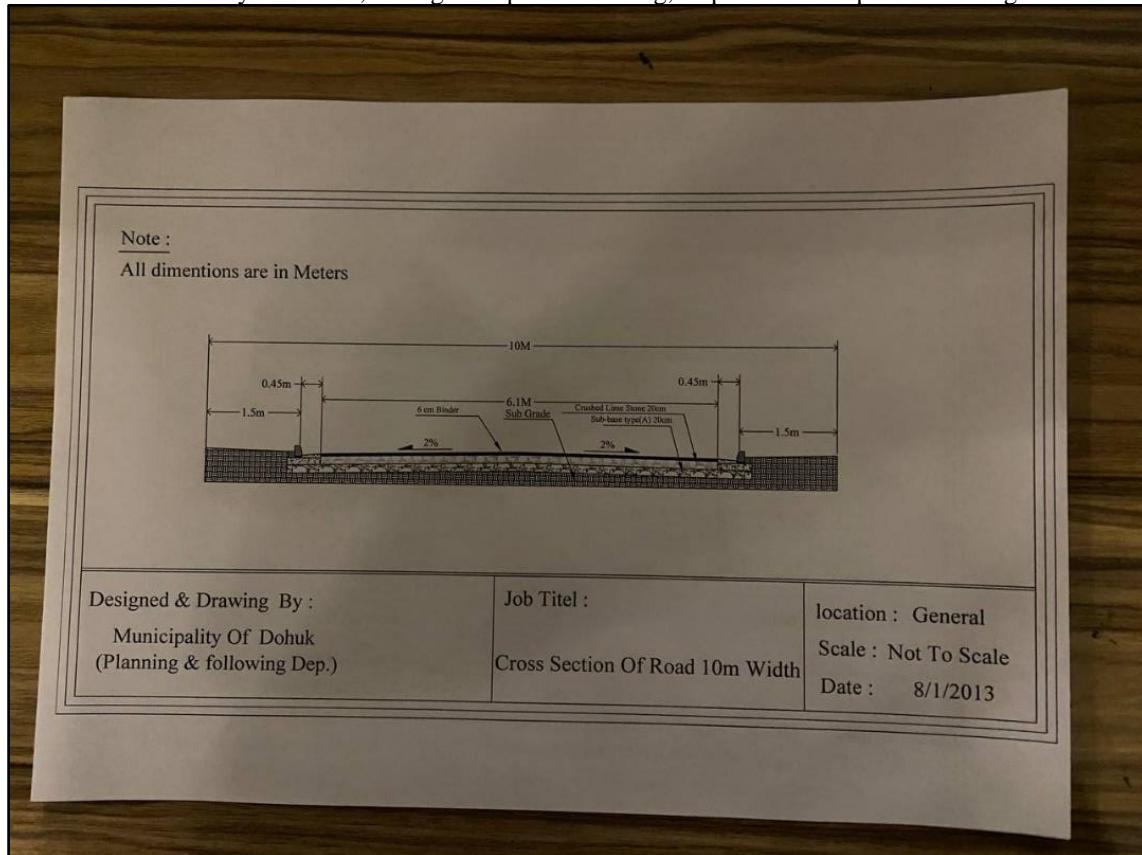
Statistics

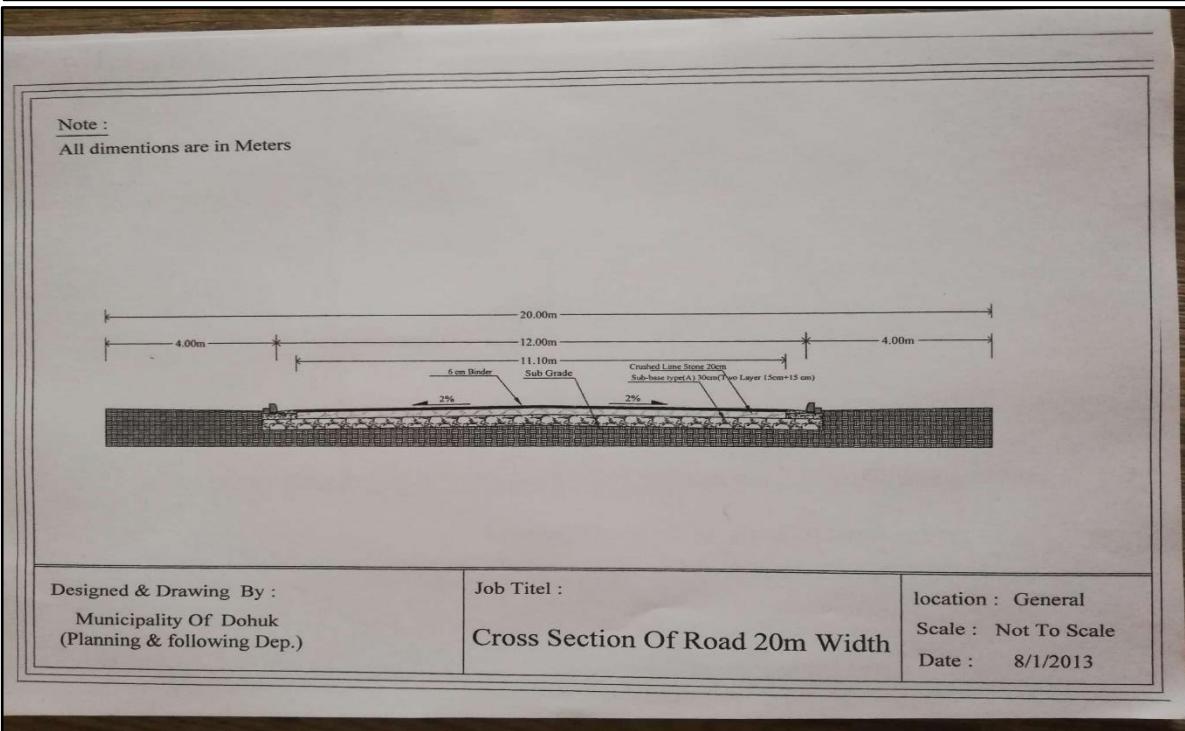
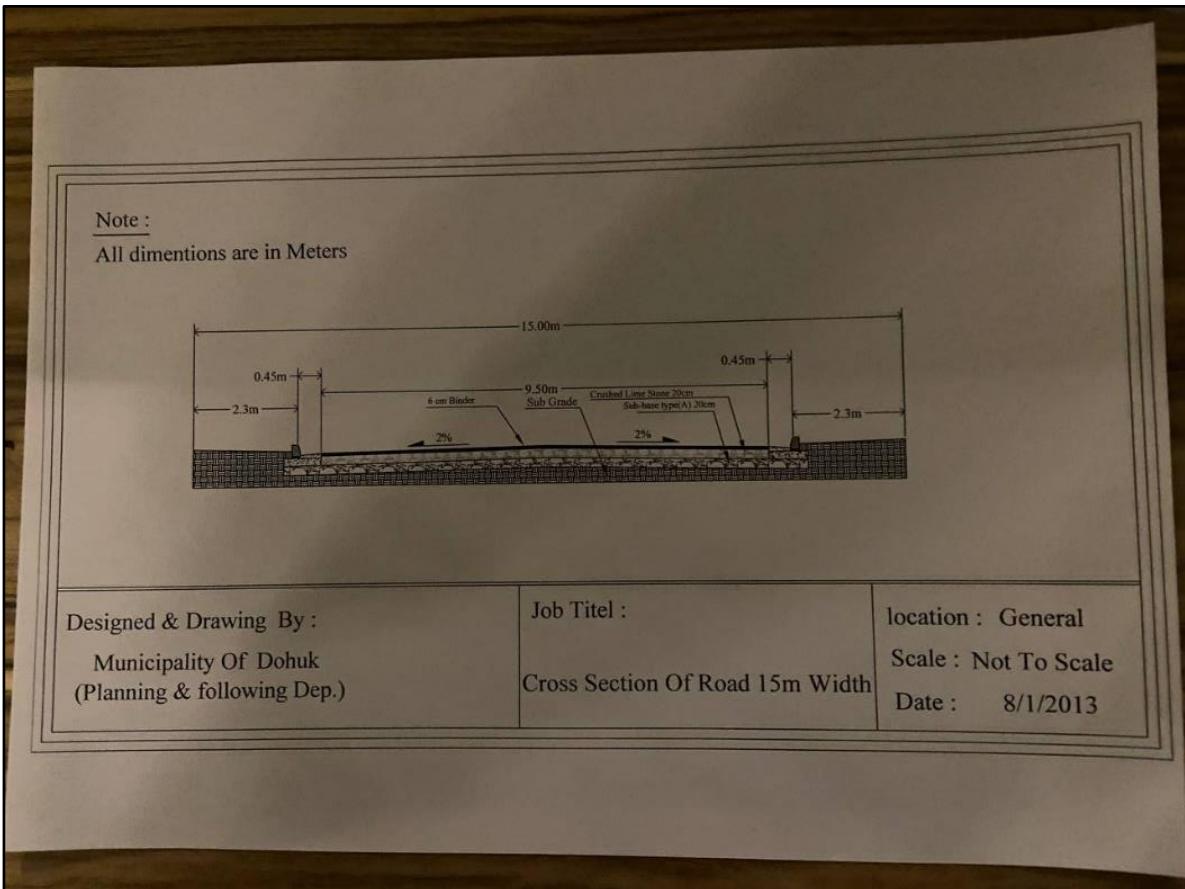
Q13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	53	40.8	40.8	40.8
	Disagree	40	30.8	30.8	71.5
	Neutral	15	11.5	11.5	83.1
	Agree	12	9.2	9.2	92.3
	Strongly Agree	10	7.7	7.7	100.0
	Total	130	100.0	100.0	

Q13

N	Valid	130
	Missing	0
Mean		2.123077
Median		2.000000
Mode		1.0000
Std. Deviation		1.2576303





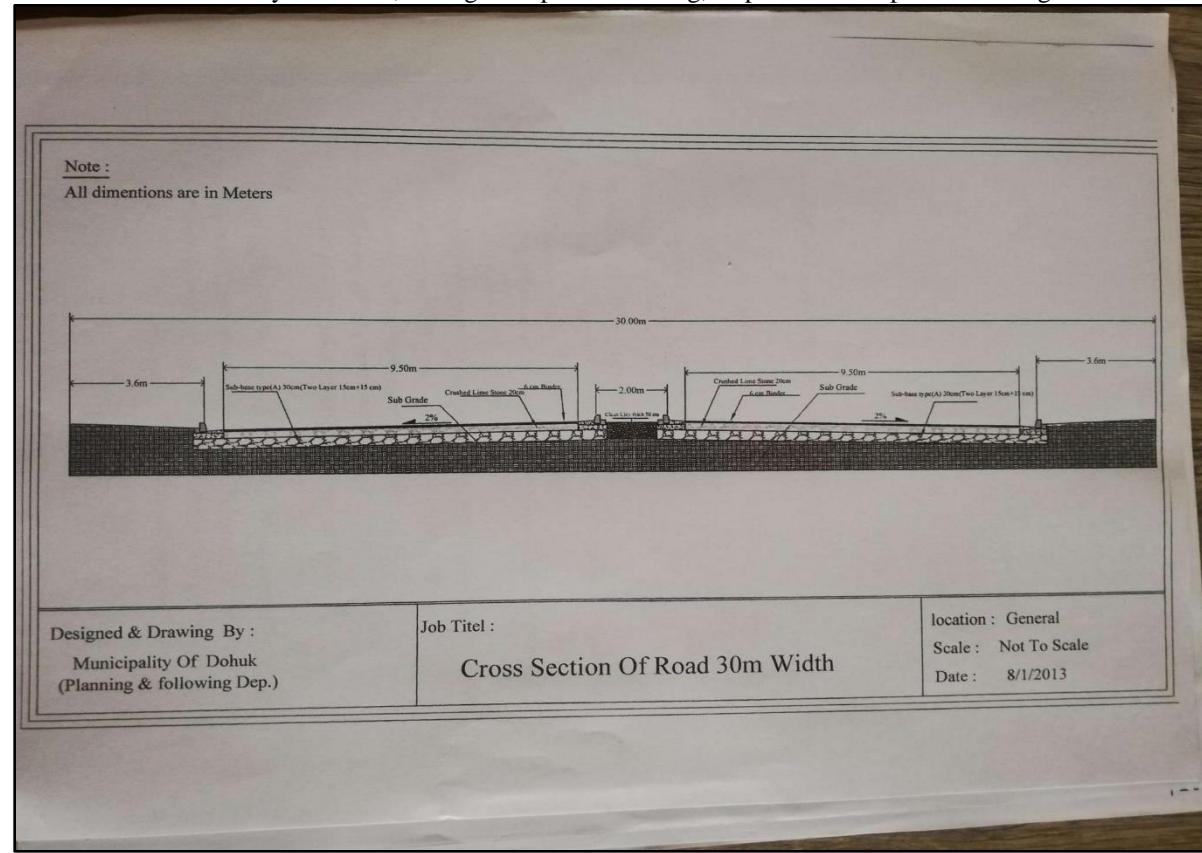


Iraqi Planning Standards for Community Services

Mahalla	Type of facility	Average area (m2)	Neighborhood	Type of facility	Average area (m2)	Sector	Type of facility	Average area (m2)
Nursery		2000	Intermediate school		7500	Youth center		15000
Kindergarten		3500	Secondary school		70000	Public library		1000
Primary school		5000	Health center		1500	Pub. office		4500
Children playground		1500	Social center		2500	Culture center		5000
Market		200	Post office		400	Swimming pool		3500
Public garden		5000	Mosque		1000	Market		5000
			Public garden		16000	Public transport		3600
			Playground		25000	Trip		
						Fire station		2000
						Police center		2000
						Fuel station		5000
						Mosque		2500
						Sports ground		55000
						Social club		1000
						Other facilities		1000

Distribution of Housing Types

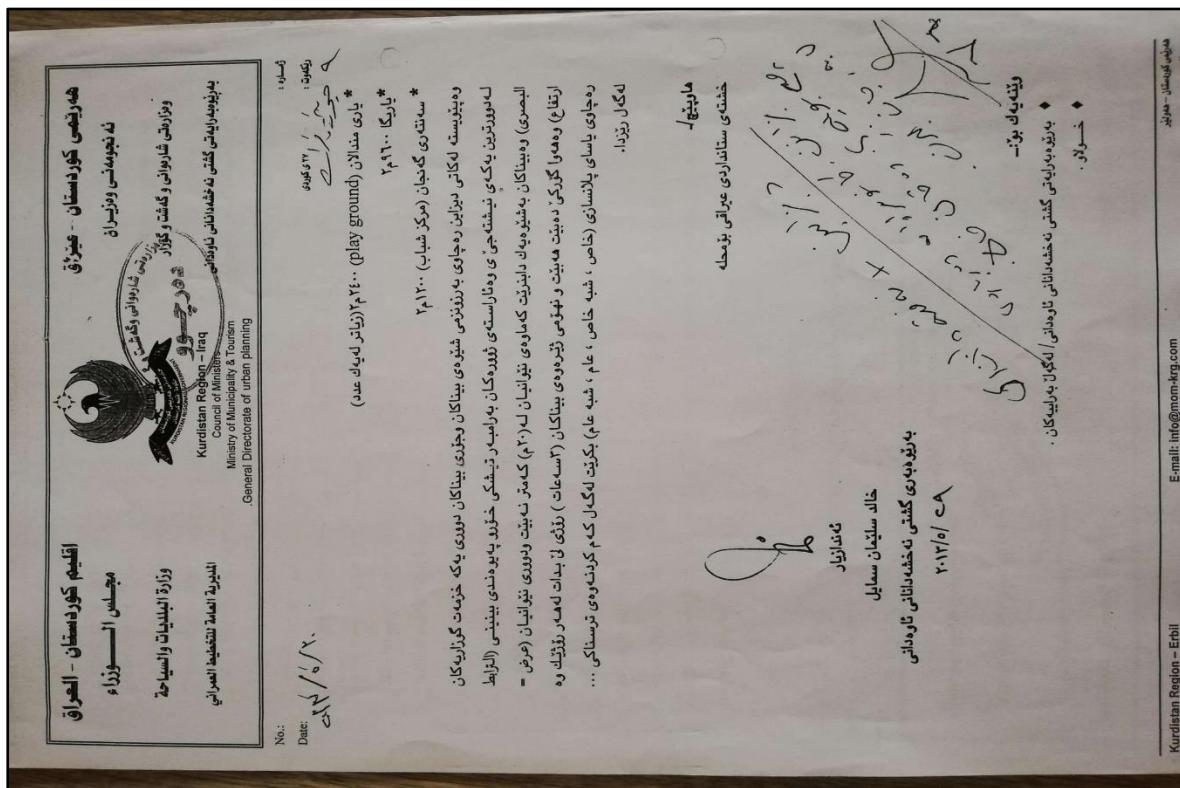
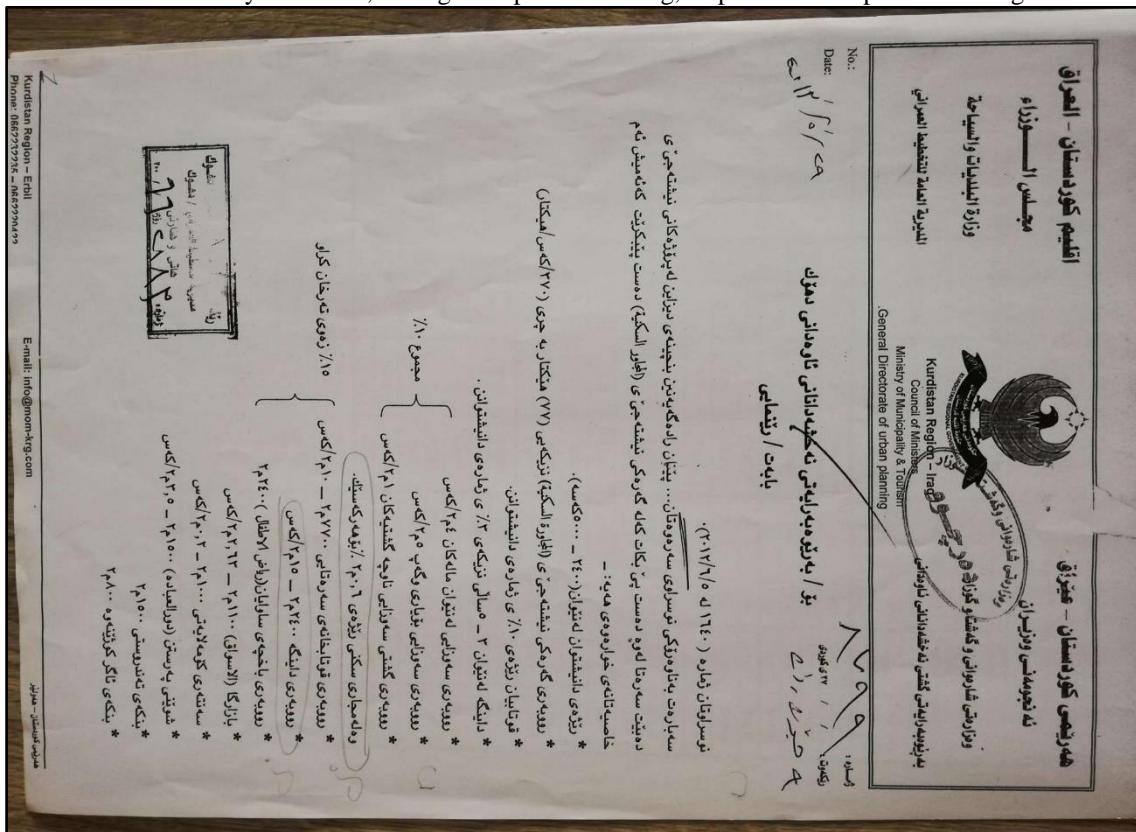
Urban Areas	Plot Area	Population Density by mahalla Person/Hectare	Population Density by neighborhood Person/Hectare	Population Density by sector Person/Hectare
First	100-199	275-380	240-320	215-290
Second	200-299	150-220	140-210	135-170
Third	300-599	100-140	95-125	95-130
Fourth	600-800	65-90	60-85	60-80
Apartment buildings				
3 stories		250-340	200-299	185-265
4-5 stories		270-350	220-300	190-270
6 or more		320-440	250-345	220-310



Erbil City Master Plan Proposed Planning Regulations

(Table 11-1) Summary of Community Facilities Planning Standards:

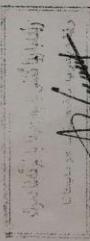
Planning Level	Type of Facility	Low Density Areas (<70persons/hectare)		Med. Density Areas (70-220 persons/hectare)		High Density Areas (> 220 persons/hectare)	
		Pop. Served (x1000)	Min. Site Area (ft²)	Pop. Served (x1000)	Min. Site Area (ft²)	Pop. Served (x1000)	Min. Site Area (ft²)
Neighborhood Level (2000-3000)	Local Mosque	2-3	24000	3-5	16000	3-5	12000
	Retail Facilities	2-3	4000	3-5	5000	3-5	4000
	Local Plaza	2-3	30000	3-5	30000	3-5	25000
Tot Lot		2-3	30000	3-5	25000	3-5	20000
Jama Mosque		7-10	50000	10-15	40000	10-15	30000
Com. Shopping C.		7-10	95000	10-15	86000	10-15	70000
Children Nursery		5-7	20000	7-10	15000	7-10	12000
Kindergarten		5-7	78000	7-10	63000	7-10	50000
Primary School		5-7	126000	8-12	90000	8-12	81000
Pvt. General Clinic		5-7	12000	5-7	10000	5-7	8000
Pvt. Specialty Clinic		7-10	12000	7-10	10000	7-10	8000
Private Polyclinic		7-10	16000	7-10	12000	7-10	8000
Playground		5-7	80000	5-7	70000	5-7	60000
Community Park		7-10	190000	7-10	160000	7-10	120000
Intermediate Sch.		10-15	140000	15-20	100000	15-20	80000
Secondary Sch.		15-20	220000	20-30	160000	20-30	130000
Pvt. Daycare Centre		15-20	24000	15-20	20000	15-20	16000
Post Office		20-30	27000	20-30	18000	20-30	18000
Health C. Centre		30	70000	30	50000	30	37000
Elderly Rest House		30-50	50000	70-100	40000	-	-
District Park		30-50	400000	30-50	320000	30-50	250000
Court Defense Centre		50-70	40000	70-100	35000	70-100	30000
Eid Prayer Area		70-100	150000	150-200	150000	200-250	150000
Public Library		70-100	60000	120-150	50000	120-150	50000
Police Station		70-100	50000	120-150	40000	120-150	30000
DM Office		50-70	35000	70-100	35000	100-120	35000
DM Centre		150-200	60000	200-250	50000	250-300	50000
Private Hospital		50-70	210000	50-70	180000	50-70	175000
Gov. Ref. Hospital		150-200	450000	200-250	360000	240-300	300000





ب/ راجونه ک لسور روپههین زهفین قوتا بخانا
جه نایی ههود ناگهههار دکن ب شان پیشانین لخواری دبارک و دلیف داخرب رشیدهه
ندخشدانان ناقادی لدیف شنساز وان با زماده (٥٠-١٠٠) امسارههین دامتوна
زهفین قوتا بخانا و بخچن زارک دلیف زمارا خیزانن تا کجین ههور ده فرمه، وکی لخواری
دارکری:

- (١) بوهار خیزانانکی (١) قوقابی ناجهی زارک دهنهه دانان.
- (٢) بوهار خیزانانکی (١) قوقابی نهندوی دهنهه دانان.
- (٣) بوهار خیزانانکی (١) قوقابی ناما دهنهه دهنهه دانان.
- ٩٩ بوهار و تکنون قوتا بخانن بوکه دهنهه ناکرکن لدیف شان زمانیان خواری نه:
١) قوتا بخانن (١) پولی نهندوی ل گوندا، کومههکها و سندنهه ناحجا دهنهه ناکرکن لسور روپهه
٢) قوتا بخانن (١) پولی ناما دهنهه ل کومههک ههن مدان و سندنهه ناحجا وقرا دهنهه ناکرکن
٣) قوتا بخانن (١) پولی ناما دهنهه ل سندنهه نفزا و بانزگهه دهنهه ناکرکن لسور روپهه
٤) قوتا بخانن (١) پولی ناما دهنهه کونهه ل سندنهه بانزگهه دهنهه ناکرکن لسور روپهه
٥) قاتههین با جهی زارک (١) پولی کسول کومههک ههن مدان و سندنهه ناحجا وقرا
بانزگهه دهنهه ناکرکن لسور روپهه (٥٠-٤٥) م و بیزگی (٠٠) قوتا بخانا و ده ده کریت.
- ٦) قرمون بوز ازاب و ناگهههار و فرمائی جههه ههود گل زیگریتی.....



د/ احمد حسن صیری